# Center for Advancement and Synthesis of Open Environmental Data and Sciences

## PROGRAM SOLICITATION
### NSF 21-549

**National Science Foundation**

Directorate for Biological Sciences
Division of Biological Infrastructure

Directorate for Computer and Information Science and Engineering
Office of Advanced Cyberinfrastructure

**Letter of Intent Due Date(s)** ***(required)*** (due by 5 p.m. submitter's local time):

April 01, 2021

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

April 29, 2021

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

September 15, 2021

## IMPORTANT INFORMATION AND REVISION NOTES

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

## SUMMARY OF PROGRAM REQUIREMENTS

### General Information

**Program Title**:

Center for Advancement and Synthesis of Open Environmental Data and Sciences

**Synopsis of Program**:

NSF seeks to establish a Center fueled by open and freely available biological and other environmental data to catalyze novel scientific questions in environmental biology through the use of data-intensive approaches, team science and research networks, and training in the accession, management, analysis, visualization, and synthesis of large data sets. The Center will provide vision for speeding discovery through the increased use of large, publicly accessible datasets to address biological research questions through collaborations with scientists in other related disciplines. The Center will be an exemplar in open science and team science, fostering development of generalizable cyberinfrastructure solutions and community-driven standards for software, data, and metadata that support open and team science, and role-modeling best practices. Open biological and other environmental data are produced by NSF investments in research and infrastructure such as the National Ecological Observatory Network (NEON), the Ocean Observatories Initiative (OOI), the Long-Term Ecological Research (LTER) network, National Center for Atmospheric Research (NCAR), Critical Zone Observatories (CZOs), Integrated Digitized Biocollections (iDigBio), and the Global Biodiversity Information Facility (GBIF), as well as by many other public and private initiatives in the U.S. and worldwide. These efforts afford opportunities for collaborative investigation into, and predictive understanding of life on Earth to a far greater degree than ever before. The Center will help develop the teams, concepts, resources, and expertise to enable inclusive, effective, and coordinated efforts to answer the broad scientific questions for which these open data were designed, as well as key questions that emerge at interfaces between biology, informatics, and a breadth of environmental sciences. It will engage scientists diverse in their demography, disciplinary expertise, and geography, and in the institutions that they represent in collaborative, cross-disciplinary, and synthetic studies. It is expected that this new Center will build on decades of experience from NSF's prior investments in other synthesis centers, while providing visionary leadership and advancement for data-intensive team science in a highly connected and increasingly virtual world. It will serve as an incubator for team-based, data-driven, and open research that includes cyberinfrastructure, tools, services, and application development and innovative and inclusive training programs. The Center is also expected to spur collaborative interactions among the facilities and initiatives that produce open biological and other environmental data, and cyberinfrastructure efforts that support the curation and use of those data, such as Biological and Chemical Oceanography Data Management Office (BCO-DMO), CyVerse, Environmental Data Initiative (EDI), DataOne, EarthCube, and Cyberinfrastructure (CI) Centers for Excellence, to address compelling research questions and to enable training and data product and tool development. The new Center will further enable data-driven discovery through immersive education and training experiences to provide the advanced skills needed to maximize the scientific potential of large volumes of available open data.

**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.*

- Matthew D. Kane, Program Director, BIO/DEB, telephone: (703) 292-7186, email: mkane@nsf.gov
- Reed S. Beaman, Program Director, BIO/DBI, telephone: (703) 292-7163, email: rsbeaman@nsf.gov
- Tevfik Kosar, Program Director, CISE/OAC, telephone: (703) 292-8970, email: tkosar@nsf.gov

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

- 47.070 --- Computer and Information Science and Engineering
- 47.074 --- Biological Sciences

## Award Information

**Anticipated Type of Award**: Cooperative Agreement

**Estimated Number of Awards**: 1

**Anticipated Funding Amount**: $20,000,000

## Eligibility Information

**Who May Submit Proposals**:

Proposals may only be submitted by the following:

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

Only a single investigator may appear on the cover sheet of a preliminary or full proposal. This individual should be the intended center director or provisional director. No co-PIs are allowed.

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

There are no restrictions or limits.

**Limit on Number of Proposals per PI or Co-PI**: 1

A person may be PI on no more than ONE proposal. No co-PIs are allowed. There is no limit on the number of proposals on which an individual can be included as a subaward PI.

