

Physics Frontiers Centers (PFC)

PROGRAM SOLICITATION NSF 22-592

REPLACES DOCUMENT(S): NSF 19-578



National Science Foundation

Directorate for Mathematical and Physical Sciences
Division of Physics

Preliminary Proposal Due Date(s) (required) (due by 5 p.m. submitter's local time):

August 01, 2022

(required) (due by 5 p.m. submitter's local time).

Full Proposal Deadline(s) (due by 5 p.m. submitter's local time):

January 27, 2023

by invitation only

IMPORTANT INFORMATION AND REVISION NOTES

Revision Notes

This Physics Frontiers Centers solicitation supersedes version [NSF 19-578](#). Physics Frontiers Centers funded through this solicitation will be funded for six years instead of the previous five years. In addition, the length of the Project Description has been increased from 70 pages to 72, to allow a corresponding change in the length of the Education, Human Resources, Diversity, and Outreach Section (increased from three pages to four) as well as the addition of a Broader Impacts section. A requirement for a plan to sustain Education, Outreach, and Diversity activities beyond the lifespan of the Center has been added.

Important Information

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, research 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:

Physics Frontiers Centers (PFC)

Synopsis of Program:

The Physics Frontiers Centers (PFC) program supports university-based centers and institutes where the collective efforts of a larger group of individuals can enable transformational advances in the most promising research areas. The program is designed to foster major breakthroughs at the intellectual frontiers of physics by providing needed resources such as combinations of talents, skills, disciplines, and/or specialized infrastructure, not usually available to individual investigators or small groups, in an environment in which the collective efforts of the larger group can be shown to be seminal to promoting significant progress in the science and the education of students. Activities supported through the program are in all sub-fields of physics within the purview of the Division of Physics: atomic, molecular, optical, plasma, elementary particle, nuclear, particle astro-, gravitational, and biological physics. Interdisciplinary projects at the interface between these physics areas and other disciplines and physics sub-fields may also be considered, although the bulk of the effort must fall within one of those areas within the purview of the Division of Physics. The successful PFC activity will demonstrate: (1) the potential for a profound advance in

physics; (2) creative, substantive activities aimed at enhancing education, diversity, and public outreach; (3) potential for broader impacts, e.g., impacts on other field(s) and benefits to society; (4) a synergy or value-added rationale that justifies a center- or institute-like approach.

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.

- Kathleen McCloud, Program Director, telephone: (703) 292-8236, email: kmccloud@nsf.gov
- James T. Shank, Program Director, telephone: (703) 292-4516, email: jshank@nsf.gov

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

- 47.049 --- Mathematical and Physical Sciences

Award Information

Anticipated Type of Award: Cooperative Agreement

Estimated Number of Awards: 3 to 5

Anticipated Funding Amount: \$6,000,000 to \$8,000,000 in FY 2023, pending availability of funds and the quality of proposals received.

Eligibility Information

Who May Submit Proposals:

Proposals may only be submitted by the following:

- Institutions of Higher Education (IHEs) - Two- and four-year IHEs (including community colleges) accredited in, and having a campus located in the US, acting on behalf of their faculty members. Special Instructions for International Branch Campuses of US IHEs: If the proposal includes funding to be provided to an international branch campus of a US institution of higher education (including through use of subawards and consultant arrangements), the proposer must explain the benefit(s) to the project of performance at the international branch campus, and justify why the project activities cannot be performed at the US campus.

Who May Serve as PI:

There are no restrictions or limits.

Limit on Number of Proposals per Organization: 2

No more than two preliminary proposals may be submitted by any one institution. The same limitation applies to full proposals.

Limit on Number of Proposals per PI or co-PI: 1

Any one individual may be the Principal Investigator (PI) or co-Principal Investigator (co-PI) for only one preliminary proposal. The same limitation applies to full proposals. Individuals may be listed as participating senior investigators on more than one proposal.

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Letters of Intent:** Not required
- **Preliminary Proposals:** Submission of Preliminary Proposals is required. Please see the full text of this solicitation for further information.
- **Full Proposals:**
 - Full Proposals submitted via Research.gov: *NSF Proposal and Award Policies and Procedures Guide (PAPPG)* guidelines apply. 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.
 - Full Proposals submitted via Grants.gov: *NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov* guidelines apply (Note: 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).

B. Budgetary Information

- **Cost Sharing Requirements:**

Inclusion of voluntary committed cost sharing is prohibited.

- **Indirect Cost (F&A) Limitations:**

Not Applicable

- **Other Budgetary Limitations:**

Other budgetary limitations apply. Please see the full text of this solicitation for further information.

C. Due Dates

- **Preliminary Proposal Due Date(s) (required)** (due by 5 p.m. submitter's local time):

August 01, 2022

(required) (due by 5 p.m. submitter's local time).

- **Full Proposal Deadline(s)** (due by 5 p.m. submitter's local time):

January 27, 2023

by invitation only

Proposal Review Information Criteria

Merit Review Criteria:

National Science Board approved criteria. Additional merit review criteria apply. Please see the full text of this solicitation for further information.

