Building Synthetic Microbial Communities for Biology, Mitigating Climate Change, Sustainability, and Biotechnology (Synthetic Communities)

PROGRAM SOLICITATION
NSF 22-607

Full Proposal Deadline(s) (due by 5 p.m. submitter's local time):
- October 03, 2022
- August 01, 2024
- August 1, Every Other Year Thereafter

IMPORTANT INFORMATION AND REVISION NOTES

Innovating and migrating proposal preparation and submission capabilities from FastLane to Research.gov is part of the ongoing NSF information technology modernization efforts, as described in Important Notice No. 147. In support of these efforts, proposals submitted in response to this program solicitation must be prepared and submitted via Research.gov or via Grants.gov and may not be prepared or submitted via FastLane.

Any proposal submitted in response to this solicitation should be submitted in accordance with the revised NSF Proposal & Award Policies & Procedures Guide (PAPPG) (NSF 22-1), which is effective for proposals submitted, or due, on or after October 4, 2021.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:
Building Synthetic Microbial Communities for Biology, Mitigating Climate Change, Sustainability and Biotechnology (Synthetic Communities)

Synopsis of Program:
Microbes and communities of microbes have remarkable genetic, physiological and biochemical diversity, allowing them to flourish in environments all over the planet and in a variety of substrates and hosts. Given their relative importance to ecosystems around the world, to the economy and to health, researchers have studied microbial systems extensively and have a better understanding of their capabilities and impacts on hosts and the environment. In recent years, researchers have increasingly turned to microbes and their diverse capabilities for bioremediation and applications in biotechnology, agriculture, and medicine. Because of advances in molecular biology, synthetic biology and bioengineering, researchers now have the ability to assemble synthetic microbial communities that have novel compositions, genetics and phenotypes and to use these communities to address both fundamental biological questions and a range of societal problems. The goal of this solicitation is to support research that addresses one or more of the three themes: 1) define the underlying mechanisms or rules that drive the formation, maintenance or evolution of synthetic microbial communities, 2) use synthetic microbial communities to address fundamental biological questions, including questions in molecular biology, cellular/organismal biology, ecology and evolution and/or 3) build synthetic communities with biotechnology, bio-economy or environmental engineering applications, including but not limited to the production of novel bio-renewable chemicals, bio-degradation of recalcitrant or "forever chemicals," enabling a circular bio-economy, fostering sustainable agriculture and mitigating the impacts of climate change. For theme 3, the emphasis should be on designing communities with novel capabilities and understanding the underlying mechanisms that lead to these novel capabilities.

Proposals must address one or more of the three themes noted above. Highest funding priority is given to proposals that have outstanding intellectual merit and broader impacts, while proposals with weaknesses in either category (or those that are perceived as likely to have an incremental impact) will not be competitive. The most competitive broader impacts include assessment plans. Well-conceived broader impacts activities take time and resources; thus, proposers are encouraged to include appropriate costs for broader impacts in the budget.

To better understand the societal benefits and risks, as well as the potential for misuse or unintended damage to natural biological systems, synthetic microbial communities proposals should include a careful consideration of the social, ethical, and biosafety/security dimensions of the research. Investigators may choose to address these issues either as part of intellectual merit or broader impacts.
Reproducibility in research leads to data that is amenable to more powerful analysis and the potential for reuse of data and greater generation of knowledge. Reproducibility in biological research that is prone to context dependent biological variation presents a unique challenge for the synthetic microbial communities researchers. Investigators must follow or advance best practices in sample collection and preparation, experimental design, data analysis, model generation, and/or validation of mathematical and computational methods to produce scientifically defensible results.

Cognizant Program Officer(s):

Please note that the following information is current at the time of publishing. See program website for any updates to the points of contact.

- Anthony G. Garza, telephone: (703) 292-8440, email: aggarza@nsf.gov
- John McDowell, telephone: (703) 292-8008, email: jmcdowel@nsf.gov
- Andrea Porras-Alfaro, telephone: (703) 292-2944, email: aporrasa@nsf.gov
- Mamta Rawat, telephone: (703) 292-7265, email: mrawat@nsf.gov

Applicable Catalog of Federal Domestic Assistance (CFDA) Number(s):

- 47.074 --- Biological Sciences

**Award Information**

**Anticipated Type of Award:** Standard Grant or Continuing Grant

**Estimated Number of Awards:** 7 to 12

**Anticipated Funding Amount:** $9,500,000

**Eligibility Information**

**Who May Submit Proposals:**

The categories of proposers eligible to submit proposals to the National Science Foundation are identified in the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG), Chapter I.E. Unaffiliated individuals are not eligible to submit proposals in response to this solicitation.