## Proposal Preparation and Submission Instructions

**A. Proposal Preparation Instructions**

- **Letters of Intent**: Submission of Letters of Intent is required. Please see the full text of this solicitation for further information.
- **Preliminary Proposals**: Submission of Preliminary Proposals is required. Please see the full text of this solicitation for further information.
- **Full Proposals**:
  - Full Proposals submitted via FastLane: *NSF Proposal and Award Policies and Procedures Guide* (PAPPG) guidelines apply. The complete text of the PAPPG is available electronically on the NSF website at: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg.
  - Full Proposals submitted via Grants.gov: *NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov* guidelines apply (Note: The *NSF Grants.gov Application Guide* is available on the Grants.gov website and on the NSF website at: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide).

**B. Budgetary Information**

- **Cost Sharing Requirements**: Inclusion of voluntary committed cost sharing is prohibited.
- **Indirect Cost (F&A) Limitations**: Not Applicable
- **Other Budgetary Limitations**: Not Applicable

**C. Due Dates**

- **Letter of Intent Due Date(s) *(required)*** (due by 5 p.m. submitter's local time):

  April 01, 2021

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

  April 29, 2021

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

  September 15, 2021

## Proposal Review Information Criteria

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

## Award Administration Information

**Award Conditions**: Standard NSF award conditions apply.

**Reporting Requirements**: Standard NSF reporting requirements apply.

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## I. INTRODUCTION

The NSF has established various environmental networks and observatories that are generating vast amounts of open access biological and other environmental data. These efforts afford opportunities for collaborative investigations that will advance our predictive understanding of life on Earth; publicly available data are burgeoning. Access to and creative use of these data can democratize science and diversify the STEM workforce as never before by making the same data available to and usable by everyone, from collaborative teams of experts to individual students, researchers, educators and policymakers. Open biological and other environmental data are produced at large spatiotemporal scales by NSF-supported efforts such as the National Ecological Observatory Network (NEON) including the NEON Bio-repository of biological samples and data, the Ocean Observatories Initiative (OOI), the Long-Term Ecological Research (LTER) network, National Center for Atmospheric Research (NCAR), Critical Zone Observatories (CZOs), Integrated Digitized Biocollections (iDigBio), and the Global Biodiversity Information Facility (GBIF), as well as by many other public and private initiatives in the U.S. and worldwide. Fueled by these open data resources, NSF seeks to establish a center for the advancement and synthesis of open environmental data sciences to catalyze novel scientific questions and data-intensive approaches through promoting team science and advancing new scientific collaborations. These efforts will require the combination of sound informatics principles, integration and interoperability of advanced software and cyberinfrastructure, and development of best practices into collaborative scientific workflows that facilitate efficiency, transparency, and reproducibility.

The education and training of a new generation of diverse, interdisciplinary environmental and computational researchers and continuing education for mid- and advanced-career investigators will be essential to the Center's success. The Center will create immersive education and training experiences to develop and enhance the advanced skills needed to access, manage, analyze, integrate, and model the heterogeneous and/or large volumes of open data produced by biological and other environmental observatories and networks. The success of the scientific enterprise depends on the ability of future researchers to work with modern computational approaches in dynamic, diverse, and collaborative interdisciplinary teams. Through its advancement, synthesis, and training activities, the Center will maximize the scientific potential of open biological and environmental data and the sciences that use them to understand changes to the biosphere and predict their impacts and will create the next generation of diverse scientific leaders prepared to confront these challenges.

Of equal importance is the need for effective training paradigms that are inclusive and prepare the next generation of scientists to navigate a wide range of data-intensive research questions. Students and postdoctoral scholars need training to address barriers posed by language and cultural differences between fields

and among people, to rigorously interpret a variety of data types, and to interrogate hypotheses that transcend narrow systems or sub-disciplines. The next generations of scholars and educators must reflect the diversity of peoples and cultures in the Nation, and they will need working knowledge of not just their disciplinary research concepts but also the skills to work with large, open data sets.

## II. PROGRAM DESCRIPTION

**General Characteristics**:

The goal of this activity is to establish a center to support discovery through integration, visualization, analysis, and synthesis of open biological and environmental data and sciences to rapidly advance understanding of the Earth's biota in the face of environmental change. The Center will become an exemplar of open, inclusive, and team science and will provide a vision for speeding discovery through its application to research questions that span spatiotemporal scales in biology and related disciplines. The Center will support the generation of novel research questions and approaches and serve as an incubator for team-based, data-driven research as well as tool and application development. Integration of robust approaches to data handling, informatics, software and data cyberinfrastructure development, and access to vast computation resources will accelerate discovery as well as the convergence of environmental science disciplines and sub-disciplines on standards and best practices that provide the foundation for open science. It will spur collaborative interactions that integrate and synthesize data and activities among the facilities and research initiatives that produce open biological and other environmental data, as well as among cyberinfrastructure efforts that support the discovery, analysis, and use of applicable open data to find solutions to compelling research questions. Building on prior and existing NSF synthesis centers (see further, below), this Center will provide visionary leadership for open science in an increasingly data-rich, collaborative and virtually connected research environment.

