Sedimentary Geology and Paleobiology (SGP)

PROGRAM SOLICITATION
NSF 22-597

REPLACES DOCUMENT(S):
NSF 17-536

National Science Foundation
Directorate for Geosciences
Division of Earth Sciences

Full Proposal Deadline(s):

Proposals Accepted Anytime

IMPORTANT INFORMATION AND REVISION NOTES

Revision Notes

The program synopsis, introduction, program description and anticipated funding levels have been updated.

This solicitation clarifies requirements for proposals to work in foreign countries, or on Native/Tribal/Indigenous lands, as well as the need to include information about sampling permits and repository for projects that include sample collection.

This solicitation allows for the inclusion of Student Mentoring Plans and Field Safety Plans in the Supplementary Documents.

This solicitation clarifies data management requirements and reminds PIs that Broader Impacts activities should be specifically addressed in annual and final reports.

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 *NSF Proposal & Award Policies & Procedures Guide* (PAPPG).

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Sedimentary Geology and Paleobiology (SGP)

Synopsis of Program:

Sedimentary Geology and Paleobiology supports innovative research that advances understanding of the deep-time sedimentary crust and investigates environmental change and evolution of the biosphere through the pre-Holocene geologic record. The program seeks to fund projects that focus on: (1) the evolution of life, ecology, environments, and biogeography based on the study of fossils, sediments and/or geochemical proxies; (2) geological processes forming and shaping the Earth's sedimentary lithosphere – including the study of mechanisms leading to rich organic and inorganic resources locked in rock sequences; (3) new geochronological projects aiming to measure the rate and sequence of events of pre-Holocene sedimentary and biological (fossil) processes; and (4) the production, transportation, and deposition of physical, bioclastic and chemical sediments of the geologic record**.** Projects that are focused on the study of modern and/or Holocene sedimentary, geochemical and/or biological

samples should clearly address how the project will lead to understanding of deep-time (pre-Holocene) geological, environmental, and biological (fossil) processes.

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.

- Yurena Yanes, telephone: (703) 292-8551, email: earsgp@nsf.gov
- Alberto Perez-Huerta, telephone: (703) 292-8551, email: earsgp@nsf.gov
- Margaret Fraiser, telephone: (703) 292-4660, email: earsgp@nsf.gov

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

- 47.050 --- Geosciences

Award Information

Anticipated Type of Award: Standard Grant or Continuing Grant

Estimated Number of Awards: 20 to 30

Anticipated Funding Amount: $10,400,000

Annual estimated program budget, number of awards, and average award size/duration are subject to the availability of funds and the quality of the proposals.

Eligibility Information

Who May Submit Proposals:

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

Who May Serve as PI:

There are no restrictions or limits.

Limit on Number of Proposals per Organization:

There are no restrictions or limits.

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

According to the Division of Earth Sciences (EAR) policy (https://www.nsf.gov/geo/ear/resubmission_policy.jsp), proposals that have been declined are not eligible for resubmission for one year from the original date of submission and must be substantially revised to be considered. Exceptions to this policy require prior approval by an EAR Program Officer.

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 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

- **Full Proposal Deadline(s)**:

  Proposals Accepted Anytime

Proposal Review Information Criteria

Merit Review Criteria:

National Science Board approved criteria apply.

Award Administration Information

Award Conditions:

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

Reporting Requirements:

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

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I. INTRODUCTION

The Sedimentary Geology and Paleobiology (SGP) program supports hypothesis-driven research that advances our understanding of the history and evolution of our biosphere, and long-term environmental changes. The program supports the study of life through deep time (pre-Holocene) fossils preserved in the geologic record, sedimentary processes (including organic and inorganic systems), and new geochronological analyses to

understand the timing and mode of sedimentary and biological processes of the geologic past. The program supports a wide range of Broader Impacts activities, and the Division of Earth Sciences prioritizes addressing challenges to create an inclusive geoscience discipline through activities that promote belonging, accessibility, justice, equity, diversity, and inclusion (BAJEDI). Proposers are encouraged to explicitly address this priority in their proposed activities.