**Who May Serve as PI:**

There are no restrictions or limits.

**Limit on Number of Proposals per Organization:**

There are no restrictions or limits.

**Limit on Number of Proposals per PI or co-PI:**

There are no restrictions or limits.

**Proposal Preparation and Submission Instructions**

**A. Proposal Preparation Instructions**

- **Letters of Intent:** Not required
- **Preliminary Proposal Submission:** Not required
- **Full Proposals:**

**B. Budgetary Information**

- **Cost Sharing Requirements:**
  Inclusion of voluntary committed cost sharing is prohibited.

- **Indirect Cost (F&A) Limitations:**
  Not Applicable

- **Other Budgetary Limitations:**
  Not Applicable
I. INTRODUCTION

NSF recognizes recent advances in microbial communities (microbiome) research and the potential to use the tools of molecular biology, synthetic biology and bioengineering to assemble synthetic microbial communities that have novel compositions, genetics, and phenotypes to use these communities to address fundamental questions in the biological sciences and to address pressing societal goals such as mitigating the effects of climate change, building a circular bio-economy, bio-degradation of recalcitrant or "forever chemicals," sustainable crop production, and correcting imbalances in microbial populations in hosts and the environment.

This solicitation aims to support these areas of research, as they represent a convergence of biology and engineering. The three research themes in this solicitation are viewed as natural extensions of NSF’s investment in basic microbial communities research, such as research that aims to define the interactions and mechanisms that control microbiome structure/function (see NSF 20-513 and NSF 21-534).

Highest funding priority is given to proposals that have outstanding intellectual merit and broader impacts, while proposals with weaknesses in either category (or those that are perceived as likely to have an incremental impact) will not be competitive. Effective broader impacts activities can include educational, workforce development, broadening participation, or outreach activities, including participation via existing institutional infrastructure for education, training, and outreach. The most competitive broader impacts activities include assessment. Well-conceived broader impacts activities take time and resources; thus proposers are encouraged to include appropriate costs for broader impacts in the budget.

NSF is particularly interested in increasing the participation of groups underrepresented in research and education such as women, persons with disabilities, and
underrepresented groups\(^1\), and those from geographically underrepresented areas in science, technology, engineering, and mathematics (STEM). Proposals submitted to any theme described in this solicitation are strongly encouraged to involve PIs, co-PIs, postdoctoral fellows, students, and other personnel who are members of these groups. Proposers are also strongly encouraged to consider involving veterans of the U.S. Armed Forces as part of NSF’s broader effort to promote veteran involvement in STEM research and education.


**II. PROGRAM DESCRIPTION**

The earth has an abundance of microbial life and many, if not most, microbes live in heterogeneous communities with substantial phenotypic and/or genetic variation and often many species. It is the diversity of community membership, as well as the diversity of genetic, physiological and biochemical capabilities, that have allowed microbial communities to occupy and flourish in spaces all over the planet and in a variety of hosts.

Microbial communities play important roles in ecosystems around the planet and are important for the health of animals and many other host organisms. Indeed, researchers have studied microbial systems to better understand a variety of processes that are important for life on earth. Researchers have also used the remarkable physiological and biochemical diversity of microbes and microbial communities for a broad range of applications, including production of food and feed crops, high-value chemicals and therapeutics, wastewater management and bio-remediation.

In recent years, researchers have turned to synthetic biology and bioengineering to assemble microbial communities that have specific capabilities and/or to provide microbes with new capabilities. Given the relative ease at which microbes are grown and genetically modified, and the recent development of numerous genetic tools, researchers now have the ability to synthetically modify microbes and to artificially assemble microbial communities. This has allowed researchers to approach fundamental biological questions in a new way and to address urgent problems such as the need for novel therapeutics to treat emerging diseases, improving nutrient utilization and disease resistance in crop plants, remediation of plastics from the environment, and sequestration of carbon dioxide and removal of methane from the environment to mitigate climate change and its impacts.