Each of the observatories, networks, initiatives, and facilities mentioned above was created to address different scientific questions, and so, generates or collates many different kinds of standardized data reflecting atmospheric, terrestrial and oceanic processes; ecological and evolutionary processes; biogeochemistry; ecohydrology; and distribution and abundance of organisms, populations, and communities. All these data can be useful for addressing many research questions, including those not imagined by their original designers. Access to and formats of these extensive data vary across the different entities and often within an entity. There is an enormous need for biological, environmental, and allied sciences to access, synthesize, coordinate, and create generalizable tools to use these data efficiently and to educate investigators at all career stages about how to generate new research questions and then use the data to answer them.

The Center will help develop the teams, concepts, resources, and expertise to enable more inclusive, effective, and coordinated efforts to answer the broad scientific questions for which these open data were designed and to identify new questions that these resources might address. It will engage scientists diverse in demography, disciplines, and geographies in collaborative, cross-disciplinary, and synthetic studies. The Center activities are expected to produce quality products, result in important science outcomes, be openly accessible to a broad scientific and educational community, and have the potential to be used by a community of researchers beyond a single research team.

The Center should be motivated by a clear and compelling vision for the use and potential of the current and next generations of open biological and other environmental data and important science outcomes that can be achieved. Education, training, and inclusivity should be thoroughly integrated with research to create a seamless and intimate association in all activities. Appropriate informatics and computational expertise must be well integrated and justified in the Center's vision. These core expectations may be accomplished through a variety of mechanisms, and NSF expects that this new Center will implement an innovative range of approaches to generating new research questions, supporting the conceptualization of novel observational and experimental approaches that are now enabled by continental- and global-scale data collection, and educational and training activities that facilitate the accessibility and usability of data. We urge broad and creative thinking about the form, structure, and activities of this new Center, with the mandates that it includes the broadest possible community and disseminates results through a culture of cooperative interactions among scientists and society. Well supported and compelling strategic and management plans are essential, as described in more detail below. These plans should be accompanied by clear metrics and milestones required to evaluate the Center's performance.

**Specific Objectives of the Center**:

1. This Center will host incubator groups focused on cutting edge research that leverage open biological and other environmental data, as well as those seeking to develop innovative new research approaches and the creation of applications that access relevant open-source data products and their features. The Center will foster team science, promote collaborations across historically disparate communities, and catalyze the integration of open biological and other environmental data from distributed and heterogeneous sources. The Center will support an inclusive research community to address questions in environmental biology that are intractable using single-investigator or single perspective approaches and that leverage multiple data stream types, disciplines, or perspectives. Robust cyberinfrastructure and data analytics practices will be woven into the fabric of the Center's ethos and practices, not only accelerating the Center's environmental research but also providing tools and best practices for the broader community. As the community of biological and other environmental researchers using open data grows, the Center will become critical to the support and coordination of groups generating new research questions and developing new research approaches that take advantage of large datasets.
2. The Center will engage researchers and innovators across sectors in: i) creating a climate of inclusion and equity through the use of contemporary team science approaches, and engaging scientists diverse in demography, disciplines, and geographies; ii) using and promoting open science approaches to research, including but not limited to the creation of open-access derived data, modeled data, standardized software and data cyberinfrastructure to discover, access, analyze and exploit open-source data products produced by NSF's environmental observatory networks and other sources, iii) understanding the interconnectedness of environmental systems, and iv) understanding the uncertainties inherent in environmental predictions and forecasts.
3. The Center will provide the needed software, data, and compute for research so that scientists will be able to design novel or adapt existing tools, workflows, or scientific gateways that facilitate finding, accessing, manipulating, analyzing, combining, and visualizing data from multiple sources to address novel research questions. The Center will also support the generation of cyberinfrastructure, tools, and services that enhance current data sets by building analytical models and protocols that derive higher-level datasets from lower level ones. PIs are encouraged, where possible, to leverage existing cyberinfrastructure components in lieu of acquiring or developing new ones.
4. The Center will be a leader in diversifying the data-intensive environmental science workforce across demographic, geographic, institutional, and disciplinary dimensions. It will provide immersive training and research experiences for diverse undergraduate and graduate students, postdoctoral researchers, and scientists and educators at all career stages. The Center will also provide access points for faculty who teach data skills courses for undergraduates at both research- and teaching-intensive institutions.
5. The Center will serve as an open forum for discussion among user communities and the managing organizations of major environmental observatory facilities. This open exchange will help the observatories to consider new ideas, inform users of the details and workings of facility resources, and foster better understanding of the challenges and limitations of managing them. Although the Center will have no direct role in governance or oversight of the facilities or their managing organizations, its activities may provide useful feedback and/or generate white papers, publications, editorials, or reports that

suggest modifications to the facilities' operations, data collection, or educational and training activities.

