

Partnerships for Research and Education in Materials (PREM)

PROGRAM SOLICITATION

NSF 21-510

REPLACES DOCUMENT(S):

NSF 17-599



National Science Foundation

Directorate for Mathematical and Physical Sciences
Division of Materials Research

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

February 05, 2021

IMPORTANT INFORMATION AND REVISION NOTES

Any proposal submitted in response to this solicitation should be submitted in accordance with the revised *NSF Proposal & Award Policies & Procedures Guide* (PAPPG) (NSF 20-1), which is effective for proposals submitted, or due, on or after June 1, 2020.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Partnerships for Research and Education in Materials (PREM)

Synopsis of Program:

The DMR Partnerships for Research and Education in Materials Research (PREM) program aims to enable, build, and grow partnerships between minority-serving institutions and DMR-supported centers and/or facilities to increase recruitment, retention and degree attainment (which defines the PREM pathway) by members of those groups most underrepresented in materials research, and at the same time support excellent research and education endeavors that strengthen such partnerships.

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.

- Debasis Majumdar, Program Director, telephone: (703)292-4709, email: dmajumda@nsf.gov
- Shadi Mamaghani, telephone: (703) 292-7307, email: smamagha@nsf.gov

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

- 47.049 --- Mathematical and Physical Sciences

Award Information

Anticipated Type of Award: Continuing Grant

Estimated Number of Awards: 4 to 8

Anticipated Funding Amount: \$3,000,000

in FY 2021. Awards are anticipated to be \$300,000 to \$700,000 per year for up to 6 years pending the availability of funds and receipt of competitive proposals.

Eligibility Information

Who May Submit Proposals:

Proposals may only be submitted by the following:

- Proposals may only be submitted by the following:

The proposal must be submitted by a minority-serving college or university. See 'Eligible Institutions of Higher Education' in this program solicitation for a complete description.

Institutions holding a 2018 PREM award, responsive to the PREM solicitation [NSF 17-599](#), granted for a period of six years, are not eligible.

Who May Serve as PI:

The Principal Lead Investigator must hold a faculty appointment at an eligible college or university as defined in the 'Eligible Institutions of Higher Education' section. A co-PI must be identified and be a Director at the DMR-supported center and/or facility. Funding of partnering institutions should be requested via subawards; separately submitted collaborative proposals will not be accepted.

Limit on Number of Proposals per Organization:

1 per lead institution

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:**
 - Full Proposals submitted via FastLane: *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

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

February 05, 2021

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:

Standard NSF award conditions apply.

Reporting Requirements:

Additional reporting requirements apply. Please see the full text of this solicitation for further information.

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I. INTRODUCTION

The National Science Foundation's vision of "a Nation that is the global leader in research and innovation" encompasses core values of research excellence, inclusion, and collaboration, as described in NSF's strategic plan (https://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf18045). The NSF Division of Materials Research (DMR) supports a broad interdisciplinary research community, which encompasses materials science, physics, chemistry, mathematical sciences, and engineering disciplines, providing a unique opportunity to broadly promote the NSF vision and core values, especially inclusion and collaboration.

Minority-serving colleges and universities and DMR-supported centers and/or facilities represent rich resources for improving minority access to STEM careers. In the U.S., minority-serving colleges and universities are the leading sources of degrees in materials-related fields that are awarded to underrepresented minorities. In this context, underrepresented minorities include African Americans/Blacks, Hispanic Americans, American Indians, Alaska Natives, Native Hawaiians, and Native Pacific Islanders. DMR supports research to advance new materials discovery, design, synthesis, and characterization, which are essential for the development of future technologies and industries that address societal needs, as well as for preparing the next generation of materials researchers. DMR-supported centers and facilities, which are housing preeminent researchers and world-class scientific infrastructure, offer a singular opportunity for minority-serving institutions to network across the nation.

II. PROGRAM DESCRIPTION

The DMR Partnerships for Research and Education in Materials Research (PREM) program aims to enable, build, and grow formal partnerships between minority-serving institutions and DMR-supported centers and/or facilities through materializing the PREM pathway. The PREM pathway increases diversity through enhanced recruitment, retention, and degree attainment by members of those groups most underrepresented in materials research. As an essential ingredient for its success, PREM supports excellent research and education endeavors that nurture and strengthen such partnerships and advance the materials research field.

Information about current PREMs and a description of the PREM framework can be found at <https://prem-dmr.org/>.