For the purposes of this solicitation, synthetic microbial communities are defined as mixtures of microbes or strains that are not naturally occurring and have novel characteristics or have been rationally designed genetically and/or metabolically to have a particular capability. Organisms across multiple phyla and kingdoms, including bacteria, archaea, and eukaryotes such as fungi and microalgae, can be used to generate the synthetic microbial communities.

This solicitation seeks proposals that use synthetic microbial communities to address at least one of three thematic areas: 1) defining the mechanisms or rules that drive the formation, maintenance or evolution of synthetic microbial communities; 2) using synthetic microbial communities to address fundamental biological questions, including questions in molecular biology, cellular/organismal biology, ecology and evolution; 3) building synthetic communities with biotechnology or bio-economy applications, including but not limited to the production of novel bio-renewable chemicals, bio-degradation of harmful or recalcitrant environmental chemicals, enabling a circular bio-economy, fostering sustainable agriculture and mitigating the impacts of climate change. For theme 3, the emphasis should be on designing communities with novel capabilities and understanding the underlying biological mechanisms that lead to these novel capabilities. Projects that identify rules for the formation of microbial communities using natural systems and then apply the rules to synthetic microbial communities are permissible for theme 1.

**Additional Considerations**

Research on synthetic microbial communities requires simultaneous careful exploration of the social, ethical, and biosafety/security dimensions of the research. Only by doing so will we be able to fully understand both the societal benefits and risks as well as their potential for willful misuse or unintended damage to natural biological systems. Investigators are encouraged to carefully consider possible social, ethical and/or biosafety/security issues that might be associated with the proposed research, and when warranted, to address these issues either as part of intellectual merit or broader impacts.

Context-dependent biological variation presents a unique challenge to the reproducibility of results in all biological research. Proposers are required to address how they will ensure reproducibility and replicability of sample collection and preparation, experimental design, data analysis, model generation and/or validation of mathematical and computational methods that either conform to or advance best practices in the field.

**Summary of Solicitation Requirements**

- Proposals must use synthetic microbial communities as defined in the solicitation.
- Proposals must align with one or more of the three themes identified including (1) defining the mechanisms or underlying rules that drive the formation, maintenance or evolution of synthetic microbial communities; (2) using synthetic microbial communities to address a fundamental biological question; and/or (3) assembling and analyzing synthetic communities for a biotechnology or bio-economy application.
- When appropriate, the proposal should address the social, ethical, and/or biosafety/biosecurity implications of the proposed synthetic microbial communities research.
- Proposals must address reproducibility and replicability in accordance with or in advancement of best practices in the field.

**III. AWARD INFORMATION**

Pending availability of funds, approximately $9,500,000 will be committed in total for all new awards in each fiscal year. Award size and duration should be commensurate with the scope of the project.
IV. ELIGIBILITY INFORMATION

Who May Submit Proposals:

The categories of proposers eligible to submit proposals to the National Science Foundation are identified in the NSF Proposal & Award Policies & Procedures Guide (PAPPG), Chapter I.E. Unaffiliated individuals are not eligible to submit proposals in response to this solicitation.

Who May Serve as PI:

There are no restrictions or limits.

Limit on Number of Proposals per Organization:

There are no restrictions or limits.

Limit on Number of Proposals per PI or co-PI:

There are no restrictions or limits.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Full Proposal Preparation Instructions: Proposers may opt to submit proposals in response to this Program Solicitation via Research.gov or Grants.gov.

- Full Proposals submitted via Research.gov: Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the NSF Proposal and Award Policies and Procedures Guide (PAPPG). The complete text of the PAPPG is available electronically on the NSF website at: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg. Paper copies of the PAPPG may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-8134 or by e-mail from nsfpubs@nsf.gov. The Prepare New Proposal setup will prompt you for the program solicitation number.
- Full proposals submitted via Grants.gov: Proposals submitted in response to this program solicitation via Grants.gov should be prepared and submitted in accordance with the NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov. The complete text of the NSF Grants.gov Application Guide is available on the Grants.gov website and on the NSF website at: (https://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide). To obtain copies of the Application Guide and Application Forms Package, click on the Apply tab on the Grants.gov site, then click on the Apply Step 1: Download a Grant Application Package and Application Instructions link and enter the funding opportunity number, (the program solicitation number without the NSF prefix) and press the Download Package button. Paper copies of the Grants.gov Application Guide also may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-8134 or by e-mail from nsfpubs@nsf.gov.

