# NSF 23-564: Synthesis Center for Understanding Organismal Resilience

## Program Solicitation

### Document Information

**Document History**
- **Posted:** March 1, 2023

View the program page

**National Science Foundation**
Directorate for Biological Sciences
    Division of Biological Infrastructure
    Division of Integrative Organismal Systems

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

January 12, 2024

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

July 15, 2024

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## Important Information And Revision Notes

**Safe and Inclusive Working Environments:** The Directorate for Biological Sciences requires that proposers who include off-campus or off-site research as part of their project submit, as supplementary documentation, a Plan for Safe and Inclusive Working Environments. For this solicitation, this document replaces the required plan associated with the certification in Chapter II.E.9 of the Proposal and Award Policies and Procedures Guide (PAPPG, NSF 23-1). Instructions for inclusion of the Plan for Safe and Inclusive Working Environments can be found in the additional proposal preparation instructions in this solicitation.

Any proposal submitted in response to this solicitation should be submitted in accordance with the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG) that is in effect for the relevant due date to which the proposal is being submitted. The NSF PAPPG is regularly revised and it is the responsibility of the proposer to ensure that the proposal meets the requirements specified in this solicitation and the applicable version of the PAPPG. Submitting a proposal prior to a specified deadline does not negate this requirement.

## Summary Of Program Requirements

**General Information**

**Program Title:**

    Synthesis Center for Understanding Organismal Resilience

**Synopsis of Program:**

    Synthesis Centers are a mechanism used by NSF's Directorate for Biological Science (BIO) to bring together communities that leverage existing data to catalyze discoveries through synthesis, analysis, and integrative training. Research supported by the Division of Integrative Organismal Systems (IOS) in BIO focuses on organisms as integrated units of biological organization, i.e., why they are structured as they are and function as they do.

    IOS seeks to establish a new Synthesis Center to advance our ability to explain and predict organismal resiliency and plasticity in response to complex and dynamic environmental circumstances encountered over a lifespan through the synthesis of varied data sets and types that bridge multiple scales and levels.

    The Synthesis Center will enable innovative synthesis and analysis of available biological and related data by providing the vision, infrastructure, and expertise to advance new avenues of inquiry in organismal

biology focused on organismal resilience and plasticity. To accomplish this vision, the Synthesis Center will adopt approaches that are based on open science, team science, and data-intensive methods that enable data synthesis, sharing and inclusive collaborations among researchers across multiple levels of biological inquiry that may include genomic, physiological, structural, developmental, behavioral, neural, immunological, and microbiological analyses across some or all the IOS subdisciplines. In addition to supporting data and knowledge synthesis, the Synthesis Center should train new generations of researchers in solving challenging research problems through data-intensive, open, cross-disciplinary, and collaborative science. The Synthesis Center is also expected to serve as an example in effectively engaging diverse scientists from different types of institutions and across multiple disciplines. These types of data syntheses are expected to provide the basis for fundamental scientific discoveries and/or potentially translational, use-inspired research. In doing so, the Synthesis Center will have a profound impact on the progress of science and society.

**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.*

- Steven E. Ellis, telephone: (703) 292-7876, email: IOS-SynCenter@nsf.gov

- Anna K. Allen, telephone: (703) 292-8011, email: IOS-SynCenter@nsf.gov

- Jodie M. Jawor, telephone: (703) 292-7887, email: IOS-SynCenter@nsf.gov

- Paul Forlano, telephone: (703) 292-4611, email: IOS-SynCenter@nsf.gov

- Pankaj Jaiswal, telephone: (703) 292-4594, email: IOS-SynCenter@nsf.gov

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

- 47.074 --- Biological Sciences

**Award Information**

**Anticipated Type of Award:** Cooperative Agreement

**Estimated Number of Awards:** 1

Only one Synthesis Center award will result from this activity.

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

Estimated program budget, number of awards and average award size/duration are subject to the availability of funds and the quality or responsiveness of proposals received in response to this solicitation.

**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 laboratories, professional societies and similar organizations located in the U.S. that are directly 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:** 1

An individual may be designated as PI or co-PI on at most one preliminary proposal and at most one full proposal to this solicitation. In the event that an individual exceeds this limit, proposals will be accepted based on earliest date and time of submission, i.e., the first compliant preliminary or full proposal will be accepted, and the remainder will be returned without review.

**Proposal Preparation and Submission Instructions**

**A. Proposal Preparation Instructions**

- **Letters of Intent:** Not required

- **Preliminary Proposals:** Submission of Preliminary Proposals is required. Please see the full text of this solicitation for further information.

- **Full Proposals:**

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

**B. Budgetary Information**

- **Cost Sharing Requirements:**

  Inclusion of voluntary committed cost sharing is prohibited.

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

  Not Applicable

- **Other Budgetary Limitations:**

  Not Applicable

**C. Due Dates**

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

  January 12, 2024

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

July 15, 2024

**Proposal Review Information Criteria**

**Merit Review Criteria:**

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

**Award Administration Information**

**Award Conditions:**

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

**Reporting Requirements:**

Standard NSF reporting requirements apply.

## I. Introduction

The Synthesis Center is envisioned as a catalytic force that generates novel insights into organismal resilience and plasticity, function, performance, or fitness by focusing on synthesis of data across individual organismal systems to:

- build a deeper, integrative understanding of how organisms maintain and/or recover function and performance when challenged by changing conditions (i.e. resilience)
- identify the mechanistic connections across scales within organisms that translate genotypes to organismal phenotypes; and
- provide translational insights and identify practical solutions to grand challenges in organismal biology and society.

