

# Infrastructure Capacity for Biology (ICB)

## core programs

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## PROGRAM SOLICITATION

NSF 18-594

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### REPLACES DOCUMENT(S):

NSF 16-506, NSF 15-577, NSF 15-582

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National Science Foundation

Directorate for Biological Sciences  
Division of Biological Infrastructure

### Full Proposal Deadline(s):

Proposals Accepted Anytime

## IMPORTANT INFORMATION AND REVISION NOTES

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There will be **no limits** on the number of proposals an investigator can submit as PI or co-PI.

Any proposal submitted in response to this solicitation should be submitted in accordance with the revised *NSF Proposal & Award Policies & Procedures Guide* (PAPPG) ([NSF 18-1](#)), which is effective for proposals submitted, or due, on or after January 29, 2018.

## SUMMARY OF PROGRAM REQUIREMENTS

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### General Information

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#### Program Title:

Infrastructure Capacity for Biology (ICB) core programs

#### Synopsis of Program:

The Infrastructure Capacity for Biology (ICB) supports the development, expansion, or improvement of infrastructure that will enable fundamental research within the biological sciences. Infrastructure supported under this solicitation may include cyberinfrastructure, instrumentation, biological collections, living stocks, field stations, marine labs, or other resources that are shared and openly accessible. Proposals submitted to the ICB solicitation must make a compelling case that the proposed infrastructure will advance or transform research in areas of science that are supported by the Directorate for Biological Sciences (BIO) at the National Science Foundation.

While other programs in the Division of Biological Infrastructure (DBI) focus on innovative research leading to new infrastructure or sustained operation of mature infrastructure, this solicitation focuses on supporting projects that seek to deliver, enable access to, or substantially improve infrastructure that will advance the capacity of today's scientific community to conduct leading edge research. The impacts of the activities funded by awards made through this solicitation will be reflected not just in the quality of their products, but by the novel and transformative science outcomes that will be achieved by the users of these resources. Infrastructure projects that will advance any field of research supported by the Directorate for Biological Sciences are eligible for support under this program.

#### 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.

- Peter H. McCartney, telephone: (703) 292-8470, email: [pmccartn@nsf.gov](mailto:pmccartn@nsf.gov)
- Robert D. Fleischmann, telephone: (703) 292-7191, email: [rfleisch@nsf.gov](mailto:rfleisch@nsf.gov)
- Reed S. Beaman, telephone: (703) 292-7163, email: [rsbeaman@nsf.gov](mailto:rsbeaman@nsf.gov)

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

- 47.074 --- Biological Sciences

## Award Information

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

**Estimated Number of Awards:** 50 to 80

Actual number of awards may vary depending on the split of funds across the different programmatic areas, which in turn may vary according to submission distribution, individual proposal merits, budget amounts, and availability of funds.

**Anticipated Funding Amount:** \$40,000,000

Approximately \$40 million is expected to be available for new awards in FY 2019. The size and duration of any individual request should be justified by the amount and complexity of the work to be accomplished. As a rule, the larger the budget, the greater the expected impact on the biological research community.

## Eligibility Information

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**Who May Submit Proposals:**

Proposals may only be submitted by the following:

- Institutions of Higher Education (IHEs) - Two- and four-year IHEs (including community colleges) accredited in, and having a campus located in the US, acting on behalf of their faculty members. Special Instructions for International Branch Campuses of US IHEs: If the proposal includes funding to be provided to an international branch campus of a US institution of higher education (including through use of subawards and consultant arrangements), the proposer must explain the benefit(s) to the project of performance at the international branch campus, and justify why the project activities cannot be performed at the US campus.
- Non-profit, non-academic organizations: Independent museums, observatories, research labs, professional societies and similar organizations in the U.S. associated with educational or research activities.

**Who May Serve as PI:**

There are no restrictions or limits.

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

There are no restrictions or limits.

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

There are no restrictions or limits.