**Staffing of the Center**:

**Center Director** - NSF views the Director as essential to successful operation of the Center. Therefore, the scientific leadership and management qualifications of the Director are critical to a successful proposal. The Director will be responsible for management and staffing; appropriate Center oversight, including ensuring an inclusive and equitable climate that will be welcoming to diverse scientists; effective communication with the broad research community, other appropriate organizations, and the general public; and management of the funds provided. The Principal Investigator of a proposal is expected to be the Center's Director or Interim Director; if the latter, the proposal must clearly describe the process that will be used to select a full-time Director. Co-Principal Investigators are not allowed.

**Project Manager** - It is expected that the Center will have a Project Manager (or Associate Director) with appropriate project-management training whose duties would include project execution planning, procuring and managing project resources, scheduling, assessing risks and opportunities, and ensuring that milestones and outcomes are being met and budgets balanced. This individual will oversee most of the day-to-day operations of the Center and should be designated as senior personnel in the proposal.

**Other Key Positions** - The Center will require full-time staff positions to foster excellence in areas such as: Education & Training, Cyberinfrastructure & Data Management, and others to ensure that the Center is successful in carrying out a visionary and thriving program. These individuals should also be designated as senior personnel.

**Structure of the Center**:

The Center may be single or multi-institutional. If the latter is the case, the proposal must come from one leading institution; others should be included as sub-awardees. The advantages and strengths of the chosen structure should be articulated such that they clearly and concisely justify support at the level of a modern center for scientific advancement and synthesis.

The Biological Sciences Directorate has previously supported three synthesis centers: the National Center for Ecological Analysis and Synthesis (see https://www.nceas.ucsb.edu), the National Evolutionary Synthesis Center (see http://www.nescent.org), and the Plant Science Cyberinfrastructure Collaborative (now known as CyVerse; see https://www.cyverse.org/). Two others are currently supported: the National Institute for Mathematical and Biological Synthesis (https://www.nimbios.org) and the National Socio-Environmental Synthesis Center (see http://www.sesync.org). Proposers should become familiar with these to understand the Directorate's approach to synthesis centers and should design the structure of this new center based on the proposed goals and by leveraging contemporary advances./p>

## III. AWARD INFORMATION

The initial term of the award will be 5 years, with the potential for renewal for another 5 years. Pending availability of funds, NSF anticipates a budget of up to $2,000,000 in year 1, $3,000,000 in year 2, and $5,000,000 in years 3 through 5.

Proposals Involving Multiple Organizations. Of the two types of collaborative proposal formats described in the Proposal & Award Policies & Procedures Guide, this solicitation allows only a single proposal submission with subawards administered by that lead organization (Chapter II.D.3.a). In the case of proposals involving multiple organizations, a single organization must be identified as the lead, and a single proposal describing the entire project must be submitted by that organization. Funds may be distributed among partner organizations via subawards from the lead organization. A budget on the standard NSF budget form should be submitted for each subawardee. The requirement for a single organization to submit the sole proposal for a project is designed to facilitate effective coordination among participating organizations and to avoid difficulties that ensue in funded projects when individuals change organizations and/or cease to fulfill project responsibilities.

## IV. ELIGIBILITY INFORMATION

**Who May Submit Proposals**:

Proposals may only be submitted by the following:

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

Only a single investigator may appear on the cover sheet of a preliminary or full proposal. This individual should be the intended center director or provisional director. No co-PIs are allowed.

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

There are no restrictions or limits.

**Limit on Number of Proposals per PI or Co-PI**: 1

A person may be PI on no more than ONE proposal. No co-PIs are allowed. There is no limit on the number of proposals on which an individual can be included as a subaward PI.

# V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

## A. Proposal Preparation Instructions

**Letters of Intent *(required)***:

A one-page Letter of Intent is required. The Letters of Intent will be used for planning the review of proposals. It is expected that the development and writing of the preliminary proposal is well underway when the letter of intent is submitted. If an organization submits a letter of intent by the deadline then the organization is automatically eligible to submit the preliminary proposal; there is no formal invitation or other notice after the letter of intent has been submitted.