Award Administration Information

Award Conditions:

Additional award conditions apply. Please see the full text of this solicitation for further information.

Reporting Requirements:

Standard NSF reporting requirements apply.

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I. INTRODUCTION

Physics addresses an inspiring range of phenomena, from quarks to the cosmos, from the Big Bang to the end of the universe, and all energy, length and time scales in between. The results of physics research touch everyone's life every day and promise solutions to some of our most daunting challenges. In a very real sense, advancing the intellectual frontiers in science, generally, and physics, in particular, is vital to the nation's health, prosperity, and defense. The purpose of the Physics Frontiers Centers (PFC) program is to support timely, aggressive, and forward-looking research that has the potential to lead to a major advance in physics, and, thereby, to advances in other fields and to benefits for society.

Major advances in physics are produced by efforts of all sizes. Over time, individual investigators and the small research group have consistently been among the most important producers of ideas and innovations. However, as projects have become increasingly more complex, large collaborations with hundreds of members are needed to address certain problems involving large-scale tools and facilities. An increasingly important mode of discovery-class research has developed that engages intermediate-sized collaborations that involve a mix of disciplines and/or talents, infrastructure for shared use, and center-scale activities. It is this mode of research that the PFC program is designed to address.

The PFC program will enable university-based investigators to address research areas that require more resources than are normally available to individual

investigators or small groups, such as combinations of talents, skills, and/or disciplines or specialized infrastructure. Centers, groups, or institutes funded through the program are expected to address the most exciting questions at the very edge of current understanding. Such activities frequently take new research directions and always involve considerable technical risk. Organization of such activities will vary widely, depending on the particular needs of the research. It follows that maximum flexibility in the design of units funded through the program is essential, so the specific organization of the unit, whether it be a group, a center, or an institute, is left to the creativity of the Principal Investigators. Proposals to the program will be evaluated through use of the two National Science Board approved merit review criteria of intellectual merit and broader impacts. In addition to this, a major deciding factor in determining whether an activity qualifies for PFC funding is the synergy and value added that justifies center-scale support.

Units supported through the PFC program are expected to provide an exceptionally stimulating environment for education so that students will benefit from interactions with a large, often interdisciplinary, group of scientists at all career levels. Awardees should strongly attract the most talented and motivated graduate and undergraduate students and postdocs and provide them with broad educational experiences. They should actively seek to enhance the participation of underrepresented groups in the scientific enterprise and as participants in the proposed unit. And they should reach out to involve k-12 students and the public in ways that increase science interest and literacy.

Activities supported through the program are in all sub-fields of physics within the purview of the Division of Physics: atomic, molecular, optical, plasma, elementary particle, nuclear, particle astro-, gravitational, and biological physics. Proposals using experimental, theoretical, or computational methods, or any combination, will be considered. Interdisciplinary projects that connect these physics areas to other disciplines and physics sub-fields not within the purview of the Division of Physics may also be considered, although the bulk of the effort must fall within one of those areas within the purview of the Division of Physics. Such projects will be considered and reviewed in consultation with other relevant Divisions.

II. PROGRAM DESCRIPTION

The PFC program is designed to provide support to enable research at the frontiers of physics when the activities are of a scope and complexity that would not be feasible with standard individual investigator or small group support. Through the PFC program university researchers can form centers, institutes, or large group efforts that lead to major new ideas, discoveries, or broad advances in physics or at the boundaries of physics with other disciplines. Proposals for PFC support may address any area within the purview of the Division of Physics, including interdisciplinary and emerging areas of research.

Since the PFC program is designed to foster research at the intellectual frontiers, new types of joint efforts may be needed to address the most promising problems. Therefore, preconceived specifications as to the organization of the effort are kept to a minimum. In all cases, however, a unit must demonstrate that the whole is substantially greater than the sum of the parts. The unit must have a Director who takes overall responsibility for the effort. There must be a management and governance plan to indicate how the unit will operate. Such a plan must contain information on the overall management and reporting structure, how research projects are chosen, the existence and makeup of any advisory board(s) to be used, and the senior investigators responsible for different parts of the unit's research and education activities. All units are expected to be actively engaged in activities that promote the participation of groups that have been traditionally underrepresented in the sciences, and these activities should be clearly described. Outreach to the scientific community and the general public must also be described. Specific plans for these three topics must be clearly delineated in the proposal.

The main characteristics of a PFC-supported unit are tailored by the Principal Investigators to most effectively address the chosen physics goals. Therefore, every unit will be different. Some may be centers; others may be institutes. Some may be stand-alone efforts; others may be intellectually-connected parts of a larger unit. Whatever the type of organization, it is expected that the PFC-supported unit will have some or all of the following characteristics of successful units of similar size and complexity in physics and other fields. In no particular order, these are: (1) combining talent, skills, or facilities required for a major advance in physics; (2) combining groups, departments, institutions, etc. required to make a major advance in physics; (3) providing critical mass or specialized infrastructure needed for an advance by the unit, and often the broader field; (4) providing the context and/or organization to bring together leaders and students to initiate work in a promising new area, a new interdisciplinary field, an important application, or a new facility of strategic importance to physics; (5) fostering field-wide exploration of frontier research within the community at large; (6) making available specialized infrastructure to others; and (7) creating innovative projects to promote education, the participation of traditionally underrepresented groups in science, and public outreach using the center as a focal point.