## Proposal Preparation and Submission Instructions

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**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](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](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:**

Not Applicable

### C. Due Dates

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

Proposals Accepted Anytime

## Proposal Review Information Criteria

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### Merit Review Criteria:

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

## Award Administration Information

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### Award Conditions:

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

### Reporting Requirements:

Standard NSF reporting requirements apply.

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## I. INTRODUCTION

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Infrastructure for scientific research follows a life-cycle characterized by **innovation** (research on new technologies, methods and approaches), **capacity-building** (development and deployment of robust, production quality tools and services), and **sustainability** (long-term maintenance and operation of those resources in support of science). The goals of this program are aligned with the middle of this cycle - to build capacity by providing the research community with the tools, databases, software, instrumentation, and capital infrastructure to enable and accelerate the pace of scientific discovery in the biological sciences.

The merits of proposals will be assessed by the breadth and significance of the research they will enable and the likelihood of

successful delivery of this impact. Modern science is increasingly dependent on technology and on expertise in the use of technology in enabling all aspects of the research cycle including collection of data, analysis and modelling, disseminating results, and persistence of research products for future research and education. An accumulating legacy of research products in the form of digital information, physical collections, living stocks, and other value-added resources represents an invaluable wealth for validation, reuse, and reinterpretation by future biological science generations. The services and resources offered by dedicated laboratory and field research facilities provide access to unique research opportunities.

This new call for proposals integrates activities supported in several previous DBI programs. A common set of proposal preparation instructions and review criteria are provided in order to enhance compatibility in proposal management across representative programmatic areas listed below. Recent trends in proposal submissions to DBI reveal that effective research infrastructure often requires synergies and expertise between cyberinfrastructure, instrumentation, and facilities. By consolidating programs under this solicitation DBI will be better poised to accommodate projects that synergistically incorporate elements from multiple classes of infrastructure where appropriate.

Proposers should review the [NSF Proposal & Award Policies & Procedures Guide \(PAPPG\), Introduction A](#) for a general description of research topics normally outside the scope of NSF funding such as disease, clinical, or drug design related research. Proposals to develop or provide infrastructure that is primarily to enable research in these excluded topics are not eligible for support under this solicitation and will be returned without review.

## II. PROGRAM DESCRIPTION

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This solicitation invites proposals that are responsive to one or more of the programmatic areas listed below. Resources must support discovery in the biological sciences and may consist of cyberinfrastructure, instrumentation, equipment, collections, experimental and observational infrastructure, and capital improvements depending on what is supported under the specific program scope. Proposals may also significantly expand or improve upon existing resources by adding new functionality or capacity. Investments made through this program are expected to serve audiences well beyond the submitting institution. This will limit eligibility for certain types of resources that lack an explicitly broad-reaching mission.

Competitive proposals will identify the resource that will be delivered and present a science-driven rationale for its need. They will demonstrate a high likelihood of success as evidenced by community-vetted requirements, prototypes, or existing infrastructure. Resource design and the plan for dissemination of information must be clearly articulated with attention to the potential and means for scaling their applicability and relevance beyond the initial target community or current frame of reference. User audiences will be identified and engaged throughout the design, development, dissemination, and training cycle. A well-organized work plan will identify: specific aims, activities and deliverables, roles and responsibilities, assessment plans and metrics, communication plans, resource allocation, risk management and mitigation plans, the expected schedule, the milestones and associated costs.

The anticipated products of all awards made under this solicitation will be usable infrastructure resulting in measurable downstream impacts in the form of publications of research enabled or through derivative products created through the incorporation or use of resources funded under this program. It is expected that products of this program will be applicable to a broad range of biological research questions and will be shared broadly within the science and educational community via appropriate means of communication and dissemination. Proposals seeking to develop, acquire, or improve infrastructure to benefit users associated with a specific research project, lab, or institution, or which are simply making use of existing computational methods or data resources, should apply for funding from core research programs in the Directorate for Biological Sciences or other means of support.