As defined recently by Hacket et al., (2021)[1], "*Synthesis centers are a form of scientific organization that catalyzes and supports research that integrates diverse theories, methods and data across spatial or temporal scales to increase the generality, parsimony, applicability, or empirical soundness of scientific explanations.*"

To be successful, the Synthesis Center's activities must cross boundaries and draw together data, theory, tools, and ideas from multiple sub-disciplines of biology. Thus, the Synthesis Center must employ team science approaches that build effective and inclusive collaborations among researchers across biological, chemical, computational, mathematical, and physical sciences, and base all activities on the principles of open science. The Synthesis Center should provide or support access to state-of-the-art infrastructure, expertise, and resources needed to harmonize, curate, document, analyze, and integrate disparate data for synthesis. The Synthesis Center should promote data science approaches that integrate scientific knowledge and data to derive mechanistic insights into how organisms have evolved the resiliency and plasticity in response to complex and ever-changing environments. The Synthesis Center is also expected to establish a climate of inclusion and equity, and to harness the power of diverse perspectives by engaging scientists from the full demographic, geographic, and institutional spectrum of the Nation.

In recent decades, biological sciences have experienced an unprecedented growth in data. New experimental technologies, advances in nucleic acid sequencing, analytic and computational tools, production of large-scale sequence data, complex '-omics' datasets, and high-throughput phenotyping data are being generated at a rapid pace. Adding to the complexity is that these new data come from single cells to communities, and extend beyond studies in traditional model organisms in controlled environments to non-model plants, animals, fungi and microbes in natural systems. Data are collected from organisms that are facing internal (e.g., hormonal, physiological, immunological, etc.) or external changes or challenges (e.g., temperature, diminishing resources, social structure and interactions, etc.), or over a wide range of timescales and taxa. While great strides are being made toward understanding components of an organism, a grand challenge is synthesizing the varied data generated by the scientific community to understand the organism as a

whole. In spite of technological advances, there are still barriers to making full use of available datasets. The barriers include but are not limited to:

- heterogeneity and fragmentation arising from biological complexity and differences in experimental systems, approaches, technologies and standards, and language or terminology;
- the large number of divergent data types that are not interoperable or reusable, e.g., due to sub-disciplinary silos or incomplete metadata;
- the invention of new experimental and analytical tools that are not directly comparable with historical data;
- disparity in access to distributed data; and
- insufficient connections between experimentalists, theoreticians and computational scientists.

Even with these barriers the high dimensionality and volume of data, the increase in openly accessible data, along with the development of powerful analytical and computational tools, have greatly expanded the breadth and depth to which we can explore organismal resilience and plasticity in the face of varying internal and external stimuli. As a result, extraordinary opportunities are available to build strong, reciprocally informed links among scientific conceptual frameworks, the growing body of data, and existing knowledge to expand our ability to explain and predict complex organismal phenomena. Thus, the Synthesis Center is expected to use innovative synthesis and integration of available data and related information to create new knowledge and understanding of organismal resilience and plasticity.

Broader Impacts, training, and broadening participation activities are critical elements of all NSF awards. To address the Broader Impacts review criterion, proposals can contain the development of innovative educational, broadening participation, and outreach activities or substantive participation in existing institutional infrastructure for education, training and outreach with appropriate budget requested to support those activities. Successful proposals often demonstrate close integration of the scientific and educational goals. The Synthesis Center must therefore provide integrative and multi-disciplinary training through experiences that improve the data-intensive analytical and modeling skills of scientists and nurture their creativity in solving problems together in dynamic, collaborative, interdisciplinary teams. The students, scholars, and educators affiliated with this Synthesis Center must also reflect the diversity of peoples and cultures that is critical to the strength and success of the scientific enterprise.

The Directorate for Biological Sciences is committed to the inclusion of all people and institutions in the research enterprise because all are vital to the nation's health, security, and global leadership in STEM. The nation's changing demographics make this commitment all the more timely. Therefore, to be competitive, proposers must be intentional regarding broadening participation through efforts to promote diversity, equity, and inclusion of individuals and institutions traditionally underrepresented in STEM. NSF is also interested in ensuring the inclusion of individuals from diverse social categories and/or identities including but not limited to: race, ethnicity, gender, sexual orientation, socio-economic status, disability status, veteran status, or geography—recognizing that underrepresentation can vary by career stage and discipline and that there are additional considerations of intersectionality. Proposals submitted to this solicitation are strongly encouraged to involve PI, co-PI(s), postdoctoral fellows, students, and other personnel who are members of these groups. NSF also recognizes that STEM research and education occurs at a wide range of institutions, including Minority-serving Institutions (MSIs), Primarily Undergraduate Institutions (PUIs), and two-year colleges, as well as major research institutions. Proposals from EPSCoR jurisdictions are especially encouraged.