The PREM program activity is expected to enhance both the quantity and quality of materials research and education opportunities for students and faculty members at minority-serving institutions, and to demonstrably lead to increased diversity in materials research. These opportunities result from long-term, multi-investigator, collaborative research and education partnerships that define a framework wherein a supportive and stable PREM pathway for promoting inclusiveness in STEM is designed and built. In this context, the framework includes the partnership, the pathway (i.e. the recruitment/retention/degree attainment paradigm), as well as essential research and education elements that collectively propel the participants' progression along the pathway. Additionally, the PREM activity may also contribute to and strengthen diversity efforts at partnering institutions (i.e. the DMR-supported centers and facilities).

A PREM typically encompasses research thrust(s) that involve several faculty members addressing materials research topic(s). Sustained support is developed through a collaborative effort by the participants from both partnering institutions that is based on common intellectual interests (either pre-existing or newly identified) and complementary backgrounds, skills, and knowledge. Ideally, a PREM proposal defines a vision for the partnership that simultaneously promotes inclusiveness and research excellence; the proposed research should be aligned with research supported by DMR. The role of each institutional partner should be explicit, and project goals to achieve the vision should be clearly defined and addressed. Importantly, anticipated challenges and expected outcomes towards increasing diversity and research output must be identified and addressed. Plans for student/faculty reciprocal exchange between partnering institutions are required. Project assessment and evaluation plans are required, and are designed to emphasize an increase in the quality and quantity in diversity, research,

and education, measured relative to the beginning of the award. Successful PREMs can be developed regardless of the starting research and capacity levels at the lead institution.

Increasing diversity in materials research relies on creating research and education partnerships that promote inclusive institutional cultures. An effective partnership defines a framework that contains the PREM pathway towards diversity, as well as research and education resources. Through effective utilization of research and education resources, and depending on the level of support that the lead institution can provide to enable research efforts, a variety of strategies may be developed towards a progressive materialization of the recruitment/retention/degree attainment components of the PREM pathway. Examples include but are not limited to: workshops, technical meetings, technical courses, curricular development, summer schools, outreach towards improving recruitment, student mentoring activities, and overall opportunities in science learning and training.

Starting research and capacity levels will position the PREM partnership at a specific location within the PREM pathway, which can range from pre-recruitment to pre-degree attainment stages. It is expected that eventually, and as a result of the developed strategies and proposed research and education elements, the partnership on the PREM pathway will evolve and mature, leading to an increased enrollment of underrepresented students in graduate school, and eventually, to a diverse materials research workforce at all levels (i.e., student, post doc, faculty, STEM career). As examples, to date, successful PREMs have devised innovative strategies around recruitment, retention, and degree attainment that have successfully promoted enrollment of minority students in STEM Ph.D. programs in both minority- and non-minority-serving institutions throughout the U.S. Other successful PREMs have prepared undergraduates at the lead institution for recruitment by the partner institution, which provides another example of a fully materialized PREM pathway that benefits both institutions by simultaneously increasing diversity in STEM areas and research output.

It should be emphasized that the partnership is expected to develop capacity in at least one segment of the PREM pathway within the duration of the award, commensurate with the partnership's starting research and capacity levels. The vision for the partnership, however, must include a deliberate effort that aims at the full completion of the pathway, possibly in subsequent awards.

Successful PREMs are expected to:

- Engage in compelling scientific materials research: research thrust(s) must have a well-integrated research program with compelling intellectual merit. Each thrust must demonstrate clear benefits from a collaborative approach, which in turn defines the research and education partnership.
- Promote increased diversity in the PREM pathway covering all or a segment of the recruitment/retention/degree-attaining sequence through opportunities in science learning and training. These opportunities are the result of applying the elements from the PREM framework in the PREM pathway. Challenges and progress throughout the stages of recruitment, retention, and degree attainment are addressed, as appropriate.
- Propose either existing or newly designed elements in the framework that will successfully promote inclusiveness and research excellence by increasing both diversity efforts and research output in materials research at both partnering institutions. The proposed elements must clearly define purpose, challenges, and expected outcomes towards increasing diversity and research output.
- Provide metrics: PREM partners propose specific metrics with which the partnership will be evaluated. The metrics will emphasize increase in both diversity as well as research quality and quantity measured relative to the beginning of the award in each partnership. Successful PREMs can be developed regardless of differences in starting research and capacity levels at the lead institution.
- Specify gains: Each partner must specify anticipated gains both in increased diversity and research output. Using the metrics identified in the proposal, gains will be evaluated and assessed within the context of the segment in the PREM pathway that a specific partnership is targeting.
- Establish reciprocity: Reciprocal faculty and student exchanges are a core component of the partnership.