Investigators making up the unit requesting PFC funding may already have, or choose to apply for, funding outside the context of the PFC funds. The combination of PFC support with other support for the major investigators will be handled in the following way: If the existing individual support is for work not related to the PFC, it must be listed in the proposal to indicate the context of the proposed work. If an existing grant is related to the objectives of the proposed PFC, that support could be considered to be a base for the incremental PFC support that would then contribute to the additional benefits expected from the PFC. If no related support exists, or if the PIs so choose, the PFC budget can include all support for the activity. Examples of both approaches exist, and the PIs are encouraged to discuss such matters with the cognizant Program Director prior to submitting the preliminary proposal. Whatever the choice made, however, it is critical to demonstrate that the research for which PFC funds are requested is connected to the overall PFC-supported activity in such a way as to foster progress that would not be realized in the absence of the synergy provided by the PFC effort.

III. AWARD INFORMATION

Estimated program budget, number of awards and average award size/duration are subject to the availability of funds. Individual PFC awards are expected to range in size between \$1.0 million/year and \$5.0 million/year. The number of awards in FY 2023 is expected to be in the range 3-5, depending upon the availability of funds and the quality of proposals received. Awards will be made for six years. Proposals from existing (re-competing) PFCs will be evaluated in open competition with new proposals. If a proposal from an existing Center is not successful, phase-out support, primarily for students and postdocs, may be provided at a reduced level for up to two years under the current award. If a proposal from an existing PFC is successful, a new cooperative agreement will be awarded. Anticipated date of awards: On or about August 1, 2023.

IV. ELIGIBILITY INFORMATION

Who May Submit Proposals:

Proposals may only be submitted by the following:

- Institutions of Higher Education (IHEs) - Two- and four-year IHEs (including community colleges) accredited in, and having a campus located in the US, acting on behalf of their faculty members. Special Instructions for International Branch Campuses of US IHEs: If the proposal includes funding to be provided to an international branch campus of a US institution of higher education (including through use of subawards and consultant arrangements), the proposer must explain the benefit(s) to the project of performance at the international branch campus, and justify why the project activities cannot be performed at the US campus.

Who May Serve as PI:

There are no restrictions or limits.

Limit on Number of Proposals per Organization: 2

No more than two preliminary proposals may be submitted by any one institution. The same limitation applies to full proposals.

Limit on Number of Proposals per PI or co-PI: 1

Any one individual may be the Principal Investigator (PI) or co-Principal Investigator (co-PI) for only one preliminary proposal. The same limitation applies to full proposals. Individuals may be listed as participating senior investigators on more than one proposal.

Additional Eligibility Info:

Interested IHEs in the United States with research and education programs in the areas of physics outlined in the Introduction in Section I must submit preliminary proposals. In order to guarantee a review of these complex projects that is sufficiently informative to guide the decision-making process and free of conflicts, given the breadth of the science covered and the large numbers of investigators involved as senior participants, the NSF will accept full proposals for PFC funding by invitation only, based on the results of the preliminary proposal evaluation. No more than two preliminary proposals may be submitted by any one institution. While more than one institution may participate in a single proposal or preliminary proposal, a single institution must accept overall management responsibility for the PFC. Although collaborations between institutions are strongly encouraged, the proposal must be submitted by only one institution with funding provided to the other institutions through subawards; use of separately submitted collaborative proposals is not permitted. Any one individual may be the Principal Investigator (PI) or co-Principal Investigator (co-PI) for only one preliminary proposal. The same limitations apply to full proposals. Individuals may be listed as participating senior investigators on more than one proposal.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Preliminary Proposals (required): Preliminary proposals are required and must be submitted via Research.gov even if full proposals will be submitted via Grants.gov.

The following instructions for the submission of preliminary proposals supplement the NSF *Proposal & Award Policies & Procedures Guide* (PAPPG). Unless otherwise specified in this solicitation, the guidelines listed in the PAPPG must be followed:

The following instructions supplement the guidance in the PAPPG.

Preliminary Proposal Set-Up: Select "Prepare New Preliminary Proposal" in Research.gov. Search for and select this solicitation title in Step One of the Preliminary Proposal wizard. Select "Single proposal (with or without subawards). Separately submitted collaborative proposals will be returned without review.

Cover Sheet: Enter a proposed duration of 72 months.