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[1] Edward J. Hackett, Erin Leahey, John N. Parker, Ismael Rafols, Stephanie E. Hampton, Ugo Corte, Diego Chavarro, John M. Drake, Bart Penders, Laura Sheble, Niki Vermeulen, Todd J. Vision. Do synthesis centers synthesize? A semantic analysis of topical diversity in research. Research Policy, Volume 50, Issue 1, 2021, 104069; https://doi.org/10.1016/j.respol.2020.104069 ⎋

## II. Program Description

Synthesis Centers are an established mechanism used by NSF's Directorate for Biological Sciences (BIO) to catalyze new discoveries and understanding by leveraging existing data. BIO has previously supported several synthesis centers, e.g.,

the National Center for Ecological Analysis and Synthesis (https://www.nceas.ucsb.edu/ ⧉), the National Evolutionary Synthesis Center (http://www.nescent.org ⧉), the National Institute for Mathematical and Biological Synthesis ( http://www.nimbios.org/ ⧉), and the National Socio-Environmental Synthesis Center (http://www.sesync.org ⧉). **It is important to note that Synthesis Centers do not directly support generation of new data, nor do they fund an individual research group, but rather are dedicated to facilitating synthesis of available data by multidisciplinary research teams to address compelling scientific questions**. Proposals to generate new data or simply establish or update data repositories are not appropriate for this solicitation, nor are projects that are primarily concerned with human health.

The new IOS Synthesis Center will serve as a nexus for connections that elevate the utility of biological data from different modalities and varied spatial, temporal and/or hierarchical scales in service to the topic of resilience and plasticity. The Synthesis Center must enable use of the data beyond the common and relatively narrow studies of single-dimensional aspects of an organism (e.g., a single organ system or tissue) or individual investigator-scale projects. To do so, the Synthesis Center will help develop collaborative teams with complementary expertise and perspectives from different disciplines and will support development of theoretical foundations and technological platforms for data synthesis. The resulting collaborative environment must allow scientists to take on challenges such as: how to leverage experimental and theoretical knowledge to integrate data, theories, and models; how to transcend differences in data types and find common, interpretable information; how to overcome barriers to data sharing, reuse, and synthesis, including divergent experimental protocols, incomplete metadata, disparate standards, and scientific culture; how to take advantage of existing resources and create new ones that are broadly applicable; how to engage and educate the wider community to use new ideas and methods for data analysis and synthesis; and how to encourage a culture of common standards and practices that imbue new data with higher utility and meaning.

The Synthesis Center will have an equally important role in recruiting, training, and nurturing diverse new talent to build capacity in the organismal sciences for a data-intensive future. An essential feature will be the Synthesis Center's commitment to expanding access to, as well as sharing and reuse of, available data that enables creative application by many stakeholders, including students, scientists, educators, and policymakers. Ideally, the Synthesis Center would also serve as an incubator for evidence-based modes of inclusive training and practice in data science that better equip the next generation of scientists to address future challenges.

The Synthesis Center should have an overarching vision and plans to address complex questions in integrative organismal biology by using contemporary approaches that are data-intensive, team-based, and promote open science. This vision should serve as the common ground for all its activities, including scientific inquiry, infrastructure design and development, education, training, and broadening participation. The Synthesis Center should also build in mechanisms to adapt its founding vision as its capabilities and the community evolve over time. NSF encourages innovative models for the Synthesis Center's structure and function and expects it to harness the full potential of diverse scientific communities and different types of institutions beyond the host institution. Substantive, well-developed strategic and management plans are necessary to predict success, as described below and should be accompanied by clear metrics and milestones to evaluate the Synthesis Center's performance.

Specific objectives of the Synthesis Center must:

- Promote synthesis research across individual organismal systems, biological subdisciplines, and targets of inquiry to build a deeper understanding of organismal resilience and plasticity in response to factors that directly or indirectly affect organismal performance and/or fitness.
- Develop or provide the necessary resources to enable data management and integration; advance open science strategies that increase data access, sharing, and reuse.
- Enhance access to existing infrastructure, e.g., computing power; foster collaboration and team science; and promote standards and best practices in the community for synthesis research.
- Build an effective and evidence-based training enterprise for the next generation of scientists.
- Integrate efforts to broaden participation across demographic, geographic, institutional, and disciplinary lines in all activities.

Additional, well-justified activities may be included.

**Staffing of the Synthesis Center:**

A full-time Director will be critical to the scientific leadership and management of a successful Synthesis Center. The Director will be responsible for management and staffing; appropriate Synthesis Center oversight, which includes ensuring an inclusive and equitable environment that is welcoming to diverse scientists; effective communication with the broad research community and other appropriate organizations; and management of the funds provided. The Principal Investigator of a proposal is expected to be the Synthesis Center's full-time Director. In addition, the Synthesis Center must be staffed by the personnel necessary to support its activities and achieve its objectives. Responses to this solicitation should include a description of key personnel roles and responsibilities, the leadership model and structure (team-based leadership approaches are welcome), and a staffing plan. For example, staffing might include project and product managers, data scientists, software developers and programmers, postdoctoral scholars and other scientists, team science experts, educational staff, and administrative coordinators.

**Structure of the Synthesis Center:**

Broad and creative thinking about the form, structure, and activities of the new Synthesis Center is strongly encouraged. The Synthesis Center should adopt any organizational structure that is well-justified and helps achieve its vision. The structure should also maximize the potential of remote and virtual engagement in all activities. The Synthesis Center structure is expected to ensure an inclusive environment and foster broad participation by the science community. The Synthesis Center may be single- or multi- institutional; however, proposals for multi-institutional Synthesis Centers must have one leading institution with collaborating institutions included as sub-awardees or sub-contracts. The strengths and advantages of the chosen structure should be articulated clearly and concisely to justify support at the level of a modern synthesis center.

**Webinars:**

NSF will hold three informational webinars between March 2023 and November 2023. The date and registration information for the webinars will be posted on the Synthesis Center for Understanding Organismal Resilience Program Web page.