A PREM may address any area of research supported by the NSF Division of Materials Research which includes 8 programs, known as Topical Materials Research Programs (TMRP): Biomaterials (BMAT), Ceramics (CER), Condensed Matter Physics (CMP), Condensed Matter and Materials Theory (CMMT), Electronic and Photonic Materials (EPM), Metals and Metallic Nanostructures (MMN), Polymers (POL), and Solid State and Materials Chemistry (SSMC). For a detailed description of the research supported by the 8 core programs visit <https://www.nsf.gov/materials>.

III. AWARD INFORMATION

NSF expects to make Continuing Grants. The estimated number of awards will be 4 to 8. Awards are anticipated to be effective in October 2021. The total anticipated funding amount in FY 2021 is approximately \$3,000,000. Awards are expected to be \$300,000 to \$700,000 per year for up to 6 years. Estimated program budget, number of awards and average award size/duration are subject to the availability of funds and receipt of competitive proposals.

IV. ELIGIBILITY INFORMATION

Who May Submit Proposals:

Proposals may only be submitted by the following:

- Proposals may only be submitted by the following:

The proposal must be submitted by a minority-serving college or university. See 'Eligible Institutions of Higher Education' in this program solicitation for a complete description.

Institutions holding a 2018 PREM award, responsive to the PREM solicitation [NSF 17-599](#), granted for a period of six years, are not eligible.

Who May Serve as PI:

The Principal Lead Investigator must hold a faculty appointment at an eligible college or university as defined in the 'Eligible Institutions of Higher Education' section. A co-PI must be identified and be a Director at the DMR-supported center and/or facility. Funding of partnering institutions should be requested via subawards; separately submitted collaborative proposals will not be accepted.

Limit on Number of Proposals per Organization:

1 per lead institution

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

There are no restrictions or limits.

Additional Eligibility Info:**Eligible Institutions of Higher Education**

PREM proposals may be submitted by Institutions of Higher Education (IHEs) that primarily serve underrepresented groups in STEM as listed below. Each PREM proposal must be submitted in partnership with one or more DMR-supported centers and/or facilities. The proposal typically includes a subaward to the DMR supported center and/or facility, consistent with the proposed partnership activities.

Colleges and universities eligible to participate in this activity must be accredited and award degrees in materials-related disciplines and belong to, at least, one of the following classifications as Minority-Serving Institutions (MSI):

1. Alaska Native Serving Institutions (ANSI) - Accredited IHEs that award bachelor level degrees that have a 20 percent or greater enrollment of Alaska Native undergraduate students.
2. Hispanic Serving Institutions (HSI) - Accredited IHEs that award bachelor level degrees that have a 25 percent or greater full-time equivalent enrollment of Hispanic undergraduate students.
3. Historically Black Colleges and Universities (HBCU) - Identified in the Higher Education Act of 1965, as amended, as any accredited historically black college or university that was established prior to 1964, whose principal mission was, and is, the education of Black Americans.
4. Native Hawaiian Serving Institutions (NHSI) - Accredited IHEs that award bachelor level degrees that have a 10 percent or greater enrollment of Native Hawaiian undergraduate students.
5. Native American-serving, non-Tribal Institutions and Tribal Colleges and Universities (TCU) – The definition of Native American-Serving, Nontribal Institutions can be found in Section 319 (b) (2) of the Higher Education Act of 1965, 20 U.S.C. 1059 (f). TCUs are accredited IHEs that are formally controlled, or have been formally sanctioned or chartered by the governing body of a Federally recognized Native American tribe or tribes. Specifically, TCUs are those institutions cited in section 532 of the Equity in Educational Land-Grant Status Act of 1994 (7 U.S.C. 301 note), any other institution that qualifies for funding under the Tribally Controlled Community College Assistance Act of 1978 (25 U.S.C. 1801 et seq.), and Dine' College, authorized in the Navajo Community College Assistance Act of 1978, Public Law 95- 471, title II (25 U.S.C. 640a note).
6. Other Minority-Serving Institutions (MSI) - Accredited IHEs that award bachelor level degrees that have an aggregate undergraduate enrollment of African Americans/Blacks, Hispanic Americans, American Indians, Alaska Natives, Native Hawaiians, and Native Pacific Islanders exceeding 50 percent of total undergraduate enrollment.