Project Summary: The Project Summary consists of an overview, a statement on the intellectual merit of the proposed activity, and a statement on the broader impacts of the proposed activity. Include scientific thrusts, educational, outreach and broadening participation activities, and other information necessary to provide a concise overview of the proposed PFC activities. When preparing in Research.gov, please note that the Project Summary must have three separate section headers entitled "Overview", "Intellectual Merit", and "Broader Impacts and that each heading must be on its own line with no other text on that line. (Limit: 1 page)

Project Description: This section must include the following:

a. a list of the PI, any co-PIs and each participating senior investigator (faculty level and equivalent) by full name, institutional affiliation, and departmental affiliation. It is assumed that **all participating members** will have an active role in all center activities, research, education, and outreach, and will be able to provide a statement to that effect should a full proposal be invited. This list should be clearly labeled and made the first item in the Project Description.

b. a narrative that includes the following:

- a brief overview of the PFC project as a whole, including a concise rationale for establishing the PFC, and an outline of the existing and planned capabilities of the participating institutions in physics research and education (**Limit: 2 pages**);
- a description of pertinent achievements under prior NSF support. This should include both research results and the results of activities that pertain to broader impacts. (**Limit: 2 pages**);
- a description of each Major Activity (MA) (a Major Activity is usually a primary research thrust, but may also be a large-scale effort in workshop organization or comparable community-building effort.) For research thrusts include names of faculty-level participants (these names should have also been included in the list of participating senior investigators) and estimated numbers of undergraduate and graduate students and postdoctoral

associates in each group (**Limit: 2 pages for each Major Activity**):

- a section labeled Broader Impacts (Please note this section must include a separate section header labeled Broader Impacts and the heading must be on its own line with no other text on that line) with a description of proposed activities in education and human resource development; specific details for activities to promote broadening participation, outreach to both the scientific community and engaging the general public; proposed collaborations with industry and/or other sectors; shared experimental facilities; international collaboration (**Limit: 2 pages**); and
- an outline of the proposed arrangements for administration and management of the PFC (**Limit: 2 pages**).

Limit this narrative section (3.b) to no more than thirteen pages total, including tables, and illustrations, regardless of the number of Major Activities.

c. a one-page synopsis of institutional support and other commitments to the proposed PFC; include this immediately following the narrative along with a title that clearly identifies the section. The synopsis should be narrative in nature and must not include any quantifiable financial information.

Limit the Project Description to no more than 16 pages, including all the items a-c

References Cited: List only references cited in the Project Description.

Budget and Budget Justification: See the Section V.B., Budgetary Information, for instructions on how to prepare these documents.

Facilities, Equipment and Other Resources: Upload or insert text that states "See Project Description."

Senior Personnel Documents

Biographical Sketch(es): In accordance with the guidance contained in the PAPPG, a separate biographical sketch must be provided for each individual designated as senior personnel.

Current and Pending Support: In accordance with the guidance contained in the PAPPG, current and pending support information must be separately provided for each individual designated as senior personnel.

Collaborators and Other Affiliations (COA) Information: COA information must be separately provided for the PI, any co-PIs and other senior personnel identified on the project. For large collaborations or authorships, the form should only list those people with whom the senior personnel have collaborated in a direct and substantive way. Note in this context that listing a collaboration name or providing a collaboration URL is not allowed - each direct collaborator must be individually named.

Supplementary Documents: Please submit only the following Supplementary Documents:

- **Letters of Collaboration.** Include only official letters of collaboration verifying specific collaborations and/or commitments of non-financial resources from participating institutions. Letters of collaboration must follow the single-sentence format:

"If the proposal submitted by Dr. [insert the full name of the Principal Investigator] entitled [insert the proposal title] is selected for funding by the NSF, it is my intent to collaborate and/or commit resources as detailed in the Project Description."

- **Postdoctoral Mentoring Plan:** (if funding for post-doctoral participants is included). **Limit: 1 page.**
- **Data Management Plan:** **Limit: 2 pages.**

Single-Copy Documents:

- Suggested Reviewers (Optional). Submit a list of individuals who might be suitable to act as impartial reviewers. Include their names, affiliations, phone numbers, e-mail addresses, and areas of expertise. PIs can also include a short list of reviewers not to include.

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=grantgovguide. 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.

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.

A full proposal may be submitted by invitation only, based on the evaluation of the preliminary proposal. For submissions involving multiple institutions, the proposal should be submitted from only one institution, with funding for participating institutions made through subawards. Proposals should not be submitted as separately submitted collaborative proposals.

The instructions below supplement the guidelines in the PAPPG or NSF Grants.gov Application Guide.

Proposal Set-Up: Select "Prepare New Full Proposal" in Research.gov. Search for and select this solicitation title in Step One of the Full Proposal wizard. Select "Center" as the proposal type. In the proposal details section, select "Single proposal (with or without subawards). Separately submitted collaborative proposals will be returned without review.

Cover Sheet: Enter a proposed duration of 72 months and include the Preliminary Proposal Number

Project Summary: The Project Summary consists of an overview, a statement on the intellectual merit of the proposed activity, and a statement on the broader impacts of the proposed activity. Include a description of proposed activities in education and human resource development; specific details for activities to promote the participation of groups traditionally underrepresented in the sciences and outreach to both the scientific community and the general public; broader impacts, and other information necessary to provide a concise overview of the PFC activities. When preparing in Research.gov, please note that the Project Summary must have three separate section headers entitled "Overview", "Intellectual Merit", and "Broader Impacts and that each heading must be on its own line with no other text on that line. **Limit: 1 page.**

Project Description: This section is comprised of the following sections and is limited to no more than 72 pages, regardless of the number of Major Activities.