The Letter of Intent must contain the following information under the following headings:

- PI and other Senior Personnel
- Proposed Title of the proposal
- Participating organizations: List confirmed and potential participating organizations, including the lead organization
- Synopsis: Describe the research and training theme(s), approaches, and other activities, highlighting the value of the particular integrative effort.

**Letter of Intent Preparation Instructions**:

When submitting a Letter of Intent through FastLane in response to this Program Solicitation please note the conditions outlined below:

- Submission by an Authorized Organizational Representative (AOR) is not required when submitting Letters of Intent.
- A Minimum of 0 and Maximum of 4

  Other Senior Project Personnel are permitted
- A Minimum of 0 and Maximum of 4

  Other Participating Organizations are permitted
- Additional Participating Organizations is required when submitting Letters of Intent
- Submission of multiple Letters of Intent is permitted

**Preliminary Proposals *(required)***: Preliminary proposals are required and must be submitted via the NSF FastLane system, even if full proposals will be submitted via Grants.gov.

Submission of a preliminary proposal is required for eligibility to submit a full proposal. The preliminary proposal must include the following:

**TITLE**: The title must begin with "Preliminary Proposal:" followed by the proposed name of the Center.

**PROJECT SUMMARY** (1 page): must consist of three parts: 1) an overview of the proposed Center and its components; 2) a succinct summary of the intellectual scope of the activity including the vision and rationale for center capabilities and mechanisms for achieving this vision; and 3) a clear description of the broader impacts of the proposed activities, including the approaches proposed to advance leadership in education, training and broadening participation.

**PROJECT DESCRIPTION** limited to 10 pages, including description of: 1) the scientific rationale and vision for the Center; 2) the transformative science that will be enabled by the Center and the range and modes of intellectual activities that will be supported; 3) plans for education, training, and broadening participation; 4) plans for development and/or integration of appropriate software, data, and compute cyberinfrastructure and data management in research, education and training, 5) the organizational and management structure of the Center; 6) a list of participating institutions and the primary individuals involved (and their roles); 7) capabilities of the institution(s) to host and manage the Center.

Results of prior support are not required for preliminary proposals.

**REFERENCES CITED**: Cited references are limited to 5 pages.

**BIOGRAPHICAL SKETCHES**: A two-page biographical sketch should be included for the PI and should emphasize that individual's training and skills in leadership. Two-page biographical sketches for up to five other members of the leadership team designated as senior personnel should also be included.

Current and pending support statements are not required for preliminary proposals.

No budget is required.

**COLLABORATORS AND OTHER AFFILIATIONS (COA) INFORMATION**: As detailed in the PAPPG Chapter II.C.1.e, information regarding collaborators and other affiliations must be provided for each individual identified as senior personnel on the project. The COA information must be provided through use of the COA template https://www.nsf.gov/bfa/dias/policy/coa.jsp.

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

- Full proposals submitted via FastLane: Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG). The complete text of the PAPPG is available electronically on the NSF website at: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg. Paper copies of the PAPPG may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-8134 or by e-mail from nsfpubs@nsf.gov. Proposers are reminded to identify this program solicitation number in the program solicitation block on the NSF Cover Sheet For Proposal to the National Science Foundation.

Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.

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

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

The following exceptions and additions to the PAPPG or the NSF Grants.gov Application Guide apply to full proposals submitted to this Program*:*

**Full proposals will be accepted only from organizations that have submitted preliminary proposals and that are subsequently invited to submit a full proposal after peer review of preliminary proposals.** Eligible proposals must be based on the preliminary proposal submitted. All proposals not meeting these specifications will be returned without review. Full proposals whose preliminary proposals received a recommendation of 'not invited' will also be returned without review.

**Proposal Cover Sheet** - Entries on the cover sheet are limited to the Principal Investigator/Center Director. No co-Principal Investigators are allowed. All other senior project participants should be entered as Senior Personnel (this provision allows their biographical sketches to be included in the full proposal).

**TITLE** - The title of the proposal must begin with "Full Proposal:" followed by the proposed name of the Center.

**PROJECT SUMMARY** (1 page) - This section must consist of three parts 1) a brief overview of the activity, 2) a succinct summary of the intellectual merit and scope of the activity including the vision and rationale for center capabilities and mechanisms for achieving this vision, and 3) a clear description of the broader impacts of the proposed activities, including the approaches proposed to advance leadership in education and training and broadening participation.