Budgets and award durations should accommodate the iterative process of bringing a proof-of-concept into a form that is sufficiently robust to become a broadly-adopted infrastructure resource. Proposals should be product-driven and typically will be assessed on their perceived contribution to a broad portfolio of national infrastructure capacity. Proposals may include limited data collection, experimentation or other research activities as appropriate to design, evaluate, or calibrate the proposed infrastructure. Synergies with, and leveraging of, other existing and ongoing resources are taken into consideration.

The scope of this solicitation encompasses the core programmatic areas of the Infrastructure Capacity for Biology program in the Division of Biological Infrastructure (DBI). Please refer to the individual program descriptions for detailed guidance on what is supported by that area:

- [Cyberinfrastructure for Biological Research \(CIBR\)](#);
- [Collections in Support of Biological Research \(CSBR\)](#);
- [Improvements in Facilities, Communications, and Equipment at Biological Field Stations and Marine Laboratories \(FSML\)](#); and
- [Instrumentation Capacity for Biological Research \(ICBR\)](#)

Proposals need not necessarily be limited to one of these programs. Projects that integrate across these resource types to develop comprehensive infrastructure solutions are encouraged.

### **Special proposal types**

**Workshops.** ICB will consider workshop proposals as described in the “Conference” section of the [NSF PAPPG, Part I II.E.7](#). Priority is given to meetings that have clearly defined goals that address compelling and broadly recognized common challenges in the provisioning of research infrastructure, show a results-driven plan for meeting those challenges, and are broadly inclusive in their participation. ICB does not typically provide support for, or travel to, recurring conferences, but recognizes that co-location of workshops with such events may promote broader engagement, student participation, and expanded networking opportunities.

**Planning proposals.** ICB will consider proposals for comprehensive planning to transform a resource (or a network of resources) in terms of its research and training mission. The effort should produce strategic plans for advancing research and education covering at least a five-year time frame. Planning proposals may address, but are not limited to, research/training program development, infrastructure needs assessment, and research coordination at regional scales. Proposed activities will normally include workshops,

conferences, or travel for engaging research, educational, and stakeholder communities. Award of a planning grant does not imply an NSF commitment for support beyond the planning period.

*RAPID/EAGER.* ICB will consider RAPID and EAGER proposals as described in the [NSF PAPPG, Part I II.E.1&2.](#)

*Grant Opportunities for Academic Liaison with Industry (GOALI).* ICB accepts GOALI proposals as described in the [NSF PAPPG, Part I II.E.4.](#)

*Research Coordination Networks (RCN).* ICB accepts proposals that follow the guidelines of the RCN solicitation ([https://www.nsf.gov/funding/pgm\\_summ.jsp?pims\\_id=11691&org=BIO&from=home](https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=11691&org=BIO&from=home)) and benefit the goals of the program(s) to which it is directed. PIs are encouraged to contact program officers prior to submission.

*Research Experience for Undergraduates/Research Experience for Teachers/Research Opportunity Awards (REU/RET/ROA).* ICB will consider supplemental funding for these activities as per DBI policy (<https://www.nsf.gov/bio/dbi/suppopp.jsp>).

**Related programs.** There are a number of related or complimentary programs in BIO and across the NSF which are described at in Section IX, Other Information. PIs are encouraged to consider whether these may be a more appropriate target before submitting to ICB.

### III. AWARD INFORMATION

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Estimated program budget, number of awards and average award size and duration are subject to the availability of funds, the quality of submissions, and the anticipated benefits to biological research. Both standard and continuing grants will be awarded. Large and complex projects may be awarded as cooperative agreements. The specific award type will be determined on a proposal by proposal basis.

### IV. ELIGIBILITY INFORMATION

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#### Who May Submit Proposals:

Proposals may only be submitted by the following:

- Institutions of Higher Education (IHEs) - Two- and four-year IHEs (including community colleges) accredited in, and having a campus located in the US, acting on behalf of their faculty members. Special Instructions for International Branch Campuses of US IHEs: If the proposal includes funding to be provided to an international branch campus of a US institution of higher education (including through use of subawards and consultant arrangements), the proposer must explain the benefit(s) to the project of performance at the international branch campus, and justify why the project activities cannot be performed at the US campus.
- Non-profit, non-academic organizations: Independent museums, observatories, research labs, professional societies and similar organizations in the U.S. associated with educational or research activities.