II. PROGRAM DESCRIPTION

General Description: Sedimentary Geology and Paleobiology supports innovative research that advances our understanding of the deep-time (pre-Holocene) sedimentary crust and environmental and evolutionary change. Current natural and human-driven environmental impacts across the Earth pose challenges for maintaining a sustainable and healthy future that can be better informed by an understanding of long-term events from the Earth's past. The program seeks to fund projects that focus on: (1) the evolution of life, ecology, environments, and biogeography in geologic time based on pre-Holocene fossils and/or sedimentological and/or geochemical data; (2) the Earth's sedimentary lithosphere – including the geological processes that lead to the deposition of organic and inorganic resources locked in rock sequences; (3) new and revised geochronological projects aiming to measure the sequence of events and rates of Earth's deep-time (pre-Holocene) sedimentary and biological (fossil) record; and (4) the geologic record of the production, transportation, and deposition of modern and ancient physical, bioclastic and chemical sediments. Projects that address unresolved questions and test new hypotheses in these areas are strongly encouraged. Projects that are focused on the study of modern and/or Holocene sedimentary, geochemical and/or biological samples should clearly address how the project will lead to understanding of deep-time (pre-Holocene) geological, environmental, and biological (fossil) processes.

The program encourages projects that focus on questions at the leading edge of sedimentary geology and paleobiology; these projects often integrate multiple disciplines to address research questions to understand Earth systems. The program seeks to fund projects that challenge the conceptual bases of sedimentary geology and paleobiology, have broad implications for the discipline and inform future research directions. Proposed projects may employ any combination of field, laboratory, and computational studies with empirical, theoretical, or experimental approaches. Interdisciplinary proposals that cross programmatic boundaries at NSF are welcomed and encouraged; SGP often co-reviews proposals with other programs across the Foundation.

Projects that have a research scope that crosses multiple EAR discipline areas and/or have a higher budget than what can typically be supported by disciplinary programs in the Division of Earth Sciences (EAR) are encouraged to submit to the Frontier Research in Earth Sciences (FRES) program (NSF 20-509). While multi- disciplinary integration is common in the areas of paleobiology and sedimentary geology, SGP projects are generally smaller in scope and budget than those submitted to FRES, and the research should be strongly aligned with SGP priority goals.

The program supports a wide range of Broader Impacts activities and successful projects will include creative, well-integrated, and effective, evidence-based broader impacts activities developed within the context of the mission, goals, and resources of the organizations and people involved. The expertise of collaborators, the proposal budget, and budget justification should reflect this integration. Example activities might include but are not limited to those that create effective methods of engagement with local communities or the public at large; translate research to benefit broader societal needs; involve early career researchers and students who are veterans, persons with disabilities, or from other groups that have been historically excluded from science, technology, engineering, and mathematics (STEM); or foster new partnerships, especially if focused on capacity building (e.g., with Minority Serving Institutions, two-year colleges, or internationally). We encourage innovative projects that advance belonging, accessibility, justice, equity, diversity, and inclusion or identify and remove barriers that have led to the exclusion of some groups from the geosciences.

Proposals that include community engagement, partnerships with communities, and international collaboration should either (1) have already established and agreed upon partnerships, documented with the appropriate letters of collaboration and budget allocations, or (2) provide a clear plan for community engagement and partnership building as part of the first year of the grant. Both options must follow best practices in community partnerships, especially if partnerships are to be established with Black, Indigenous, People of Color or other historically underrepresented communities such as but not limited to Native Americans, Alaska Natives, Hawai'ian Natives and Pacific Islanders and international partners. Successful proposals will have the appropriate expertise on the PI's team to conduct community-based research, participatory research, or place-based research. Sufficient funding should be allocated in the budget to support mutually beneficial and respectful interactions that not only produce meaningful research and education/outreach outcomes but also focuses on the concerns of partnering communities, including questions of data sovereignty, co-authorship, or co-review of project outcomes.

All proposals that incorporate fieldwork or new sample collections should include well-documented plans for fieldwork coordination and permitting, vouchering of new collections, specimen preparation, long-term specimen storage regimes that are openly accessible, specimen identifications and descriptions, georeferencing, data modeling and databasing, and rapid dissemination of data into public databases.

Proposals for scientific community workshops that can guide the program on future research priorities and grand challenges are encouraged. The program also funds Research Coordination Networks (RCN), Rapid Response Research (RAPID), Early-concept Grants for Exploratory Research (EAGER) and supplemental requests to existing awards. Investigators wishing to submit such proposals should discuss them with pertinent program officers prior to submitting a full-length proposal. The program also funds proposals submitted under the Faculty Early Career Development (CAREER) and Mid-Career Advancement (MCA) programs.