**PROJECT DESCRIPTION** - The project description is limited to 20 pages total. In addition to the requirements specified in the PAPPG, the Project Description must contain the following labeled sections:

1. **Scientific Vision and Rationale**: Describe a vision and rationale for the Center that includes examples of the transformative science themes and questions that will be fostered by the Center's activities.
2. **Center Design**: Describe the overall design of the Center and its activities that includes the unique opportunities it will afford for engagement of scientific researchers in the utilization, advancement, and synthesis of open biological and other environmental data. Also, describe the range and modes of Center activities in sufficient detail to allow evaluation of their merits. Describe team science approaches to be enabled by the Center and the range and modes of research community engagement. Explain selection criteria and mechanisms for any visiting and fixed-term personnel, individuals, and incubator groups. Include a description of how researchers from diverse backgrounds and institutions (e.g., Minority Serving Institutions, Primarily Undergraduate Institutions) will be fully integrated in center activities.
3. **List of Participants**: List the PI and all senior personnel by full name. Note their organizational and departmental affiliation(s), and their research and educational activities related to the project. Do NOT include additional descriptive information. If any participants differ from the preliminary proposal, please notify the Cognizant Program Officer as soon as possible prior to submission, and indicate and justify such changes.
4. **Center Organization, Management & Governance**: Describe the organizational and governance structure of the Center, roles and responsibilities (including Director, Project Manager, and all other key Senior Personnel), and an outline of the mechanisms for identifying and selecting research incubator projects and participants, allocating funds and research resources, developing center policies and practices, and managing participating groups. If there is an Interim Director, provide details of the process used to select a full-time Director. Include policies to integrate or collaborate with other existing synthesis centers and activities. It is expected that members of the Center as well as incubator groups supported by the Center are to be diverse. Teams should include a diversity of types of participants, including individuals from a variety of career stages and members of underrepresented groups in science, including women, minorities and those with disabilities. This diversity should extend to members of the leadership team.
5. **Education, Training & Diversity**: Education and training activities should be thoroughly integrated in all Center activities, with an important focus on diversifying the workforce that has the skills and background to use open biological and other environmental datasets. Describe the proposed education and training activities of the Center, and rationalize the proposed training approaches (for example, mentoring structures, pedagogical activities, social organization). Identify the trainee population(s) that will be served and describe how the approaches will achieve success at diversifying the constitution of the team at all career levels, including trainees. This section must explain how the proposed activities will be integrated with the research vision and rationale and how barriers to communication and information sharing across researchers and disciplines will be addressed. Discuss how participants and trainees will be recruited, mentored, and retained, and describe any professional development activities. This effort at broadening participation in science is a high priority of the NSF. Identify the roles of any external partners or international collaborators in these activities if appropriate. Proposals must describe the means of assessment of the effectiveness of these activities.
6. **Cyberinfrastructure**: Sustained commitment to vibrant and evolving cyberinfrastructure will be key to the Center's mission to become an exemplar of open science that not only addresses significant scientific challenges at the Center, but also leads the research community toward a broader culture of open practices and collaboration. Describe conceptual plans for meeting the software, data, and computing cyberinfrastructure needs of the Center and its users, teams, communities, and institutions, including external stakeholders, to enhance data to knowledge processes and accelerated discovery and innovation in a collaborative setting. NSF expects that proposals will detail creative and innovative cyberinfrastructure approaches to address the following research and other needs of the Center: 1) active, in-house and virtual, simultaneous use by investigators at multiple nodes of very large, distributed and diverse data sets including high frequency sensor data, remote sensing data, spatial data, and observational data; 2) integration and assimilation of multiple and disparate data sets from heterogeneous sources; 3) establishment of FAIR (Findable, Accessible, Interoperable, and Reusable) practices for all data and metadata generated and used; 4) development of generalizable CI solutions and community-driven standards for data, metadata, and sustainable software to support collaborative science; 5) development of sound informatics principles that support collaborative scientific workflows and data processing pipelines to facilitate efficiency, transparency, and reproducibility; 6) a strategy for data attribution, curation, storage, sharing, and authentication; 7) the ability to evolve over time by incorporating technological advances, accessing and analyzing new kinds of data that may develop, adapting to the changes in the application requirements, communicating emerging CI research needs and requirements to the community, and seeking novel CI advances to support the research programs of the Center; and 8) hiring, training, and professional development of CI professionals to achieve these goals. Include descriptions of hardware, middleware, software, data sets, and other research resources that will be leveraged or developed during the project. Describe in detail the mechanisms for supporting Cyberinfrastructure design, development, and implementation for generation, access, integration, analysis, and visualization of higher-level data sets from multiple sources of input, including open environmental data.