#### Who May Serve as PI:

There are no restrictions or limits.

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

There are no restrictions or limits.

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

There are no restrictions or limits.

#### Additional Eligibility Info:

A single research resource (database, software tool, collection, field station, etc) may be the focus of only one proposal to this solicitation in a single year.

### V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

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#### A. Proposal Preparation Instructions

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**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](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) 292-7827 or by e-mail from [nsfpubs@nsf.gov](mailto: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](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) 292-7827 or by e-mail from [nsfpubs@nsf.gov](mailto: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 the NSF FastLane system. PAPPG Chapter II.D.3 provides additional information on collaborative proposals.

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

The following information provides instructions that supplement the Proposal & Award Policies & Procedures Guide (PAPPG).

**Cover Page:** The proposal title should be prefixed with the acronym corresponding to the programmatic area the proposal is targeting ("CIBR:", "CSBR:", "FSML:", or "ICBR:"). If the proposal is part of a collaborative submission, then the prefix "**Collaborative Research:**" should be applied first. The title should be descriptive of the project and avoid acronyms or proper names that merely identify, rather than describe the research project.

**Project Summary (1 page):** Each Project Summary must include the following sections labelled as they are here:

**Overview.** This section should begin with a comma-separated list of keywords as the first sentence. It should then provide a brief overview of the proposed activities, planned deliverables, and the anticipated impacts on the research community.

**Intellectual Merit.** This section should include a brief description of the proposed activities and the anticipated impacts on basic biological research.

**Broader Impacts:** This section should include a brief description of the potential impacts beyond the targeted research community, including general science, educational, or public audiences.

**Project Description (maximum length 15 pages):**

The first paragraph of the project description should provide a concise, clear description of the proposed resource(s) that will be made available under this award. Describe, using a minimum of specialized language, what the resource will consist of, where it will fit within the broader context of existing infrastructure, what functionality it will offer to advance science, and what activities or acquisitions will be undertaken to implement or improve it. As per the *NSF PAPPG, Chapter II.C.2.d.(i)*, this section should be labeled "Intellectual Merit".

**Broader Impacts.** The Project Description must contain, as its own distinct element within the narrative, a section labeled "Broader Impacts". General guidance is provided in the *NSF PAPPG, Chapter II.C.2.d(i)*. For all activities or outcomes described under broader impacts, demonstrate how they will benefit from proposed infrastructure.

**Results of Prior Research.** The Project Description must contain, as its own distinct element within the narrative, a section labeled "Results of Prior Research". General guidance is provided in the *NSF PAPPG, Chapter II.C.2.d(iii)*. Where appropriate, distinguish between the proposed resource and any existing infrastructure resulting from prior NSF support.

The remaining sections, described below, may appear in any order in the project description. They need not be explicitly labeled except as noted, but the content of each should be appropriately addressed.

**Needs assessment.** Explain how the infrastructure will uniquely address a general need in fundamental biological research and clearly define the research gaps that its development or improvement will address. Provide sufficient background information to describe the existing capacity and how the proposed work deviates from prior capacity. Proposals should identify the biological user community and explicitly describe how the project will advance the capabilities of that community. In the case of proposals that improve existing infrastructure, provide a description of its current capacity and document its prior use and impacts.

**Design and implementation:** Provide a detailed description of the infrastructure for which funding is requested, its specific requirements, planned functionality, and relevant community standards, as appropriate, to explain what is to be implemented and what the necessary effort and potential risks will be. Describe the workplan for implementing the project, including, when appropriate, a graphical or tabular summary of the major deliverable components, a schedule and milestones for completion, the allocation of resources to tasks, and any associated risk and plans for mitigating them.