In determining which method to utilize in the electronic preparation and submission of the proposal, please note the following:

Collaborative Proposals. All collaborative proposals submitted as separate submissions from multiple organizations must be submitted via Research.gov. PAPPG Chapter II.D.3 provides additional information on collaborative proposals.

See PAPPG Chapter II.C.2 for guidance on the required sections of a full research proposal submitted to NSF. Please note that the proposal preparation instructions provided in this program solicitation may deviate from the PAPPG instructions.

B. Budgetary Information

Cost Sharing:

Inclusion of voluntary committed cost sharing is prohibited.

C. Due Dates

- Full Proposal Deadline(s) (due by 5 p.m. submitter’s local time):
  - October 03, 2022
  - August 01, 2024
  - August 1, Every Other Year Thereafter

D. Research.gov/Grants.gov Requirements

For Proposals Submitted Via Research.gov:

To prepare and submit a proposal via Research.gov, see detailed technical instructions available at: https://www.research.gov/research-
For Proposals Submitted Via Grants.gov:

Before using Grants.gov for the first time, each organization must register to create an institutional profile. Once registered, the applicant's organization can then apply for any federal grant on the Grants.gov website. Comprehensive information about using Grants.gov is available on the Grants.gov Applicant Resources webpage: https://www.grants.gov/web/grants/applicants.html. In addition, the NSF Grants.gov Application Guide (see link in Section V.A) provides instructions regarding the technical preparation of proposals via Grants.gov. For Grants.gov user support, contact the Grants.gov Contact Center at 1-800-518-4726 or by email: support@grants.gov. The Grants.gov Contact Center answers general technical questions related to the use of Grants.gov. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this solicitation.

VI. NSF PROPOSAL PROCESSING AND REVIEW PROCEDURES

Proposals received by NSF are assigned to the appropriate NSF program for acknowledgement and, if they meet NSF requirements, for review. All proposals are carefully reviewed by a scientist, engineer, or educator serving as an NSF Program Officer, and usually by three to ten other persons outside NSF either as ad hoc reviewers, panelists, or both, who are experts in the particular fields represented by the proposal. These reviewers are selected by Program Officers with oversight of the review process. Proposers are invited to suggest names of persons they believe are especially well qualified to review the proposal and/or persons they would prefer not review the proposal. These suggestions may serve as one source in the reviewer selection process at the Program Officer's discretion. Submission of such names, however, is optional. Care is taken to ensure that reviewers have no conflicts of interest with the proposal. In addition, Program Officers may obtain comments from site visits before recommending final action on proposals. Senior NSF staff further review recommendations for awards. A flowchart that depicts the entire NSF proposal and award process (and associated timeline) is included in PAPPG Exhibit III-1.

A comprehensive description of the Foundation's merit review process is available on the NSF website at: https://www.nsf.gov/bfa/dias/policy/merit_review/.

Proposers should also be aware of core strategies that are essential to the fulfillment of NSF's mission, as articulated in Leading the World in Discovery and Innovation, STEM Talent Development and the Delivery of Benefits from Research - NSF Strategic Plan for Fiscal Years (FY) 2022 - 2026. These strategies are integrated in the program planning and implementation process, of which proposal review is one part. NSF's mission is particularly well-implemented through the integration of research and education and broadening participation in NSF programs, projects, and activities.

One of the strategic objectives in support of NSF's mission is to foster integration of research and education through the programs, projects, and activities it supports at academic and research institutions. These institutions must recruit, train, and prepare a diverse STEM workforce to advance the frontiers of science and participate in the U.S. technology-based economy. NSF's contribution to the national innovation ecosystem is to provide cutting-edge research under the guidance of the Nation's most creative scientists and engineers. NSF also supports development of a strong science, technology, engineering, and mathematics (STEM) workforce by investing in building the knowledge that informs improvements in STEM teaching and learning.

NSF's mission calls for the broadening of opportunities and expanding participation of groups, institutions, and geographic regions that are underrepresented in STEM disciplines, which is essential to the health and vitality of science and engineering. NSF is committed to this principle of diversity and deems it central to the programs, projects, and activities it considers and supports.

A. Merit Review Principles and Criteria

The National Science Foundation strives to invest in a robust and diverse portfolio of projects that creates new knowledge and enables breakthroughs in understanding across all areas of science and engineering research and education. To identify which projects to support, NSF relies on a merit review process that incorporates consideration of both the technical aspects of a proposed project and its potential to contribute more broadly to advancing NSF's mission "to promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes." NSF makes every effort to conduct a fair, competitive, transparent merit review process for the selection of projects.