a. Executive Summary. Provide a clear rationale for and description of the proposed PFC and its potential impact. Briefly describe the institutional setting of the PFC unit, its proposed scope and organization, activities in research and education and their integration, specific efforts to promote diversity, outreach activities to the scientific community and the general public, any shared experimental facilities, any collaborative activities with industry or other sectors, links with related major research centers on or off campus, and management plan. **Limit: 4 pages.**

b. List of Participants. List the PI, any co-PIs and each participating senior investigator (faculty level or equivalent) by full name, and his or her institutional and departmental affiliation (Additional biographical information should be inserted in the Biographical Sketch section.)

c. Results from Prior NSF Support. Describe achievements under prior NSF support that pertain to the present proposal. This should include both research results and the results of activities that pertain to broader impacts. **Limit: 5 pages.**

d. Major Activities (MAs). The PFC activity may encompass one or more MAs. A Major Activity will most frequently be a major research thrust of the unit but may also be a large-scale effort in workshop organization, or comparable community-building activity that advances the frontiers of physics. For an MA that involves community-building activities the need for the activity should be clearly established, including justification for the approach, arguments for why the proposed PFC is the appropriate vehicle to carry out the organization, the proposed organizational mechanism, the number of faculty and students potentially impacted by the activity, and the expected impacts on the community. For each proposed MA that involves a research thrust, provide a concise description of the long-term research goals and intellectual focus, and describe the planned research activities in sufficient detail to enable their scientific merit and significance to be assessed. In all cases, describe the role and intellectual contribution of each senior participant in the MA, and briefly outline the resources available or planned to accomplish the stated goals. The need for a center- or institute-like approach involving several investigators and the means of achieving this should be clearly established. The role of the MA in the context of the PFC as a whole should be outlined, and connections between MAs making up the unit should be sufficiently drawn to justify their inclusion within the PFC. Interactions with other groups and institutions should be described. At the beginning of each MA section in the proposal, name the senior personnel who will participate (these participating senior personnel should have also been included in the overall List of Participants), and state the proposed number of postdoctoral and undergraduate and graduate student participants. **Limit for each MA: 10 pages.**

e. Education, Human Resources, Diversity, and Outreach. Describe the proposed activities of the PFC in education and human resource development, including plans for participation by undergraduates, and outreach to the scientific community and the general public. Specifically address how these efforts and others will impact the participation of traditionally underrepresented groups in science and in the center itself, which is a high-priority goal of the Division of Physics and of NSF. Outline plans for seminar series, colloquia, workshops, conferences, summer schools, and related activities, as appropriate. Describe any additional outreach programs not included in other sections of the proposal. If the outreach activities are carried out in conjunction with other entities, e.g. universities, other centers, or community groups, specifically address what would be the contribution made by the center to these activities. Describe means that will be used to measure and/or document the impact of these activities, including the impact on underrepresented groups. If the outreach activity is solely the responsibility of the center, describe potential means of sustaining the activity beyond the lifespan of the center. **Limit: 4 pages.**

f. Shared Facilities. Describe the shared facilities and infrastructure to be established, including specific major instrumentation, and plans for the development of instrumentation. Describe plans for maintaining and operating the facilities, including staffing, and plans for ensuring access to outside participants. Distinguish clearly between existing facilities and those still to be acquired or developed. **Limit: 3 pages.**

g. Collaboration with Other Sectors. Describe any proposed interactions and collaborations with other institutions and sectors, including national laboratories and industry, as appropriate. Define the goals of the collaboration and describe the planned activities. Describe the roles in these collaborations of any participants that have been listed as participating senior investigators. List the senior collaborating participants (Note that a statement of intent to participate is required from external collaborators as supplementary information), the mechanisms planned to stimulate and facilitate knowledge transfer, and the potential long-term impact of the collaborations. **Limit: 3 pages.**

h. International Collaboration. Describe the nature of any planned international collaboration and the expected international and scientific or engineering benefits to the research and education programs. Include a description of the research facilities at the foreign site, as appropriate, and of the division of effort and expertise among the collaborators. **Limit: 1 page.**

i. Seed Funding and Emerging Areas. Through this mechanism, NSF intends to provide flexibility for the PFC to respond quickly and effectively to new opportunities. Briefly describe emerging research plans and related activities, showing clearly how they are related to the mission of the PFC. These may include (but are not limited to): seed support for junior faculty and for investigators changing fields; high-risk research projects; emerging areas of interdisciplinary research; programs to link the university effort in physics with industry and other sectors; the development of tools for remote access to instrumentation; and innovative educational, diversity-promoting, or outreach ventures. Seed funding through the PFC is not intended to provide a substitute for NSF individual investigator funding: the criteria and mechanisms for selecting and evaluating projects must be clearly addressed in the management plan. Include the names of key personnel for the first year. **Limit: 3 pages.**

j. Management. Describe the plans for administration of the PFC, including the functions of key personnel and the role of any advisory committee, executive committee, program committee, or their equivalent. Describe the procedures and criteria used to select, administer, and evaluate the Major Activities of the PFC, including seed funding and collaborative programs with other groups and institutions. Plans for administering shared facilities should be described under item 8. Describe plans for administering the educational programs and outreach activities of the PFC, as appropriate. **Limit: 4 pages.**

k. Institutional and Other Sector Support. Outline commitments to the PFC, for example, space, faculty and staff, capital equipment, access to existing facilities, commitments for collaboration and outreach programs, and other commitments. The description should be narrative in nature and must not include any quantifiable financial information. **Limit: 1 page.**

l. Broader Impacts: As described in the PAPPG, this section should provide a discussion of the broader impacts of the proposed activities. This section may overlap with some of the sections above, but as per the PAPPG could include additional Broader Impacts not mentioned above. **Limit: 1 page.**

References Cited: List only references cited in the Project Description. See PAPPG for format instructions.