**Management.** Identify the personnel responsible for all major tasks with time schedules for all members of the team for the duration of the project; annual milestones for judging productivity and progress; means of communication and data management within the project team; training and outreach activities, including field, laboratory, and museum experiences for trainees, leadership development for key

team members, and integration of new team members; and plans for coordination with other projects.

**Communication and Dissemination.** Describe how the products of this work will be accessible to its target audience and to the broader biological, interdisciplinary, and other audiences. Provide a clear statement of relevant intellectual property considerations and any constraints these may place on access to the proposed resource.

**Outcomes Assessment.** Identify what metrics will be used to measure success toward the stated goals of the project (both for Intellectual Merit and Broader Impacts) and by what process the project will collect and evaluate them.

**Sustainability.** Identify what will be the ongoing costs for continued availability of the resource beyond the term of NSF support and present a plan for how these are to be met. PIs are encouraged to consider alternative models for long-term sustainable financial support and leveraging use of resources provided through other funding sources within and beyond NSF.

**Facilities, Equipment and Other Resources (Maximum length 2 pages):** The purpose of the facilities section is to document those existing resources, including space, computational equipment, or effort that will contribute to the project goals. Only those resources that will be used by the project should be listed with the understanding that listing them implies a commitment that they will be available. No dollar amounts may be referenced for any resource discussed in the Facilities section. If the budget requests funds for equipment, materials, or resources identified in the facilities section, the budget justification should clearly account for the duplication. The Division of Biological Infrastructure expects that institutions suitable for the development of advanced infrastructure will typically have adequate computing and equipment resources as well as appropriate support staff to facilitate the proposed research.

### Special Information and Supplementary Documents

This section may contain ONLY the following types of documents.

**Data Management Plan:** Proposals are expected to address, as part of the required Data Management Plan, the long-term availability of data, software or services generated as deliverables under this funding. This includes identification of which deliverables are appropriate for long-term preservation and the process the project will use in selecting them. It should specify any policies developed, or followed, by this project that cover the intellectual property rights, confidentiality, access conditions, or terms of use, for any research products that have been produced by this project, or that may be deposited with, or accessed from, a resource developed under this project. The commitment for deposition of data or code into independent repositories should be noted explicitly. The Data Management Plan should explain how users of infrastructure supported under this program will be advised of their obligations to share data generated from its use in accordance with NSF policies and what the operators of this infrastructure will do to facilitate that goal.

**Post Doctoral Mentoring Plan.** General guidance is provided in the [NSF PAPPG, Chapter II.C.2.j](#).

**Letters of Collaboration.** All Proposed activities must be documented in the Project Description. Statements from individuals whose role is discussed in the Project Description as providing assistance or collaboration to the project must follow [NSF PAPPG, Chapter II.C.2.d.iv](#).

**Cost Basis:** Quotes, estimates or price lists that verify the basis for budget estimates for any capital equipment, contracted, or consultant services. These may include plans, drawings, or other graphical content provided with those estimates.

**Authorities:** Memoranda of Understanding, Permits, Licenses, Agreements, or other documents as appropriate that demonstrate that the awardee institution has the appropriate authority to carry out proposed activities on property or resources owned by other organizations. For example, permits allowing a university to improve a facility on federally owned land.

### Single-Copy Documents

**Collaborators and Other Affiliations** – Documentation of Collaborators and Other Affiliations Information must be separately provided for each individual identified as senior project personnel as specified in the [NSF PAPPG, Chapter II.C.1.e](#).

## B. Budgetary Information

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### Cost Sharing:

Inclusion of voluntary committed cost sharing is prohibited.