1. Merit Review Principles

These principles are to be given due diligence by PIs and organizations when preparing proposals and managing projects, by reviewers when reading and evaluating proposals, and by NSF program staff when determining whether or not to recommend proposals for funding and while overseeing awards. Given that NSF is the primary federal agency charged with nurturing and supporting excellence in basic research and education, the following three principles apply:

- All NSF projects should be of the highest quality and have the potential to advance, if not transform, the frontiers of knowledge.
- NSF projects, in the aggregate, should contribute more broadly to achieving societal goals. These "Broader Impacts" may be accomplished through the research itself, through activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to, the project. The project activities may be based on previously established and/or innovative methods and approaches, but in either case must be well justified.
- Meaningful assessment and evaluation of NSF funded projects should be based on appropriate metrics, keeping in mind the likely correlation between the effect of broader impacts and the resources provided to implement projects. If the size of the activity is limited, evaluation of that activity in isolation
is not likely to be meaningful. Thus, assessing the effectiveness of these activities may best be done at a higher, more aggregated, level than the individual project.

With respect to the third principle, even if assessment of Broader Impacts outcomes for particular projects is done at an aggregated level, PIs are expected to be accountable for carrying out the activities described in the funded project. Thus, individual projects should include clearly stated goals, specific descriptions of the activities that the PI intends to do, and a plan in place to document the outputs of those activities.

These three merit review principles provide the basis for the merit review criteria, as well as a context within which the users of the criteria can better understand their intent.

2. Merit Review Criteria

All NSF proposals are evaluated through use of the two National Science Board approved merit review criteria. In some instances, however, NSF will employ additional criteria as required to highlight the specific objectives of certain programs and activities.

The two merit review criteria are listed below. Both criteria are to be given full consideration during the review and decision-making processes; each criterion is necessary but neither, by itself, is sufficient. Therefore, proposers must fully address both criteria. (PAPPG Chapter II.C.2.d)(i) contains additional information for use by proposers in development of the Project Description section of the proposal). Reviewers are strongly encouraged to review the criteria, including PAPPG Chapter II.C.2.d)(i), prior to the review of a proposal.

When evaluating NSF proposals, reviewers will be asked to consider what the proposers want to do, why they want to do it, how they plan to do it, how they will know if they succeed, and what benefits could accrue if the project is successful. These issues apply both to the technical aspects of the proposal and the way in which the project may make broader contributions. To that end, reviewers will be asked to evaluate all proposals against two criteria:

- **Intellectual Merit:** The Intellectual Merit criterion encompasses the potential to advance knowledge; and
- **Broader Impacts:** The Broader Impacts criterion encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes.

The following elements should be considered in the review for both criteria:

1. What is the potential for the proposed activity to
   a. Advance knowledge and understanding within its own field or across different fields (Intellectual Merit); and
   b. Benefit society or advance desired societal outcomes (Broader Impacts)?
2. To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts?
3. 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?
4. How well qualified is the individual, team, or organization to conduct the proposed activities?
5. Are there adequate resources available to the PI (either at the home organization or through collaborations) to carry out the proposed activities?

Broader impacts may be accomplished through the research itself, through the activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to, the project. NSF values the advancement of scientific knowledge and activities that contribute to achievement of societally relevant outcomes. Such outcomes include, but are not limited to: full participation of women, persons with disabilities, and other underrepresented groups in science, technology, engineering, and mathematics (STEM); improved STEM education and educator development at any level; increased public scientific literacy and public engagement with science and technology; improved well-being of individuals in society; development of a diverse, globally competitive STEM workforce; increased partnerships between academia, industry, and others; improved national security; increased economic competitiveness of the United States; and enhanced infrastructure for research and education.

Proposers are reminded that reviewers will also be asked to review the Data Management Plan and the Postdoctoral Researcher Mentoring Plan, as appropriate.

**Additional Solicitation Specific Review Criteria**

In addition to the standard NSF review criteria, reviewers will be asked to evaluate the following:

- Does the proposal use a synthetic microbial community as defined in the solicitation?
- Does the proposal address one or more of the themes identified in the solicitation?
- Does the proposal address social, ethical, biosafety or biosecurity implications of the research if appropriate?
- Does the proposal ensure reproducibility and replicability via adherence to or advancement of best practices in the field?