Examples of projects supported by the program can be found using the NSF Award Search (Program Information) engine by entering Element Code 7459.

III. AWARD INFORMATION

Anticipated Type of Award: Standard Grant or Continuing Grant

Estimated number of Awards: 20 to 30

Anticipated Funding Amount: $10,400,000

Annual estimated program budget, number of awards, and average award size/duration are subject to the availability of funds and the quality of the proposals.

IV. ELIGIBILITY INFORMATION

Who May Submit Proposals:

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

Who May Serve as PI:

There are no restrictions or limits.

Limit on Number of Proposals per Organization:

There are no restrictions or limits.

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

According to the Division of Earth Sciences (EAR) policy (https://www.nsf.gov/geo/ear/resubmission_policy.jsp), proposals that have been declined are not eligible for resubmission for one year from the original date of submission and must be substantially revised to be considered. Exceptions to this policy require prior approval by an EAR Program Officer.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

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

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

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

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

See PAPPG Chapter II.D.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.

The following information supplements the PAPPG and the NSF Grants.gov Application Guide:

Data Management Plan: Principal investigators (PIs) are required to adhere to the EAR Division Data Sharing Policy available on the NSF website. With the goal of making EAR-supported data products findable, accessible, interoperable, and reusable (FAIR), key considerations for compliance with the EAR Division Data Sharing Policy include the following:

- EAR's definition of "data" is expansive and includes (but is not limited to) full data sets, derived data products (e.g., model results, output, and workflows), software, and physical collections (e.g. living and fossil specimens, sedimentary samples and associated data).
- The proposal Data Management Plan (DMP) should clearly describe what data will be collected, what analyses will be done, when data collection is considered "final," and how and when the project will provide open and timely access to data during and after the project.

Specimen deposition: Proposals that incorporate fieldwork or new collections of any kind should include the following: well-documented plans for fieldwork coordination and permitting, vouchering of new collections, specimen preparation, long-term specimen storage regimes that are openly accessible, specimen identifications and descriptions, georeferencing, data modeling and databasing, and rapid dissemination of data into public databases. If physical specimens are to be deposited in a repository, a statement from the repository agreeing to store the specimens should be included in the Other Supplementary Documents section of the proposal.

Permits for projects: PIs are responsible for obtaining the required authorizations from federal, state or local authorities for any collecting or other activities and for advising NSF that they have been obtained or requested. Failure to obtain the appropriate permits for all aspects of the research project may jeopardize not only the proposed research, but also the well-being of the personnel. The plans for addressing any requirements should be discussed in the proposal and Investigators must include copies of such permits (including legally required collecting, import, and export permits for samples, instrumentation, and data), authorizations, and agreements, in the Other Supplementary Documents section of the proposal.

Projects involving collaboration with foreign organizations and/or work in foreign countries: As stated in the PAPPG, NSF rarely provides direct funding to support foreign organizations and only provides support for the U.S. portion of collaborative projects. If foreign organization involvement is essential to the project, subawards or consultant arrangements may be considered if the foreign organization contributes unique resources not otherwise available, or significant education, training and/or research opportunities to the U.S. Such information must be provided in the Project Description section of the proposal. For studies in countries other than the United States, the Project Description should discuss, where appropriate, collaborations with scientists and students from the host country, and how these individuals will be involved in the project. Collaborations should be well justified, in that they represent true intellectual collaboration and utilize the expertise and specialized skills, facilities, and/or resources of the foreign collaborator. Letters of collaboration must be included in the Other Supplementary Documents section of the proposal. These letters should include a discussion of the role of the collaborator in the project and the resources the collaborating foreign institution/organization will provide to the project. Principal investigators are encouraged to provide U.S. students and junior researchers with international research experiences. Where relevant, arrangements to allocate samples and data between host country organization(s) or institution(s) and U.S. organization(s) or institution(s) should be discussed in the proposal. Investigators are encouraged to include any such permits (including legally required collecting, import, and export permits for samples, instrumentation, and data), authorizations, and agreements, in the Other Supplementary Documents section of the proposal.