### Budget Preparation Instructions:

**Budget Guidance:** Budgets should be well justified according to the effort required to carry out the proposed work. Typical award budgets vary widely depending on the nature of the infrastructure, the resources and effort required to implement them, and the relative breadth of the biological science community likely to be impacted. Proposers are advised to pay close attention to the following guidelines:

- Proposals that are primarily for capital improvements, acquisition, and/or deployment of fully developed technology may not include compensation for permanent employees to carry out oversight, review, operation, or other administrative tasks that would be considered within their existing job description. Salary for in-house hiring for activities directly involved in the improvement like construction, design, commissioning, etc., that would otherwise be covered through external contracts would be allowable.
- For proposals requiring substantial PI and/or senior personnel effort to carry out the proposed aims and activities, proposers should carefully read the [NSF PAPPG, Chapter II.C.2.g.i.a](#) concerning Senior Project Personnel Salaries. An appointment in a “soft-money” position is NOT by itself sufficient justification for exceeding the 2 month limit.
- The budget justification should clearly identify how the NSF funds will be allocated to the major activities and deliverables identified in the above section. It must be clear how the effort requested for each individual is apportioned to the activities they will be doing.
- For major equipment or software purchases, a vendor, model, and price quote should be included or referenced with a URL or

catalog citation. Justification should explicitly address why the need cannot be met by existing facilities either at the institution or within national cyberinfrastructure or other instrumentation facilities supported by other NSF programs. Requests for equipment must account for administration and maintenance both during and beyond the tenure of the award. For equipment, the proposal should also explain how any usage time or storage space not consumed by the project would be made available to the broader scientific community at the campus, regional or even national scale.

- Travel requests must be justified in reference to specific activities described in the proposal's scope of work. Foreign travel must identify the destination country or countries.
- Limited budgets for data acquisition through observation, experiment, or modeling activities will be considered only if a strong justification for why this is needed to inform or validate the proposed infrastructure work is provided.
- If there is an institutional policy setting direct cost fees for the use of computational facilities by sponsored projects, then funds for these fees should be included on line G4 Computer Services as per the [NSF PAPPG, Chapter II.C.2.g.vi.d](#). Budgets must not include costs on other lines that are redundant with the services provided by these fees.
- Budgets may not include costs for contingency.

## C. Due Dates

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### Full Proposal Deadline(s):

Proposals Accepted Anytime

## D. FastLane/Grants.gov Requirements

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### For Proposals Submitted Via FastLane:

To prepare and submit a proposal via FastLane, see detailed technical instructions available at: <https://www.fastlane.nsf.gov/a1/newstan.htm>. For FastLane user support, call the FastLane Help Desk at 1-800-673-6188 or e-mail [fastlane@nsf.gov](mailto:fastlane@nsf.gov). The FastLane Help Desk answers general technical questions related to the use of the FastLane 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: <http://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](mailto: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 are strongly encouraged to use FastLane 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

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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/](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

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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**

Reviewers will be instructed to consider the following additional criteria when evaluating proposals submitted to this program:

- Demonstration of transformative impacts the proposed activities will have on research areas supported by the Directorate for Biological Sciences.
- The size, diversity, and significance of the targeted user community at a scale far beyond that of the proposing institution.
- Quality of the needs assessment, feasibility of a detailed requirements-driven work plan, and alignment of the associated cost documentation.
- Consideration of and compliance with relevant community standards such as data formats, methodological practices, engineering standards, or green and sustainable practices.
- The demonstrated likelihood of success and appropriate control over risks.
- Engagement with the targeted user community through the entire development/implementation cycle.
- The assessment plans for setting milestones, evaluation criteria, and change control.
- The plan for broad dissemination or accessibility on a local, regional, national, and/or global scale.
- The facilities for the awardee institution to host the activities of the project and, where appropriate, ensure the availability of the proposed resource beyond the life of the grant.
- The plan for how the project, and its resulting products, will enable broader impacts beyond the primary science community to be targeted.
- The plan for sustaining the impacts of the proposed resource beyond the life of the award.

Please see the individual programmatic area webpages for additional information regarding these foci.

## **B. Review and Selection Process**

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

Most proposals will be reviewed by a combination of adhoc and panel review. Proposals with large budgets (ca >\$1M annually) will likely be subjected to a site visit or reverse site visit.