Note that 2-year and 4-year Associate degree-granting colleges are not eligible to submit a proposal under this solicitation, except where an established degree-granting partnership exists with an eligible institution. However, a 2-year and 4-year Associate degree-granting college may partner with a leading Minority-Serving Institution (MSI).

Eligible Partners

Eligible partners include DMR-supported centers and facilities as listed below:

1. **Materials Research Science and Engineering Centers (MRSEC).** Please see <https://mrsec.org> for a list and information about currently-funded centers.
2. **Science and Technology Centers (STC).** DMR currently supports two STCs: i) Center for Integrated Quantum Materials (CIQM) (<http://ciqm.harvard.edu>) and ii) Center on Real-Time Functional Imaging (STROBE) (<http://strobe.colorado.edu>).
3. **Materials Innovation Platforms (MIP).** DMR currently supports four MIPs: i) 2D Crystal Consortium (2DCC-MIP, <http://mri.psu.edu/mip>), ii) Platform for the Accelerated Realization, Analysis, and Discovery of Interface Materials (PARADIM, <https://www.paradim.org>), iii) BioPolymers, Automated Cellular Infrastructure, Flow, and Integrated Chemistry (BioPACIFIC MIP, <https://biopacificmip.org/>), and iv) GlycoMIP for Automating the Synthesis of Rationally Designed Glycomaterials (GlycoMIP, <http://glycomip.org>).
4. **The National High Magnetic Field Laboratory (NHMFL).** (<https://nationalmaglab.org>)
5. **The Center for High-Energy X-ray Sciences at the Cornell High-Energy Synchrotron Source (CHEXS@CHESS).** (<https://www.chess.cornell.edu/partners/chexs>)
6. **The Center for High Resolution Neutron Scattering (CHRNS).** (<https://www.ncnr.nist.gov/programs/CHRNS/>)
7. **The NSF Quantum Foundry at the University of California at Santa Barbara** (<https://quantumfoundry.ucsb.edu>)

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 Grants.gov or via the NSF FastLane system.

- Full proposals submitted via FastLane: Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the *NSF Proposal & Award Policies & 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. Proposers are reminded to identify this program solicitation number in the program solicitation block on the NSF Cover Sheet For Proposal to the National Science Foundation. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.

- 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.

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.

In addition to the guidance in the PAPPG and NSF Grants.gov Application Guide, the following items should be included and/or addressed in the proposal:

1. **Project Description (limit 28 pages)**. This section should be completed according to the general guidelines detailed in the NSF PAPPG. In addition, it should include:

- a. *List of Participants (limit 1 page)*. Provide a list of participating faculty and/or scientific personnel as well as faculty rank from all institutions of Higher Education and/or research centers and facilities. List each faculty participant by full name, and her/his institutional and departmental affiliation. Also, enter each name in "Add/Delete Non Co-PI Senior Personnel" FastLane Form. Grants.gov users: Instructions for entering additional senior project participants are included in Section V.5. of the NSF Grants.gov Application Guide. (Note: All faculty participants should have a biographical sketch and the NSF current and pending support format included in the corresponding section of the proposal.)
- b. *Partnership Vision Statement (no more than 1 page)*. The ultimate goal of PREM is to increase diversity in Materials Research. This can be achieved through the establishment of a research and education partnership. To this end, each proposal must emphasize the plan to form a cohesive research and education partnership where recruitment, retention, and degree attainment of minority students (i.e. the PREM pathway) can be achieved and monitored. In this section of the proposal, the PREM pathway towards diversity is succinctly described, and a clear and concise vision for the proposed partnership, i.e., the framework, is provided by describing its overall research and education goals, along with the diversity objectives.
- c. *Partnership Context (1-3 pages)*. Each PREM partnership has the responsibility to define progress in the recruitment/retention/degree attainment sequence within the PREM pathway that would enable an evaluation of the project. To this end, and given the possibly varying starting points for a given partnership, it is crucial that the partnership defines its context by specifying its starting-point student/post-doc diversity efforts in the PREM pathway continuum. Here, participants should describe their current status in the recruitment/retention/degree attainment paradigm. In addition, partnerships should identify the challenges associated with each step in the pathway, and provide detailed plans to address them. A description of the current institutional research capacity is also needed to enable evaluation of the project. Useful parameters to assess research capacity include availability of equipment, number of active researchers, research output (i.e. publications, patents, etc.), availability of Ph.D. granting programs, and grant capture, amongst others.