### B. Review and Selection Process

Proposals submitted in response to this program solicitation will be reviewed by Ad hoc Review and/or Panel Review.

Reviewers will be asked to evaluate proposals using two National Science Board approved merit review criteria and, if applicable, additional program specific criteria. A summary rating and accompanying narrative will generally be completed and submitted by each reviewer and/or panel. The Program Officer assigned to manage the proposal's review will consider the advice of reviewers and will formulate a recommendation.

After scientific, technical and programmatic review and consideration of appropriate factors, the NSF Program Officer recommends to the cognizant Division Director whether the proposal should be declined or recommended for award. NSF strives to be able to tell applicants whether their proposals have been declined or recommended for funding within six months. Large or particularly complex proposals or proposals from new awardees may require additional review and processing time. The time interval begins on the deadline or target date, or receipt date, whichever is later. The interval ends when the Division Director acts upon the Program Officer's recommendation.

After programmatic approval has been obtained, the proposals recommended for funding will be forwarded to the Division of Grants and Agreements or the Division of Acquisition and Cooperative Support for review of business, financial, and policy implications. After an administrative review has occurred, Grants and Agreements Officers perform the processing and issuance of a grant or other agreement. Proposers are cautioned that only a Grants and Agreements Officer may make commitments, obligations or awards on behalf of NSF or authorize the expenditure of funds. No commitment on the part of NSF should be inferred from technical or budgetary discussions with a NSF Program Officer. A Principal Investigator or organization that makes financial or personnel
commitments in the absence of a grant or cooperative agreement signed by the NSF Grants and Agreements Officer does so at their own risk.

Once an award or declination decision has been made, Principal Investigators are provided feedback about their proposals. In all cases, reviews are treated as confidential documents. Verbatim copies of reviews, excluding the names of the reviewers or any reviewer-identifying information, are sent to the Principal Investigator/Project Director by the Program Officer. In addition, the proposer will receive an explanation of the decision to award or decline funding.

VII. AWARD ADMINISTRATION INFORMATION

A. Notification of the Award

Notification of the award is made to the submitting organization by an NSF Grants and Agreements Officer. Organizations whose proposals are declined will be advised as promptly as possible by the cognizant NSF Program administering the program. Verbatim copies of reviews, not including the identity of the reviewer, will be provided automatically to the Principal Investigator. (See Section VI.B. for additional information on the review process.)

B. Award Conditions

An NSF award consists of: (1) the award notice, which includes any special provisions applicable to the award and any numbered amendments thereto; (2) the budget, which indicates the amounts, by categories of expense, on which NSF has based its support (or otherwise communicates any specific approvals or disapprovals of proposed expenditures); (3) the proposal referenced in the award notice; (4) the applicable award conditions, such as Grant General Conditions (GC-1)*; or Research Terms and Conditions* and (5) any announcement or other NSF issuance that may be incorporated by reference in the award notice. Cooperative agreements also are administered in accordance with NSF Cooperative Agreement Financial and Administrative Terms and Conditions (CA-FATC) and the applicable Programmatic Terms and Conditions. NSF awards are electronically signed by an NSF Grants and Agreements Officer and transmitted electronically to the organization via e-mail.

*These documents may be accessed electronically on NSF’s Website at https://www.nsf.gov/awards/managing/award_conditions.jsp?org=NSF. Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-8134 or by e-mail from nsfpubs@nsf.gov.


Administrative and National Policy Requirements

Build America, Buy America

As expressed in Executive Order 14005, Ensuring the Future is Made in All of America by All of America’s Workers (86 FR 7475), it is the policy of the executive branch to use terms and conditions of Federal financial assistance awards to maximize, consistent with law, the use of goods, products, and materials produced in, and services offered in, the United States.

Consistent with the requirements of the Build America, Buy America Act (Pub. L. 117-58, Division G, Title IX, Subtitle A, November 15, 2021), no funding made available through this funding opportunity may be obligated for an award unless all iron, steel, manufactured products, and construction materials used in the project are produced in the United States. For additional information, visit NSF’s Build America, Buy America webpage.

C. Reporting Requirements

For all multi-year grants (including both standard and continuing grants), the Principal Investigator must submit an annual project report to the cognizant Program Officer no later than 90 days prior to the end of the current budget period. (Some programs or awards require submission of more frequent project reports). No later than 120 days following expiration of a grant, the PI also is required to submit a final project report, and a project outcomes report for the general public.