Budget and Budget Justification: See the Section V.B., Budgetary Information, for instructions on how to prepare these documents.

Facilities, Equipment and Other Resources: Upload or insert text that states "See Project Description." This statement is required and is the only statement allowed in this section.

Senior Personnel Documents:

Biographical Sketch(es): In accordance with the guidance contained in the PAPPG, a separate biographical sketch must be provided for each individual designated as senior personnel.

Current and Pending Support: In accordance with the guidance contained in the PAPPG, current and pending support information must be separately provided for each individual designated as senior personnel.

Collaborators and Other Affiliations (COA) Information: COA information must be separately provided for the PI, any co-PIs and other senior personnel identified on the project. For large collaborations or authorships the form should only list those people with whom the senior personnel have collaborated in a direct and substantive way. Note in this context that listing a collaboration name or providing a collaboration URL is not allowed - each direct collaborator must be individually named.

Supplementary Documents: Please submit only the following:

- A one-paragraph statement (not to exceed one-half page per person) from the PI, Co-PIs, and each of those listed as participating senior investigators outlining how they view their role in the center. This must be specific and not a general letter of support.
- **Letters of Collaboration.** Include only official letters of collaboration verifying specific collaborations and/or commitments of non-financial resources from participating institutions. Letters of collaboration must follow the single-sentence format:

"If the proposal submitted by Dr. [insert the full name of the Principal Investigator] entitled [insert the proposal title] is selected for funding by the NSF, it is my intent to collaborate and/or commit resources as detailed in the Project Description."

Departure from this format may result in the proposal being returned without review.

- **Postdoctoral Mentoring Plan:** (if funding for post-doctoral participants is included). **Limit: 1 page.**
- **Data Management Plan:** Limit: 2 pages.

Please submit the following Single-Copy Documents:

- Suggested Reviewers (Optional). Submit a list of individuals who might be suitable to act as impartial reviewers. Include their names, affiliations, phone numbers, e-mail addresses, and areas of expertise. PIs can also include a short list of reviewers not to include.

Proposals that deviate from the required elements of this solicitation (or other items listed in the PAPPG) may be returned without review.

B. Budgetary Information

Cost Sharing:

Inclusion of voluntary committed cost sharing is prohibited.

Other Budgetary Limitations:

Six-year awards are expected to range in size between \$1.0 million/year and \$5.0 million/year. The total budget for the full proposal may not be larger than the total budget listed in the preliminary proposal.

Budgets: Complete NSF official budget pages for each year of support (1-6). A six-year budget summary will be automatically generated. A summary budget justification must be included. This must follow the page limits described in the PAPPG. This pertains to both preliminary proposals and full proposals.

Preliminary proposals: NSF budget pages are required for each of the six years. The summary budget table described below must be included in the budget justification section. Detailed subaward budgets are not required at the preliminary proposal stage. The subaward totals should be added in line G.5 to the lead institution total. While budgets for the separate years may change between the preliminary proposal and the full proposal, the six-year budget total in the full proposal must be the same as in the preliminary proposal.

Full Proposals: Provide separate budget pages for the PFC as a whole and for each participating institution. In the summary budget table described below provide the overall support levels planned for each of the Major Activities of the PFC as a whole (only year 1 and six-year totals are required.) This should be included as part of the budget justification narrative. This information augments, but does not replace the NSF official budget page. The six-year budget total in the full proposal must match the six-year budget total in the preliminary proposal.

Summary Table of Requested NSF Support		
Activity	Year One	Six Year Total
Major Activity (MA) 1 (Title)		
MA 2 (title) (repeat for each MA)		
Shared Facilities		
Seed Funding and Emerging Areas		
Education and Human Resources		
Outreach and Broadening Participation		
Administration		

Total			
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For each entry in the Table, include indirect costs. Column totals must equal the total budget requested from NSF for the period shown. Include major capital equipment under shared facilities. Support for graduate students should normally be included under Major Activities for research, not under education and human resources.

C. Due Dates

- **Preliminary Proposal Due Date(s) (required)** (due by 5 p.m. submitter's local time):

August 01, 2022

(required) (due by 5 p.m. submitter's local time).

- **Full Proposal Deadline(s)** (due by 5 p.m. submitter's local time):

January 27, 2023

by invitation only

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-portal/appmanager/base/desktop?_nfpb=true&_pageLabel=research_node_display&_nodePath=researchGov/Service/Desktop/ProposalPreparationandSubmission.html. For Research.gov user support, call the Research.gov Help Desk at 1-800-673-6188 or e-mail rgov@nsf.gov. The Research.gov Help Desk answers general technical questions related to the use of the Research.gov system. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this funding opportunity.