PREM partnerships present an opportunity for advancement for both partners in diversity and research capacity. In this section, the starting point of each institution must be described in terms of diversity and research capacity for all partners involved.

The partnership context will be used as the baseline in the Project Assessment and Evaluation section in section *i. Project Assessment and Evaluation* of the Project Description (described below).

- d. *Results from Prior NSF Support (limit 5 pages)*. This section should be completed according to the general guidelines detailed in the NSF PAPPG. In addition, new PREM proposals may use this section to describe their scientific and educational achievements under prior NSF support. Collaborative research and related activities funded by other agencies may also be included here. Recompeting applicants must describe achievements under prior NSF support that pertain to the previous PREM award. Recompeting proposals must provide a "List of publications and patents from prior NSF support" and "Inclusiveness Strategy and Results," which are to be appended to the end of the References Cited section of the Proposal and do not count towards page limits. The "Inclusiveness Strategy and Results" should be a 2-page summary describing recruitment and retention efforts of students who received any PREM support over the 5 years of funding
- e. *Research Description (5-10 pages)*. Provide a concise description of the long-term research goals and intellectual focus of the partnership, and describe the planned research and education activities in sufficient detail to enable assessment of their scientific merit.

Two sections must be included in the Research Description that address the following:

- i. Define the research scope of the partnership. Both partners must define the common intellectual interests (either pre-existing or newly identified) to build a scientific partnership that encompasses the PREM framework. In this section, the purpose of the research, along with the foreseen challenges to accomplish it must be described. In addition, expected outcomes and an evaluation plan of the research effort must be provided. Importantly, the reinforcing action of the research effort throughout the PREM pathway (briefly introduced in section *b. Partnership Vision Statement*), must be described.
- ii. Describe the role and intellectual contribution of each faculty member associated with the PREM; briefly outline the resources available and plans to accomplish the research goals. Describe the role of the partner(s). Use **bold-face** type for the **name of each senior personnel** wherever it occurs.

- f. *For recompeting only:*

The PREM program allows institutions with a previous PREM award to recompete, provided the original PREM award was granted no later than 2015. The recompeting institutions will need to submit their proposals following the guidelines of the current solicitation, and not those from the solicitation of their original awards. The recompeting proposals will be reviewed as any other incoming proposal for this competition, using the review criteria outlined in this solicitation.

- g. *Partnership Impacts (limit 6 pages)*. This section should be completed according to the specific criteria in this solicitation; i.e. the unfolding of the proposed PREM pathway towards diversity.
 - i. Building up from the *Partnership Context* in section *c*, describe the proposed strategy for increased "recruitment, retention, and degree attainment" in the PREM pathway. Each partnership will identify which step(s) of the pathway will be tackled for the duration of the award, provided the starting point (*Partnership Context, section c*) is factored in, and an attainable final point within the duration

of the award is set (not necessarily completing the whole PREM pathway). The proposed strategy is formed by either pre-existing or newly developed research and education elements within the framework described in section 1.b. *Partnership Vision Statement*. These elements encompass a variety of opportunities in science learning and training. Provide a brief description of such elements and how their deployment onto specific segments of the PREM pathway will help advance diversity for both partners. Identify challenges and possible solutions.

- ii. Impact of Partnership both on minority-serving institution and partner. The PREM program is designed to bring benefits to both partners in both diversity and research output. Describe the potential outcomes of building the PREM pathway in the context of inclusive participation and community diversity in materials researchers for both partners.
- iii. Identify how gains from establishing the framework and building the PREM pathway could affect non-participants.

h. *Management Plan (limit 1 page)*. Describe the plans for the administration of the PREM, including the functions of key personnel, and the role of any external advisory committee and internal executive committee. Describe the plans for administering the collaborative programs with the Partner organization and how decisions will be made and implemented. Include an organizational chart. Specify personnel responsible for student mentoring at all sites.

i. *Project Assessment and Evaluation (limit 1 page)*. Describe how increases in diversity, research and education outputs will be evaluated (internally and/or externally). Coherently with the proposed PREM pathway and devised strategies, include a plan for self-assessment and evaluation of recruitment, and/or retention, and/or degree attainment in the minority-serving institution as well as plans to evaluate diversity enhancement in the partner institution. Project assessment and evaluation is partnership-specific and should emphasize increase in both diversity as well as research and education quality and quantity measured relative to the beginning of the award.