7. **Intellectual Contribution and Credit**: Provide a clear plan for the management of the rights of and credit to project participants related to research products, including but not restricted to: data, tools, methods, code, models, manuscript authorship, and other intellectual contributions. This section should complement, rather than overlap with, the Data Management Plan and explain how the project participants will collaboratively ensure a fair and equitable assignment of credit to all project participants based on agreed-upon criteria of contribution. Because different sub-disciplines and disciplines can have vastly different expectations related to credit, the proposers need to document how they will address these important policies, related to all project participants, especially early-career researchers.
8. **Institutional Capabilities**: Provide a description of how the current capabilities and resources of the host institution(s) will facilitate the proposed activities. Include information on organizational leadership, technical expertise, general support, space, technologies and other infrastructure that will support the center's activities. Describe how the Center's location will influence its success, including any unique characteristics of the institution or its location (ease of travel, accommodations, etc.).
9. **Strategic Plan:** Describe a roadmap for developing and implementing a strategic plan within the first six months of the Center's operation, metrics and milestones to assess the center's performance, and progress toward its central mission(s).
10. **External Advisory Committee**: Describe plans for an External Advisory Committee, including the number of members, their range of expertise, the range of expertise needed for an efficient and effective committee, and how they will be chosen. Do not list names of any potential members for this advisory committee. A description of how the Center will engage with and leverage the expertise of the External Advisory Committee should also be included.
11. **Results of Prior Support** for the PI and all senior personnel.

**SUPPLEMENTARY DOCUMENTS**:

**Data Management Plan**. The Data Management Plan should include the details for making both data and tools accessible to incubator groups and external users in a timely manner. Plans for long term data storage and archival should be presented. All data, software, and other research resources are expected to be made publicly available. Include descriptions of specific data sets, licensing, timelines, and code repositories to be used. See: https://www.nsf.gov/bio/pubs/BIODMP_Guidance.pdf for further guidance.

**SINGLE COPY DOCUMENTS**:

**SUGGESTED REVIEWERS**. PIs are encouraged to provide a list of suggested reviewers, including the individuals' names, institutions, and areas of expertise, email addresses, and URLs if available. PAPPG Exhibit II-2 contains information on conflicts of interest that may be useful in preparation of this list.

## B. Budgetary Information

**Cost Sharing**:

Inclusion of voluntary committed cost sharing is prohibited.

## C. Due Dates

- **Letter of Intent Due Date(s)** ***(required)*** (due by 5 p.m. submitter's local time):

  April 01, 2021

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

  April 29, 2021

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

  September 15, 2021

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

**For Proposals Submitted Via FastLane or Research.gov**:

To prepare and submit a proposal via FastLane, see detailed technical instructions available at: https://www.fastlane.nsf.gov/a1/newstan.htm. To prepare and submit a proposal via Research.gov, see detailed technical instructions available at: https://www.research.gov/research-portal/appmanager/base/desktop?_nfpb=true&_pageLabel=research_node_display&_nodePath=/researchGov/Service/Desktop/ProposalPreparationandSubmission.html. For FastLane or Research.gov user support, call the FastLane and Research.gov Help Desk at 1-800-673-6188 or e-mail fastlane@nsf.gov or rgov@nsf.gov. The FastLane and Research.gov Help Desk answers general technical questions related to the use of the FastLane and Research.gov systems. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this funding opportunity.

**For Proposals Submitted Via Grants.gov**:

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

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

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

## VI. NSF PROPOSAL PROCESSING AND REVIEW PROCEDURES

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

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

Proposers should also be aware of core strategies that are essential to the fulfillment of NSF's mission, as articulated in *Building the Future: Investing in Discovery and Innovation - NSF Strategic Plan for Fiscal Years (FY) 2018 – 2022*. These strategies are integrated in the program planning and implementation process, of which proposal review is one part. NSF's mission is particularly well-implemented through the integration of research and education and broadening participation in NSF programs, projects, and activities.

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

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

### A. Merit Review Principles and Criteria

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

**1. Merit Review Principles**

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

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

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

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

**2. Merit Review Criteria**

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

The two merit review criteria are listed below. **Both** criteria are to be given **full consideration** during the review and decision-making processes; each criterion is necessary but neither, by itself, is sufficient. Therefore, proposers must fully address both criteria. (PAPPG Chapter II.C.2.d(i). contains additional information

for use by proposers in development of the Project Description section of the proposal). Reviewers are strongly encouraged to review the criteria, including PAPPG Chapter II.C.2.d(i), prior to the review of a proposal.