**Program Competition Timeline:**

NSF provides the timeline below for planning purposes. While NSF will make every attempt to adhere to this timeline, circumstances beyond NSF's control may affect the specific dates/activities outlined.

- Preliminary proposals due: January 12, 2024
- Results of preliminary proposal review to proposers: March 2024
- Full proposals due: July 15, 2024
- Reverse Site Visit (RSV) notifications and scheduling: November 2024
- Declined proposers informed and recommended award announced: January 2025
- Anticipated start date of awards: February 2025

## III. Award Information

Estimated program budget, number of awards and average award size/duration are subject to the availability of funds.

The award will be a cooperative agreement with an initial term of 5 years and the potential for a single, terminal renewal for an additional 5 years. Awardees should anticipate substantial NSF involvement in Synthesis Center oversight, including regular meetings with the Center leadership, site visits and other performance reviews. 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 per year in year 3 through year 5. In the fourth year of the cooperative agreement, the Synthesis Center may submit a renewal proposal upon invitation by the NSF for up to five additional years of support. The invitation will depend on the Synthesis Center's progress in meeting

the objectives outlined in this solicitation and whether its scientific focus areas remain aligned with those supported by BIO/IOS. The renewal proposal will undergo external reviews that may also involve site visits, and the renewal award is subject to the availability of funds. The NSF will support the Synthesis Center for a maximum of ten years.

Proposals Involving Multiple Organizations: Of the two types of collaborative proposal formats described in the PAPPG, this solicitation allows only a single proposal submission with subawards administered by the lead organization (PAPPG Chapter II.E.3.a). The requirement for a single organization to submit the proposal is meant 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 laboratories, professional societies and similar organizations located in the U.S. that are directly 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:** 1

> An individual may be designated as PI or co-PI on at most one preliminary proposal and at most one full proposal to this solicitation. In the event that an individual exceeds this limit, proposals will be accepted based on earliest date and time of submission, i.e., the first compliant preliminary or full proposal will be accepted, and the remainder will be returned without review.

## V. Proposal Preparation And Submission Instructions

### A. Proposal Preparation Instructions

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

Submission of a preliminary proposal is required for eligibility to submit a full proposal. The NSF decision made on the preliminary proposal is advisory (non-binding) and may include feedback on proposed activities and the responsiveness to program and theme. Preliminary proposals must conform to the format restrictions noted in the *NSF Proposal and Award Policies and Procedures Guide* (PAPPG) and contain only the permitted sections listed below.

**Preliminary Proposal Preparation:** Select "Prepare New Preliminary Proposal" in Research.gov. Search for and select this solicitation title in Step One of the Preliminary Proposal wizard. Select "Single proposal (with or without subawards)".

Separately submitted collaborative proposals will be returned without review.

The **preliminary proposal** must include the following:

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

**COVER SHEET**: Enter **02/01/2025** for the requested start date and 60 months for proposed duration.

**PROJECT SUMMARY (1 page)**: The project summary must consist of three parts with separately labeled headers:

> **Overview**: A high level description of the proposed Synthesis Center, its vision and its components;

> **Intellectual Merit**: A succinct summary of the intellectual scope, including the scientific vision and rationale for the Synthesis Center and the mechanisms for achieving its vision; and

> **Broader Impacts**: A clear description of the broader impact objectives, the activities planned to advance education, training and broadening participation, and the methods of assessment.

**PROJECT DESCRIPTION (10-page limit)**: Results of prior support should not be included in the preliminary proposal project description. The project description should include the following sections with sub-headers:

> **Vision and Objectives**. Describe the vision and specific objectives of the Synthesis Center, including compelling scientific question(s) in integrative organismal sciences and relevant data that call for synthesis research;

> **Current Limitations and Challenges**. Include an explanation of why a center-scale effort is necessary to achieve the stated objectives;

> **Infrastructure, Resources and Scientific Practices**. Describe the plans to realize the vision and objectives outlined above;

> **Broader Impacts**. Include the objectives and plans for education, training, broadening participation, and engagement with the scientific community (note: Project Description must contain the heading "Broader Impacts" on a line without additional text.)

> **Organization and Key Personnel**. Provide an outline of the preliminary network of organizations comprising the Synthesis Center and their relation to one another, as well as key contributors to the prospective synthesis activities and their suitability for the assigned roles, including Synthesis Center management. Describe the institution's capabilities to host and manage the Synthesis Center.

> **Evaluation and Assessment**. Describe methods, metrics, and timelines for both formative and summative assessment of the Synthesis Center's activities and outcomes.

**REFERENCES CITED**: Reference information is required. See PAPPG II.D.2.e for more information.

**SENIOR PERSONNEL DOCUMENTS:**

> **BIOGRAPHICAL SKETCH(ES)**: Biosketches must be submitted for the PI, co-PI(s), and any other senior project personnel using the NSF-approved format. See PAPPG Exhibit II-3 for definitions of senior personnel categories.

> **COLLABORATORS AND OTHER AFFILIATIONS (COA) INFORMATION**: As detailed in the PAPPG Chapter II.D.2.h, 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.