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.

Submitting the Proposal: Once all documents have been completed, the Authorized Organizational Representative (AOR) must submit the application to Grants.gov and verify the desired funding opportunity and agency to which the application is submitted. The AOR must then sign and submit the application to Grants.gov. The completed application will be transferred to the NSF FastLane system for further processing.

Proposers that submitted via Research.gov may use Research.gov to verify the status of their submission to NSF. For proposers that submitted via Grants.gov, until an application has been received and validated by NSF, the Authorized Organizational Representative may check the status of an application on Grants.gov. After proposers have received an e-mail notification from NSF, Research.gov should be used to check the status of an application.

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 charged 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 NSB approved merit review criteria, reviewers of PFC proposals will be asked to use the following criteria. Preliminary proposals will be evaluated in terms of their potential to meet the criteria for full proposals.

The PFC proposal must exhibit synergy or value-adding features that justify center- or institute-type support, rather than an equivalent level of support for individual investigators or small groups. Proposals must address these points for each Major Activity of the PFC, and the roles and responsibilities of each investigator must be described. Reviewers will be asked to assess each Major Activity and each investigator in their review, along with the potential synergy among the different Major Activities.

Separate Major Activity and PI Evaluation:

- Intrinsic Merit of each MA: Reviewers will be asked to evaluate the overall quality of the proposed MAs, and likelihood that the research or organizational efforts will lead to significant fundamental advances, new discoveries, and/or technological developments.
- Expertise of the PI, any co-PIs and each participating senior investigator: Reviewers will be asked to evaluate the merits of each investigator and their importance and commitment to the PFC goals.

The Center as a Whole:

- Synergy and interconnections within the PFC's Major Activities: the benefits of a multi-investigator, center- or institute-level approach; the synergy among the investigators; and the potential for cross fertilization among Major Activities.
- Institutional setting and rationale for the PFC: Relationship to existing and planned institutional programs and capabilities in physics research and education; intellectual breadth of the proposed program; potential for stimulating creative interaction and collaboration. Potential for institutional, national, and international impact.
- Achievements under prior NSF support, where applicable.
- Plans and potential to develop and maintain active collaboration with industry and/or other sectors, where applicable; to stimulate and facilitate knowledge transfer among the institutional participants and between the PFC and other institutions; and to strengthen the links between university-based physics research and its broader impacts. Outreach to other institutions and scientists in the field, including international collaboration and cooperation.
- Plans to establish, operate, and maintain shared facilities and infrastructure and to provide appropriate access to participants from the home institution and from other institutions.
- Potential effect on the infrastructure of science and engineering, particularly in fostering a broadly interactive approach to cutting-edge research and education, and effective use of seed funding to develop new research directions.
- Plans to develop effective educational outreach programs, foster increased participation in research and education on the part of women and members of underrepresented groups both within the scientific community and as participants within the center, and the potential for sustainability of education and public outreach efforts beyond the lifespan of the center
- Management plan, and budget. Likely effectiveness of the proposed management plan, including mechanisms for selection of topics and internal allocation of resources, plans for self-evaluation, and plans and potential for maintaining a flexible and innovative program. Appropriateness of the requested budget.

A summary rating and accompanying narrative will be completed and signed by each reviewer. In all cases, reviews are treated as confidential documents. Verbatim copies of reviews, excluding the names of the reviewers, are released to the Principal Investigator(s) by the Program Director.

B. Review and Selection Process

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

The proposal and review procedure will proceed in three stages. In the first stage applicants are asked to submit a preliminary proposal that outlines in summary fashion the scientific program, lists the participating scientists and institutions, and supplies the value-added rationale for requesting PFC-like funding. The preliminary proposals will be reviewed by a panel of experts covering all areas of physics supported by the Division, as well as experts from other fields or sub-disciplines of physics as needed for a thorough co-review and as recommended by any co-funding partners. This panel will recommend that the group submitting the preliminary proposal either be invited or not invited to submit a full proposal.

Submission of a full proposal is by invitation only, based on the outcome of the preliminary proposal evaluation. Full proposals will be evaluated in two stages. The first utilizes ad hoc written reviews from experts in the areas of science addressed by the proposals. These reviewers will be asked to specifically address the transformational and frontier aspects of the science proposed as well as the PFC-like nature of the project. Based upon the written reviews, Program Directors in the Division of Physics, joined by co-funding partners, will meet and select those proposals that warrant further examination through a reverse site visit. Copies of the written reviews will be mailed to the selected applicants, who will be given an opportunity to address the comments first in writing and then during a reverse site visit, the third stage of the review.

Panelists for the reverse site visit will be scientific experts across the broad range of physics covered by the full proposals. At the reverse site visit each applicant will be invited to present his/her vision of the PFC, details about the proposed activities in research and education, and any responses to the issues raised in the ad hoc reviews. (The panelists will have access to the ad hoc reviews prior to the reverse site visit.) The presentation will be followed by a question-and-answer period to allow for free exchange between the applicants and the panel. Based upon all the information provided, the panel will be asked to classify the proposals into one of three categories from strongest (A+) to weakest (A-). This input will then be used by the Program Directors in the Division of Physics to make a selection of those proposals that warrant consideration for funding through the PFC program.