2. **References Cited**. List only references cited in the Project Description. See the Proposal & Award Policies & Procedures Guide (PAPPG) for format instructions. Noncompliance with NSF guidelines may result in the full proposal being returned without review.
3. **Budget pages and budget justification**. Complete budget pages for each year of support (1-6). A six-year cumulative budget will be automatically generated by the system. Provide a six-year summary budget justification that may not exceed a total of 5 pages. Provide separate budget pages for the lead institution and for each organization receiving a subaward. Provide a separate budget justification, up to five pages, for each subaward.
4. **Facilities, Equipment and Other Resources**. This section should be prepared in accordance with the PAPPG, and should provide an aggregated description of the resources that the organization will provide to the project, should it be funded. For purposes of this solicitation, resources such as space, faculty release time, faculty and staff positions, capital equipment, access to existing facilities, collaborations, and support for outreach efforts should be addressed, for both the lead institution and the partner.
5. **Supplementary Documentation**.

Letter(s) of Collaboration from Lead Institution and Partner(s) (Limitation of 3 pages for this section). The PI of each participating DMR-supported center and/or facility must provide a detailed letter of collaboration that outlines their intellectual role in the partnership, as well as their commitment, track record and future plans for inclusive participation of underrepresented groups in STEM. It must also describe how their center, institute, and/or facility will participate in the PREM. Include the proposed collaborative research and education activities, a plan for student and faculty exchanges, and a plan for the continuation of the partnership in the event that DMR support to the center and/or facility ends before the PREM award does. Please note that letters of recommendation for the PI or other letters of support for the project are not permitted.

B. Budgetary Information

Cost Sharing:

Inclusion of voluntary committed cost sharing is prohibited.

Other Budgetary Limitations:

The proposed budget can range from \$300,000 to \$700,000/year for up to a period of 6 years.

PREM grantees will be expected to attend yearly PI meetings. Grantees should anticipate a minimum of at least one site visit held at the lead institution and one reverse site visit held at the discretion of the National Science Foundation during the course of the award. PI meetings and reverse site visits should be accounted for in the travel budget.

C. Due Dates

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

February 05, 2021

D. FastLane/Research.gov/Grants.gov Requirements

For Proposals Submitted Via FastLane or Research.gov:

To prepare and submit a proposal via FastLane, see detailed technical instructions available at: <https://www.fastlane.nsf.gov/a1/newstan.htm>. 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 FastLane or Research.gov user support, call the FastLane and Research.gov Help Desk at 1-800-673-6188 or e-mail fastlane@nsf.gov or rgov@nsf.gov. The FastLane and Research.gov Help Desk answers general technical questions related to the use of the FastLane and Research.gov systems. 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 FastLane or 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 *Building the Future: Investing in Discovery and Innovation - NSF Strategic Plan for Fiscal Years (FY) 2018 – 2022*. 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 underrepresented minorities 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

The PREM proposals will also be evaluated on the following:

- Goals of the proposed partnership that enable the PREM pathway through increasing recruitment, retention and degree attainment by underrepresented minorities in materials research.
- Role of the DMR-supported center or facility.
- Research and education partnership contributing to increase the quantity and quality of research and education at the minority-serving institution.
- Intellectual quality of the research partnership.
- Student/faculty exchange plan between partners as well as student mentoring.
- Assessment and evaluation of the partnership.
- Adequacy of budget to the proposed activities.

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 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 a Grants Officer in the Division of Grants and Agreements. 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.

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.

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.

PREM-specific reporting guidelines will be provided by the cognizant Program Officers.

Grantees are expected to participate in program-wide assessment and evaluation activities which may include submitting additional information throughout the award period.

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:

- Debasis Majumdar, Program Director, telephone: (703)292-4709, email: dmajumda@nsf.gov
- Shadi Mamaghani, telephone: (703) 292-7307, email: smamagha@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>.

Information about current PREM awards and activities can be found on <http://prem-mrsec.org/>

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 (FASSED) 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** (703) 292-5111

(NSF Information Center):

• **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.

An agency may not conduct or sponsor, and a person is not required to respond to, an information collection unless it displays a valid Office of Management and Budget (OMB) control number. The OMB control number for this collection is 3145-0058. Public reporting burden for this collection of information is estimated to average 120 hours per response, including the time for reviewing instructions. Send comments regarding the burden estimate and any other aspect of this collection of information, including suggestions for reducing this burden, to:

Suzanne H. Plimpton
Reports Clearance Officer
Policy Office, Division of Institution and Award Support
Office of Budget, Finance, and Award Management
National Science Foundation
Alexandria, VA 22314

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