**OTHER REQUIRED DOCUMENTS:**

> **SENIOR PERSONNEL LIST SPREADSHEET**: An additional spreadsheet listing the PI, co-PI(s), and other senior personnel involved in the project must be submitted. This spreadsheet is separate from the spreadsheet that lists collaborators and other affiliations (COA) information. The spreadsheet template can be found at https:\\www.nsf.gov\bio\dbi\dbipersonnellist.xlsx. Please read the instructions carefully. Using the template,

compile an Excel file that provides information for all persons identified in the proposal as: "PI or co-PI" (i.e., those listed on the Cover Sheet); "Other Senior Personnel/Subawardee"; or "Other Personnel" who have a biographical sketch included in the proposal, including all international collaborators. Only one spreadsheet should be submitted per project. The file must include the NSF proposal ID assigned after submission of your proposal (i.e., **not** the Temporary ID # or Grants.gov ID #). Once completed, the file should be submitted by email to dbitemplate@nsf.gov within one business day of the preliminary proposal submission.

**PROHIBITED DOCUMENTS**: The following standard proposal documents are not allowed for submission with the preliminary proposals in this competition. Proposals that include these documents will be returned without review:

- Budget / Budget justification
- Facilities, Equipment and Other Resources
- Other Supplementary Documents
- Postdoctoral Mentoring Plan
- Data Management Plan
- Current & Pending Support

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

- Full Proposals submitted via Research.gov: Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the *NSF Proposal and Award Policies and Procedures Guide* (PAPPG). The complete text of the PAPPG is available electronically on the NSF website at: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg. Paper copies of the PAPPG may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-8134 or by e-mail from nsfpubs@nsf.gov. The Prepare New Proposal setup will prompt you for the program solicitation number.

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

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

**Full Proposal Set-Up:** Select "Prepare New Full Proposal" in Research.gov. Search for and select this solicitation title in Step One of the Full Proposal wizard. Select "Center" as the proposal type. In the proposal details section, select "Single proposal (with or without subawards)". Separately submitted collaborative proposals will be returned without review (PAPPG Chapter II.E.3.a). The requirement for a single organization to submit the proposal is meant 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.

**TITLE**: The title of the proposal must begin with the proposed name of the Synthesis Center. Please note that if submitting via Research.gov, the system will automatically prepend the title with "Center".

**COVER SHEET:** Enter a proposed duration of 60 months and include the Preliminary Proposal Number.

**PROJECT SUMMARY (1 page)**: The project summary must consist of three parts with separately labeled headers:

**Overview**: A high level description of the proposed Synthesis Center, its vision and its components;

**Intellectual Merit**: A succinct summary of the intellectual scope, including the scientific vision and rationale for the Synthesis Center and the mechanisms for achieving its vision; and

**Broader Impacts**: A clear description of the broader impact objectives, the activities planned to advance education, training and broadening participation, and the methods of assessment.

**PROJECT DESCRIPTION** - The project description is limited to **25 pages**. In addition to the requirements specified in the PAPPG, the Project Description must contain the following labeled sections:

1. **Scientific Vision, Rationale, and Specific Objectives**: Describe a vision and rationale for the Synthesis Center that includes examples of scientific themes and compelling questions where available data can support innovative center-scale synthesis, and the anticipated impact on integrative organismal science. This section is expected to also discuss the theoretical frameworks, data-intensive approaches and infrastructure that will be developed to meet the Synthesis Center's core vision and specific objectives. Examples of data to be targeted for analysis and synthesis can be discussed in this section and elsewhere in the proposal as appropriate.

2. **Synthesis Center Design**: Describe the overall design of the Synthesis Center and its activities that includes creating the infrastructure and opportunities to engage a broad scientific community in the utilization and synthesis of open biological data to create new knowledge in integrative organismal sciences. Describe the Synthesis Center's activities in sufficient detail to allow evaluation of their merits. Describe the team science approaches to be enabled by the Synthesis Center, including the range and modes of research community engagement. Explain the recruiting criteria and participation mechanisms for any visiting and fixed-term personnel or collaborating institutions. Include information on how researchers from diverse backgrounds and institutions will be fully integrated in all the activities (e.g., Minority Serving Institutions, Primarily Undergraduate Institutions, etc.).

3. **Synthesis Center Organization, Management and Governance**: Describe the organizational and governance structure of the Synthesis Center, including the roles and responsibilities of the Director and other key personnel and the mechanisms for developing Synthesis Center policies and practices, identifying and selecting projects and participants, allocating funds and resources, and managing the participating teams. Describe the processes that will be used to prioritize Synthesis Center activities; to select and integrate projects with other Synthesis Center activities; to identify and sunset projects that reach maturity or cease to align with Synthesis Center goals; to allocate funds and equipment across activities and among partners; and to resolve conflict. Explain the Synthesis Center's objectives and planned approaches for broadening participation and diversity in Synthesis Center governance. If international activities or collaboration are envisioned, the coordination plans should be described in line with PAPPG guidance for such activities (see PAPPG I.E.6 and II.D.8). Plans for implementation, operation, and divestment or dissolution should be described and tied to deliverables and activities over the anticipated duration of the award.

4. **Broader Impacts**: Describe the education and training plans of the Synthesis Center, including the rationale for chosen approaches (e.g., mentoring structures, pedagogical and professional development activities, social organization, etc.), and mechanisms for how participants and trainees will be recruited, mentored and retained. A deliberate strategy to advertise and recruit participants should be included. Identify the trainee population(s) that will be served and describe how the Synthesis Center will succeed in including diverse populations in its activities. This section must explain how training will be integrated with the Synthesis Center's research focus and how barriers to communication and information sharing across researchers and disciplines will be overcome. Identify the roles of any external partners or international collaborators, as needed, and describe the expected societal benefits. This section must also describe the means of assessing whether the Synthesis Center's educational and other broader impacts activities accomplish the stated objectives.