Projects involving Native/Tribal/Indigenous communities: Proposals that include research in Native/Tribal communities or on Tribal lands must include a letter or email as a Supplementary Document that confirms community collaboration and/or permission to work on associated lands from the relevant community organizations or tribal leadership (see the U.S. Department of Housing and Urban Development Tribal Directory Assessment tool or the National Congress of American Indians tribal directory). Collaborations should be well justified, in that they represent true intellectual collaboration and utilize the expertise and specialized skills, facilities, and/or resources of the community. Collaboration with Native/Tribal/Indigenous communities should be reflected in the proposal budget and budget justification, such as through requests for sufficient funding to support the time and travel of Native community members, and through co-authorship on publications and presentations, as appropriate. Arrangements to allocate and share samples and data with the relevant communities should be discussed in the proposal or in the Data Management plan, following FAIR (Findable, Accessible, Interoperable, and Reusable) principles for data management and CARE (Collective benefit, Authority to control, Responsibility, and Ethics) principles for indigenous data governance.

Student Mentoring Plans: Proposals that request funding to support undergraduate and/or graduate students at any participating institution may include a mentoring plan that is no more than a single page and describes recruitment, training and/or other activities to be provided to the students and the mentors. Student mentoring plans may be uploaded as Other Supplementary Documents. Investigators are strongly encouraged to provide appropriate training for both students and research mentors.

Field projects: Field projects must include the protocol that will be undertaken to ensure the safety of the field party, especially students and others who are inexperienced in working under conditions that can be, at times, uncomfortable, unfamiliar, or threatening. Protocols should incorporate best practices to ensure both physical and emotional safety of all participants and should be uploaded as Other Supplementary Documents.

Facilities: For proposals that require support from centrally supported facilities, investigators must obtain letters of support from the managing organization agreeing to provide the needed facility resources described in the proposal and those letters should be included as a Supplementary Document. Such letters should follow the standard format of the managing organization; if no such format exists, the letters should adhere to the standard letter of collaboration required in the PAPPG.

Research Experiences: Projects anticipating the inclusion of REU, RET, or ROA activities should include those as part of the research proposal. Supplemental funding is intended only for unanticipated opportunities that arise during the course of the project.

B. Budgetary Information

Cost Sharing:

Inclusion of voluntary committed cost sharing is prohibited.

Other Budgetary Limitations:

Equipment needs that can be demonstrably linked to the conduct of a specific research project being proposed to EAR may be included within the budget of the related research proposal. In general, equipment requests on proposals submitted to EAR research programs should not exceed a total of $50,000. Equipment requests in excess of $50,000 usually require a separate proposal directly to the Instrumentation and Facilities Program. However, equipment requests of less than $50,000 that are unassociated with specific research proposals may be submitted to the Instrumentation and Facilities Program. Investigators planning on submitting an EAR research proposal with a significant equipment budget are encouraged to discuss these plans with the relevant research program officer prior to submission.

C. Due Dates

- **Full Proposal Deadline(s)**:

  Proposals Accepted Anytime

Proposals accepted anytime.

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 Research.gov 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.D.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.D.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.

B. Review and Selection Process

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

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

Collaborative proposals will also be evaluated on the integration of the collaboration and the management plan for accomplishing the project.

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.

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.

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.

Special Award Conditions:

EAR Data Policy: Principal investigators are required to adhere to the EAR Data Policy available on the NSF website. Final reports for all awards should include a statement describing how the data policy requirements have been met.

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.

EAR Data Policy: Principal investigators are required to adhere to the EAR Data Policy available on the NSF website. PIs are required to provide updates on the status of data sharing and archiving in Annual and Final reports, in the section titled "Products," under Other Products, Other Publications, or Website or Other Internet Sites.

Broader Impacts Activities: Investigators are expected to specifically address progress on activities related to proposed Broader Impacts in Annual and Final Reports. Information should be provided in the Accomplishments section under questions about opportunities for training and professional development, and dissemination of results to communities of interest. The impacts of these activities should be described in the Impacts section, under impacts on society beyond science and technology.

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:

- Yurena Yanes, telephone: (703) 292-8551, email: earsgp@nsf.gov
- Alberto Perez-Huerta, telephone: (703) 292-8551, email: earsgp@nsf.gov
- Margaret Fraiser, telephone: (703) 292-4660, email: earsgp@nsf.gov

For questions related to the use of NSF systems contact:

- NSF Help Desk: 1-800-673-6188
- 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.F.7 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.

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:

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