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

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

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

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

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

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

**Additional Solicitation Specific Review Criteria**

The following additional review criteria apply to full proposals:

1. Does the proposal describe innovative advancement and synthesis activities likely to catalyze novel and potentially transformative scientific questions, data-intensive activities and approaches, and knowledge?
2. Does the proposed organizational structure of the Center describe compelling mechanisms for identifying and selecting activities, allocating funds and resources, attributing credit for intellectual contributions, managing participating groups, ensuring an inclusive approach to these activities, and achieving the outcomes described in the proposal?
3. Will the overarching plan and vision of the Center sufficiently engage a diverse scientific community, including a variety of research platforms, observatories, research centers, and networks; promote the development of collaborative partnerships and teams; and integrate across the required disciplines to take full advantage of the potential of collaborative synthesis of open biological and other environmental data?
4. Will the Center engage in activities that help democratize the accessibility and usability of large-scale open biological and other environmental data by professional scientists, educators, students, citizen scientists, and policy analysts through open-science workflows, practices, and a clear plan for data and tool sharing broadly?
5. Will the cyberinfrastructure plan serve the Center's needs for tool design, development and dissemination, and data accession, management, analysis, synthesis and sharing? Will it result in the development of innovative cyberinfrastructure components? Is it likely to accelerate adoption of open science approaches through a broader community?
6. Are the capabilities of the PI and leadership team sufficient to lead such an effort, and are the resources of the host institution(s) sufficient to support the Center?
7. Is the plan for assessment of activities sound, and is there evidence that assessment will be conducted throughout the project to inform the Center operations?

In accordance with the NSF Proposal & Award Policies & Procedures Guide, all proposals submitted in response to this solicitation must explicitly address the Broader Impacts criterion. Although proposed Broader Impacts activities in any of the identified categories are acceptable, investigators are especially encouraged to undertake activities that effectively address goals and challenges associated with one or more of the following key areas:

- recruitment, education, and training of the future scientific, engineering, technical, and policy workforce and leadership needed to pursue basic research through team science approaches using open and freely available environmental data, observations, and specimens;
- improved public awareness and understanding of the interconnections between the biosphere, environmental change, and sustainability and their impacts, and technical strategies for adaptation and mitigation;
- opportunities to engage a diverse community of researchers, learners and educators in the use of open biological and other environmental data and team science approaches.

## 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 Site Visit Review.

A three-stage review process will be used for proposals submitted to this program. First, all proposers must submit a letter of intent for NSF planning purposes, followed by a preliminary proposal. Following external review of preliminary proposals, selected proposers will be invited to proceed to the next stage of review with submission of a full proposal. Those not invited will be ineligible to submit a full proposal. Full proposals submitted without a corresponding preliminary proposal will not be accepted. Eligible full proposals will be evaluated by panel review. Ad hoc reviews may also be sought but are not required. The outcomes of this evaluation will then be used to select no more than 2-3 proposals for the third stage of review consisting of a site visit by a panel of outside experts.

Reviewers will be asked to evaluate proposals using two National Science Board approved merit review criteria and, if applicable, additional program specific

criteria. A summary rating and accompanying narrative will generally be completed and submitted by each reviewer and/or panel. The Program Officer assigned to manage the proposal's review will consider the advice of reviewers and will formulate a recommendation.

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

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

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

# VII. AWARD ADMINISTRATION INFORMATION

## A. Notification of the Award

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

## B. Award Conditions

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

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

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

## C. Reporting Requirements

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

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

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

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

## VIII. AGENCY CONTACTS

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

General inquiries regarding this program should be made to:

- Matthew D. Kane, Program Director, BIO/DEB, telephone: (703) 292-7186, email: mkane@nsf.gov
- Reed S. Beaman, Program Director, BIO/DBI, telephone: (703) 292-7163, email: rsbeaman@nsf.gov
- Tevfik Kosar, Program Director, CISE/OAC, telephone: (703) 292-8970, email: tkosar@nsf.gov

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

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

For questions relating to Grants.gov contact:

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

## IX. OTHER INFORMATION

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

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

## ABOUT THE NATIONAL SCIENCE FOUNDATION

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

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

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

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

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

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

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

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

- **Location**: 2415 Eisenhower Avenue, Alexandria, VA 22314
- **For General Information** (NSF Information Center): (703) 292-5111
- **TDD (for the hearing-impaired)**: (703) 292-5090

- **To Order Publications or Forms**:

  Send an e-mail to: nsfpubs@nsf.gov

  or telephone: (703) 292-8134

- **To Locate NSF Employees**: (703) 292-5111

## PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

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

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

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