5. **Cyberinfrastructure**: The Synthesis Center will neither generate large volumes of new primary data nor will it replicate or re-engineer existing data repositories and cyberinfrastructure resources. However, given the focus on data harmonization, curation, management, analysis, and integration, advanced cyberinfrastructure (CI) is key to the Synthesis Center's mission. Use of existing state-of-the-art resources and platforms, including those supported by NSF, is encouraged. Development of completely novel infrastructure concepts to meet the Synthesis Center's needs may be proposed but must be particularly well justified. NSF expects that proposals will detail the following:
   - plans for addressing the software, data, and computing needs of the Synthesis Center and its users, teams, and communities; plans to integrate or leverage existing CI and repositories to realize the Synthesis Center's vision;
   - establishment of FAIR (Findable, Accessible, Interoperable, and Reusable) practices for all data and metadata that will be generated and analyzed throughout the life cycle of projects;
   - development of collaborative scientific workflows and data processing pipelines to facilitate efficiency, transparency, and reproducibility; strategies for data attribution, curation, storage, sharing, and authentication;
   - realistic plans for maintenance of infrastructure and information content beyond the time frame of the proposed work.

6. **Intellectual Contribution and Credit**: Provide a clear plan for management of the rights and credits of participants related to the research products, including but not restricted to data, tools, methods, code, models, manuscript authorship, and other intellectual contributions. This section should complement rather than duplicate the Data Management Plan and must explain how teams will collaboratively ensure fair and equitable assignment of credit to all participants based on agreed-upon criteria of contribution. The plans must address varying expectations among different disciplines and sub-disciplines about credit for all participants, especially early-career researchers and non-traditional authors such as staff members, including programmers, data managers, team facilitators.

7. **Institutional Capabilities**: Describe how the current capabilities and resources of the host institution(s) will facilitate the Synthesis Center's vision. Include information on organizational leadership, technical expertise, general support, space, technologies and other infrastructure that will support its activities.

8. **Strategic Plan and Assessment Strategy**: Describe a roadmap for developing and implementing a strategic plan within the first six months of the Synthesis Center's operation. In addition, describe the strategy for assessing the Synthesis Center throughout its lifetime, including methods, metrics, milestones, and timelines for both formative and summative evaluation of the Synthesis Center. This should include assessment of the Center's performance and progress toward its core vision and objectives for information synthesis, diverse and inclusive community engagement and capacity building to advance integrative organismal sciences. Proposers are strongly encouraged to allocate financial resources for this purpose.

9. **External Advisory Committee**: Describe plans for an External Advisory Committee, including the range of expertise and responsibilities necessary for its efficient and effective function, the size of the committee, and a plan for choosing a diverse set of committee members. Do not list names of any potential members. Include a description of how the Synthesis Center will engage with and utilize the expertise of the External Advisory Committee.

10. **Results of Prior Support**: This section should follow PAPPG guidance (II.D.2.d.iii) to report on the results of prior support for the PI and co-PI(s).

**SUPPLEMENTARY DOCUMENTS:**

**Senior Personnel List Spreadsheet**: An additional spreadsheet listing the PI, co-PI(s) and other senior personnel involved in the project must be submitted. This spreadsheet is separate from the spreadsheet that lists collaborators and other affiliations (COA) information. The spreadsheet template can be found at https:\\www.nsf.gov\bio\dbi\dbipersonnellist.xlsx. Please read the instructions carefully. Using the template, compile an Excel file that provides information for all persons identified in the proposal as: "PI or co-PI" (i.e., those listed on the Cover Sheet); "Other Senior Personnel/Subawardee"; or "Other Personnel" who have a biographical sketch included in the proposal, including all international collaborators. Only one spreadsheet should be submitted per project. The file must include the NSF proposal ID assigned after submission of your proposal (i.e., not the Temporary ID # or Grants.gov ID #). Once completed, the file should be submitted by email to dbitemplate@nsf.gov within one business day of the full proposal submission.

**Letters of Collaboration:** Non-NSF sponsored FFRDCs are required to provide a letter of collaboration from their agency as a Supplementary Document by following guidance in the NSF PAPPG for instructions.

**Safe and Inclusive Work Environments Plan:** All proposals submitted to this solicitation that include research that will be conducted off-campus or off-site must submit a plan for safe and inclusive working environments as a supplemental document that will be considered under the broader impacts review criterion. This supplemental document is in lieu of the required plan associated with the certification called for in Chapter II.E.9 of the PAPPG, NSF 23-1. More information regarding review of the plan is provided under Solicitation Specific Review Criteria.

It is NSF policy to foster safe and harassment-free environments wherever science is conducted. Work conducted off-campus or off-site should be an enriching experience for everyone and help draw researchers to biological sciences research. By requiring advanced planning and attention to maintaining an inclusive environment, NSF is working to ensure that off-campus or off-site research is safe and inclusive for all participants.

Off-campus or off-site research is defined as data/information/samples being collected off-campus or off-site, such as fieldwork and research activities on vessels and aircraft. The plan must be no longer than two pages.