Failure to provide the required annual or final project reports, or the project outcomes report, will delay NSF review and processing of any future funding increments as well as any pending proposals for all identified PIs and co-PIs on a given award. PIs should examine the formats of the required reports in advance to assure availability of required data.

PIs are required to use NSF’s electronic project-reporting system, available through Research.gov, for preparation and submission of annual and final project reports. Such reports provide information on accomplishments, project participants (individual and organizational), publications, and other specific products and impacts of the project. Submission of the report via Research.gov constitutes certification by the PI that the contents of the report are accurate and complete. The project outcomes report also must be prepared and submitted using Research.gov. This report serves as a brief summary, prepared specifically for the public, of the nature and outcomes of the project. This report will be posted on the NSF website exactly as it is submitted by the PI.


VIII. AGENCY CONTACTS
Please note that the program contact information is current at the time of publishing. See program website for any updates to the points of contact.

General inquiries regarding this program should be made to:

- Anthony G. Garza, telephone: (703) 292-8440, email: aggarza@nsf.gov
- John McDowell, telephone: (703) 292-8008, email: jmcdowell@nsf.gov
- Andrea Porras-Alfaro, telephone: (703) 292-2944, email: aporrasa@nsf.gov
- Mamta Rawat, telephone: (703) 292-7265, email: mrawat@nsf.gov

For questions related to the use of FastLane or Research.gov, contact:

- FastLane and Research.gov Help Desk: 1-800-673-6188
- FastLane Help Desk e-mail: fastlane@nsf.gov
- Research.gov Help Desk e-mail: rgov@nsf.gov

For questions relating to Grants.gov contact:

- Grants.gov Contact Center: If the Authorized Organizational Representatives (AOR) has not received a confirmation message from Grants.gov within 48 hours of submission of application, please contact via telephone: 1-800-518-4726; e-mail: support@grants.gov.

IX. OTHER INFORMATION

The NSF website provides the most comprehensive source of information on NSF Directorates (including contact information), programs and funding opportunities. Use of this website by potential proposers is strongly encouraged. In addition, "NSF Update" is an information-delivery system designed to keep potential proposers and other interested parties apprised of new NSF funding opportunities and publications, important changes in proposal and award policies and procedures, and upcoming NSF Grants Conferences. Subscribers are informed through e-mail or the user’s Web browser each time new publications are issued that match their identified interests. "NSF Update" also is available on NSF’s website.

Grants.gov provides an additional electronic capability to search for Federal government-wide grant opportunities. NSF funding opportunities may be accessed via this mechanism. Further information on Grants.gov may be obtained at https://www.grants.gov.

ABOUT THE NATIONAL SCIENCE FOUNDATION

The National Science Foundation (NSF) is an independent Federal agency created by the National Science Foundation Act of 1950, as amended (42 USC 1861-75). The Act states the purpose of the NSF is “to promote the progress of science; [and] to advance the national health, prosperity, and welfare by supporting research and education in all fields of science and engineering.”

NSF funds research and education in most fields of science and engineering. It does this through grants and cooperative agreements to more than 2,000 colleges, universities, K-12 school systems, businesses, informal science organizations and other research organizations throughout the US. The Foundation accounts for about one-fourth of Federal support to academic institutions for basic research.

NSF receives approximately 55,000 proposals each year for research, education and training projects, of which approximately 11,000 are funded. In addition, the Foundation receives several thousand applications for graduate and postdoctoral fellowships. The agency operates no laboratories itself but does support National Research Centers, user facilities, certain oceanographic vessels and Arctic and Antarctic research stations. The Foundation also supports cooperative research between universities and industry, US participation in international scientific and engineering efforts, and educational activities at every academic level.

Facilitation Awards for Scientists and Engineers with Disabilities (FASED) provide funding for special assistance or equipment to enable persons with disabilities to work on NSF-supported projects. See the NSF Proposal & Award Policies & Procedures Guide Chapter II.E.6 for instructions regarding preparation of these types of proposals.

The National Science Foundation has Telephonic Device for the Deaf (TDD) and Federal Information Relay Service (FIRS) capabilities that enable individuals with hearing impairments to communicate with the Foundation about NSF programs, employment or general information. TDD may be accessed at (703) 292-5090 and (800) 281-8749, FIRS at (800) 877-8339.

The National Science Foundation Information Center may be reached at (703) 292-5111.

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