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.

More comprehensive information on NSF Award Conditions and other important information on the administration of NSF awards is contained in the NSF *Proposal & Award Policies & Procedures Guide* (PAPPG) Chapter VII, available electronically on the NSF Website at https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg.

Special Award Conditions:

Any cooperative agreement awarded in response to this solicitation will contain the following term and condition:

Ensuring Adequate COVID-19 Safety Protocols

(a) This clause implements Section 3(b) of Executive Order 14042, Ensuring Adequate COVID Safety Protocols for Federal Contractors, dated September 9, 2021 (published in the Federal Register on September 14, 2021, 86 FR 50985). Note that the Department of Labor has included "cooperative agreements" within the definition of "contract-like instrument" in its rule referenced at Section 2(e) of this Executive Order, which provides:

For purposes of this order, the term "contract or contract-like instrument" shall have the meaning set forth in the Department of Labor's proposed rule, "Increasing the Minimum Wage for Federal Contractors," 86 Fed. Reg. 38816, 38887 (July 22, 2021). If the Department of Labor issues a final rule relating to that proposed rule, that term shall have the meaning set forth in that final rule.

(b) The awardee must comply with all guidance, including guidance conveyed through Frequently Asked Questions, as amended during the performance of this award, for awardee workplace locations published by the Safer Federal Workforce Task Force (Task Force Guidance) at <https://www.saferfederalworkforce.gov/contractors/>.

(c) *Subawards.* The awardee must include the substance of this clause, including this paragraph (c), in subawards at any tier that exceed the simplified acquisition threshold, as defined in Federal Acquisition Regulation 2.101 on the date of subaward, and are for services, including construction, performed in whole or in part within the United States or its outlying areas. That threshold is presently \$250,000.

(d) *Definition.* As used in this clause, *United States or its outlying areas* means:

- (1) The fifty States;
- (2) The District of Columbia;
- (3) The commonwealths of Puerto Rico and the Northern Mariana Islands;
- (4) The territories of American Samoa, Guam, and the United States Virgin Islands; and
- (5) The minor outlying islands of Baker Island, Howland Island, Jarvis Island, Johnston Atoll, Kingman Reef, Midway Islands, Navassa Island, Palmyra Atoll, and Wake Atoll.

(e) The Foundation will take no action to enforce this article, where the place of performance identified in the award is in a U.S. state or outlying area subject to a court order prohibiting the application of requirements pursuant to the Executive Order (hereinafter, "Excluded State or Outlying Area"). A current list of such Excluded States and Outlying Areas is maintained at <https://www.saferfederalworkforce.gov/contractors/>.

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.

More comprehensive information on NSF Reporting Requirements and other important information on the administration of NSF awards is contained in the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG) Chapter VII, available electronically on the NSF Website at https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg.

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:

- Kathleen McCloud, Program Director, telephone: (703) 292-8236, email: kmccloud@nsf.gov
- James T. Shank, Program Director, telephone: (703) 292-4516, email: jshank@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.

The National Science Foundation promotes and advances scientific progress in the United States by competitively awarding grants and cooperative agreements for research and education in the sciences, mathematics, and engineering.

To get the latest information about program deadlines, to download copies of NSF publications, and to access abstracts of awards, visit the NSF Website at <https://www.nsf.gov>

- **Location:** 2415 Eisenhower Avenue, Alexandria, VA 22314
- **For General Information (NSF Information Center):** (703) 292-5111
- **TDD (for the hearing-impaired):** (703) 292-5090
- **To Order Publications or Forms:**
 - Send an e-mail to: nsfpubs@nsf.gov
 - or telephone: (703) 292-8134
- **To Locate NSF Employees:** (703) 292-5111

PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

The information requested on proposal forms and project reports is solicited under the authority of the National Science Foundation Act of 1950, as amended. The information on proposal forms will be used in connection with the selection of qualified proposals; and project reports submitted by awardees will be used for program evaluation and reporting within the Executive Branch and to Congress. The information requested may be disclosed to qualified reviewers and staff assistants as part of the proposal review process; to proposer institutions/grantees to provide or obtain data regarding the proposal review process, award decisions, or the administration of awards; to government contractors, experts, volunteers and researchers and educators as necessary to complete assigned work; to other government agencies or other entities needing information regarding applicants or nominees as part of a joint application review process, or in order to coordinate programs or policy; and to another Federal agency, court, or party in a court or Federal administrative proceeding if the government is a party. Information about Principal Investigators may be added to the Reviewer file and used to select potential candidates to serve as peer reviewers or advisory committee members. See [System of Record Notices, NSF-50](#), "Principal Investigator/Proposal File and Associated Records," and [NSF-51](#), "Reviewer/Proposal File and Associated Records." Submission of the information is voluntary. Failure to provide full and complete information, however, may reduce the possibility of receiving an award.

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