The plan for safe and inclusive working environments must include:

- a brief description of the field setting and unique challenges for the team;
- the steps the proposing organization will take to nurture an inclusive off-campus or off-site working environment, including processes to establish shared team definitions of roles, responsibilities, and culture, e.g., codes of conduct, trainings, mentor/mentee mechanisms and field support that might include regular check-ins, and/or developmental events;
- communication processes within the off-site team and to the organization(s) that minimize singular points within the communication pathway (e.g., there should not be a single person overseeing access to a single satellite phone); and
- the organizational mechanisms that will be used for reporting, responding to, and resolving issues of harassment if they arise.

**SINGLE COPY DOCUMENTS:**

**Updates from Preliminary Proposal** (1 page maximum): Identify the required preliminary proposal submission for this full proposal and summarize updates in three additional sections as follows:

**Preliminary proposal #**: NSF-assigned preliminary proposal ID;

**Changes to PI/Co-PIs**: list additions, deletions, or changes in role;

**Changes to funded collaborative organizations**: list additions or deletions of subawardee or otherwise-funded (i.e., contract) organizations;

**Summary of significant changes of research scop**e: no more than 250 words, bulleted.

**OPTIONAL 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, as a Single Copy Document. PAPPG Exhibit II-2 contains information on conflicts of interest that may be useful in preparing this list.

**B. Budgetary Information**

**Cost Sharing:**

Inclusion of voluntary committed cost sharing is prohibited.

**C. Due Dates**

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

    January 12, 2024

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

    July 15, 2024

**D. Research.gov/Grants.gov Requirements**

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

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

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

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

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

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

# VI. NSF Proposal Processing And Review Procedures

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

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

Proposers should also be aware of core strategies that are essential to the fulfillment of NSF's mission, as articulated in *Leading the World in Discovery and Innovation, STEM Talent Development and the Delivery of Benefits from Research - NSF Strategic Plan for Fiscal Years (FY) 2022 - 2026*. These strategies are integrated in the program planning and implementation process, of which proposal review is one part. NSF's mission is particularly well-implemented through the integration of research and education and broadening participation in NSF programs, projects, and activities.

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

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

**A. Merit Review Principles and Criteria**

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

**1. Merit Review Principles**

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

- All NSF projects should be of the highest quality and have the potential to advance, if not transform, the frontiers of knowledge.

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

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

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

**2. Merit Review Criteria**

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

The two merit review criteria are listed below. **Both** criteria are to be given **full consideration** during the review and decision-making processes; each criterion is necessary but neither, by itself, is sufficient. Therefore, proposers must fully address both criteria. (PAPPG Chapter II.D.2.d(i). contains additional information for use by proposers in development of the Project Description section of the proposal). Reviewers are strongly encouraged to review the criteria, including PAPPG Chapter II.D.2.d(i), prior to the review of a proposal.

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

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

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

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

5. Are there adequate resources available to the PI (either at the home organization or through collaborations) to carry out the proposed activities?

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

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

**Additional Solicitation Specific Review Criteria**

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

1. Does the proposal describe synthesis activities that are rooted in compelling questions and relevant data, and aim to open original avenues of inquiry, catalyze novel scientific insights, and create new knowledge to advance integrative organismal biology?
2. Does the Synthesis Center design and organization include effective mechanisms for identifying and selecting projects and participants, allocating funds and resources, managing participating teams, attributing credit for intellectual contributions, ensuring an inclusive approach in all activities, and otherwise achieving the envisioned objectives?
3. Will the Synthesis Center sufficiently engage a diverse scientific community, promote collaborative partnerships and teams, facilitate data-intensive training, and integrate across disciplines to take full advantage of synthesis research?
4. Will the Synthesis Center help democratize accessibility and utility of biological data through open-science workflows and practices?
5. Will the cyberinfrastructure plan serve the Synthesis Center's needs for theory-driven computing applications; design, development and dissemination of analytical modalities; and data accession, management, analysis, synthesis and sharing?
6. Are the capabilities of the PI and leadership team sufficient to lead a successful Synthesis Center, and are the resources of the host institution(s) sufficient to support the Synthesis Center?
7. Is the plan for assessment of activities sound, and is there evidence that assessment will be conducted throughout the project to inform Synthesis Center operations in a timely manner?

Reviewers will be instructed to evaluate the **Plan for Safe and Inclusive Work Environments** within the Broader Impacts review criterion, specifically:

- Is there a compelling plan (including the procedures, trainings, and communication processes) to establish, nurture, and maintain inclusive off-campus or off-site working environment(s)?
- Does the proposed plan identify and adequately address the unique challenges for the team and the specific off-campus or off-site setting(s)?
- Are the organizational mechanisms to be used for reporting, responding to, and resolving issues of harassment, should they occur, clearly outlined?

**B. Review and Selection Process**

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

A three-stage review process will be used for proposals submitted to this program.

**Preliminary Proposal stage**: Preliminary proposals will be reviewed by NSF and an advisory determination will be sent to the PI and the organization's SPO (Encourage/Discourage). Feedback may be sent by email to the PI for both Encouraged and Discouraged proposals.

**Full Proposal Review Process**: Full proposals will be reviewed by a Review Panel augmented as necessary with ad hoc reviews.

**Site Visit / Reverse Site Visit**: Some proposals will be selected for a site visit or reverse site visit prior to final selection of the awarded Center.

Reviewers will be asked to evaluate proposals using two National Science Board approved merit review criteria and, if applicable, additional program specific criteria. A summary rating and accompanying narrative will generally be completed and submitted by each reviewer and/or panel. The Program Officer assigned to manage the proposal's review will consider the advice of reviewers and will formulate a recommendation.