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

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### A. Notification of the Award

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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

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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](https://www.nsf.gov/awards/managing/award_conditions.jsp?org=NSF). Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from [nsfpubs@nsf.gov](mailto: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](https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg).

#### Special Award Conditions:

Large awards with complex workplans may be required to complete a Project Execution Plan (PEP) with additional details on scope of work, schedule, costs, and project management. In addition, these projects may be required to provide further documentation on cost estimates. Where this is applicable, the program officer will notify the PI and provide the necessary templates and guidelines for creating the required documents. These documents must be completed prior to a final recommendation being made but are not required at time of initial proposal submission to the ICB solicitation. If awarded, PIs will be expected to address progress on PEP task items in their annual reports.

National Environmental Policy Act. Projects involving renovation, construction, or major fixed equipment installation may require additional information to assess compliance with any applicable laws such as the National Environmental Policy Act, National Historic Preservation Act, or Endangered Species Act. If review of this material indicates that the project execution is not adequately prepared or that the barriers to NEPA compliance are prohibitive, the program may elect to not proceed with an award. PIs are strongly encouraged to contact the program in advance if they are considering proposals that involve construction or any other activities that might impact the natural or cultural environment.

### C. Reporting Requirements

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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](https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg).

## VIII. AGENCY CONTACTS

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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:

- Peter H. McCartney, telephone: (703) 292-8470, email: [pmccarnt@nsf.gov](mailto:pmccarnt@nsf.gov)
- Robert D. Fleischmann, telephone: (703) 292-7191, email: [rfleisch@nsf.gov](mailto:rfleisch@nsf.gov)
- Reed S. Beaman, telephone: (703) 292-7163, email: [rsbeaman@nsf.gov](mailto:rsbeaman@nsf.gov)

For questions related to the use of FastLane, contact:

- FastLane Help Desk, telephone: 1-800-673-6188; e-mail: [fastlane@nsf.gov](mailto:fastlane@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](mailto:support@grants.gov).

## IX. OTHER INFORMATION

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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 <http://www.grants.gov>.

**Cross-cutting and special programs managed within the ICB cluster** . These programs either wholly or partially support activities consistent with the goals of this cluster. Proposals to these programs should be submitted directly to the solicitation referenced on the program description page.

[Advancing Digitization of Biodiversity Collections \(ADBC\)](#): This is a crosscutting program to invest in biodiversity data infrastructure through a national, coordinated effort to digitize biological collections.

Major Research Instrumentation (MRI): [MRI](#) supports the acquisition and development of major research instruments in all areas of science. The Division of Biological Infrastructure participates in this program and considers proposals for instruments that enable BIO-supported research.

Next Generation Networks For Neuroscience (NeuroNex): The goal of this solicitation is to foster the development and dissemination of (1) innovative research resources, instrumentation, and neurotechnologies, and (2) theoretical frameworks for understanding brain function across organizational levels, scales of analysis, and/or a wider range of species, including humans.

### **Other Related Sources of Support**

The [Information and Intelligent Systems Division \(IIS\)](#) of the Directorate for Computer and Information Science and Engineering (CISE) supports computer science research on integration of information and informatics applications in all sciences, including biology.

The [Office of Advanced Cyberinfrastructure \(OAC\)](#) of the Directorate for Computer and Information Science and Engineering offers funding opportunities in advanced computing infrastructure, long-term data preservation, data interoperability, software development, and other topics.

[SBIR/STTR](#) may provide support commercialization of outcomes of NSF funded projects.

## ABOUT THE NATIONAL SCIENCE FOUNDATION

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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** (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](mailto:nsfpubs@nsf.gov)
  - or telephone: (703) 292-7827
- **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 Systems of Records, *NSF-50*, "Principal Investigator/Proposal File and Associated Records," 69 Federal Register 26410 (May 12, 2004), and *NSF-51*, "Reviewer/Proposal File and Associated Records," 69 Federal Register 26410 (May 12, 2004). 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  
Office of the General Counsel  
National Science Foundation  
Alexandria, VA 22314



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