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

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

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

## VII. Award Administration Information

### A. Notification of the Award

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

### B. Award Conditions

An NSF award consists of: (1) the award notice, which includes any special provisions applicable to the award and any numbered amendments thereto; (2) the budget, which indicates the amounts, by categories of expense, on which NSF has based its support (or otherwise communicates any specific approvals or disapprovals of proposed expenditures); (3)

the proposal referenced in the award notice; (4) the applicable award conditions, such as Grant General Conditions (GC-1)*; or Research Terms and Conditions* and (5) any announcement or other NSF issuance that may be incorporated by reference in the award notice. Cooperative agreements also are administered in accordance with NSF Cooperative Agreement Financial and Administrative Terms and Conditions (CA-FATC) and the applicable Programmatic Terms and Conditions. NSF awards are electronically signed by an NSF Grants and Agreements Officer and transmitted electronically to the organization via e-mail.

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

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

**Administrative and National Policy Requirements**

**Build America, Buy America**

As expressed in Executive Order 14005, Ensuring the Future is Made in All of America by All of America's Workers (86 FR 7475), it is the policy of the executive branch to use terms and conditions of Federal financial assistance awards to maximize, consistent with law, the use of goods, products, and materials produced in, and services offered in, the United States.

Consistent with the requirements of the Build America, Buy America Act (Pub. L. 117-58, Division G, Title IX, Subtitle A, November 15, 2021), no funding made available through this funding opportunity may be obligated for an award unless all iron, steel, manufactured products, and construction materials used in the project are produced in the United States. For additional information, visit NSF's Build America, Buy America webpage.

**Special Award Conditions:**

The Center award will be made in the form of a cooperative agreement. The cooperative agreement will have an extensive section of Special Conditions relating to the period of performance, statement of work, awardee responsibilities, NSF responsibilities, joint NSF-awardee responsibilities, funding and funding schedule, reporting requirements, key personnel, and other conditions. NSF has responsibility for providing general oversight and monitoring of Centers to help assure effective performance and administration, and other activities necessary to further the objectives of the program. Within the first 90 days of the Award, a retreat of the Institute's key personnel to address strategic planning of the Institute will be required.

Support for each year of the cooperative agreement of the awarded Center will be contingent upon a satisfactory annual review of the Center's progress and future plans, with an emphasis on the quality and impact of the synthesis activities, education, and broadening participation. All funding is subject to availability. NSF may conduct site visits and/or reverse site visits as part of annual review of Center performance. These visits will be led by lead agency staff and may include a panel of external evaluators. The frequency or schedule of site visits and/or reverse site visits will be further specified in the award-specific terms and conditions of the cooperative agreement.

**Acknowledgement of Support**: Awardees will be required to include appropriate acknowledgment of NSF and partner support in reports and/or publications on work performed under an award.

**Ensuring Adequate COVID-19 Safety Protocols**

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

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

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

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

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

1. The fifty States;

2. The District of Columbia;

3. The commonwealths of Puerto Rico and the Northern Mariana Islands;

4. The territories of American Samoa, Guam, and the United States Virgin Islands; and

5. The minor outlying islands of Baker Island, Howland Island, Jarvis Island, Johnston Atoll, Kingman Reef, Midway Islands, Navassa Island, Palmyra Atoll, and Wake Atoll.

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

**TBD - Programmatic Terms and Conditions:**

Programmatic Terms and Conditions may be applied based on the specific Center design, planned activities, or findings from the Merit Review process.

**C. Reporting Requirement**

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:

- Steven E. Ellis, telephone: (703) 292-7876, email: IOS-SynCenter@nsf.gov

- Anna K. Allen, telephone: (703) 292-8011, email: IOS-SynCenter@nsf.gov

- Jodie M. Jawor, telephone: (703) 292-7887, email: IOS-SynCenter@nsf.gov

- Paul Forlano, telephone: (703) 292-4611, email: IOS-SynCenter@nsf.gov

- Pankaj Jaiswal, telephone: (703) 292-4594, email: IOS-SynCenter@nsf.gov

For questions related to the use of NSF systems contact:

- NSF Help Desk: 1-800-673-6188

- Research.gov Help Desk e-mail: rgov@nsf.gov

For questions relating to Grants.gov contact:

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

## IX. Other Information

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

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

## About The National Science Foundation

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

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

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

*Facilitation Awards for Scientists and Engineers with Disabilities* (FASED) provide funding for special assistance or equipment to enable persons with disabilities to work on NSF-supported projects. See the *NSF Proposal & Award Policies & Procedures Guide* Chapter II.F.7 for instructions regarding preparation of these types of proposals.

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

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

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The National Science Foundation promotes and advances scientific progress in the United States by competitively awarding grants and cooperative agreements for research and education in the sciences, mathematics, and engineering.
To get the latest information about program deadlines, to download copies of NSF publications, and to access abstracts of awards, visit the NSF Website at https://www.nsf.gov

- **Location:**                                    2415 Eisenhower Avenue, Alexandria, VA 22314

- **For General Information**            (703) 292-5111
  (NSF Information Center)**:**

- **TDD (for the hearing-impaired):**     (703) 292-5090

- **To Order Publications or Forms:**

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

      or telephone:                              (703) 292-8134

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

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## Privacy Act And Public Burden Statements

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

Associated Records." Submission of the information is voluntary. Failure to provide full and complete information, however, may reduce the possibility of receiving an award.

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

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