

Predictive Intelligence for Pandemic Prevention Phase II (PIPP Phase II Centers Program)

PROGRAM SOLICITATION

NSF 23-608



National Science Foundation

Directorate for Biological Sciences
Directorate for Computer and Information Science and Engineering
Directorate for Social, Behavioral and Economic Sciences
Directorate for Mathematical and Physical Sciences
Division of Mathematical Sciences
Directorate for Engineering
Division of Civil, Mechanical and Manufacturing Innovation

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

August 25, 2023

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

December 08, 2023

IMPORTANT INFORMATION AND REVISION NOTES

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:

Predictive Intelligence for Pandemic Prevention Phase II (PIPP Phase II Centers Program)

Synopsis of Program:

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Despite decades of research, scientists do not fully understand the dynamic nature of pathogen and disease emergence. Emerging (and re-emerging) pathogens represent a continuing risk to national security because they threaten health (animal, human, and ecosystem) and economic stability. Often, society falls short on the coordination and breadth of expertise needed to respond to such threats. Effective responses to emerging pathogens will require sustained, global-scale efforts of researchers and organizations. This can only be accomplished by synergistic integration of innovative scientific and technological advances across disciplines and scales, and effective knowledge transfer into practice. As part of these efforts, NSF is organizing a set of activities around the broad theme of **Predictive Intelligence for Pandemic Prevention (PIPP)**.

The PIPP initiative focuses on foundational research and development activities needed to **tackle grand challenges in infectious disease pandemics through prediction and prevention**. The PIPP Phase II Centers Program expands upon the Phase I Development Grant Program and is the NSF's flagship program to establish a network of Centers or large-scale awards/investments that will support interdisciplinary team-based approaches to accelerate research and development activities in emerging infectious diseases and pandemics. The overall goal of the PIPP Phase II Centers program is to support research and development activities needed to **transform society's ability to forecast the likelihood of pandemic-scale events, detect outbreaks early, and respond efficiently**.

Continued advancement, enabled by sustained federal investment channeled toward issues of national importance holds the potential for further economic impact and public health improvements.

Informed by visioning activities in the scientific community as well as a previous round of development grant activities (PIPP Phase I), the program invites proposals for Centers that have a principal focus in one of the following multidisciplinary themes:

Theme 1: **Pre-emergence** - Predicting and detecting rare events in complex, dynamical systems

Theme 2: **Data, AI/ML and Design** - Computing, manufacturing and technology innovation for pandemics

Theme 3: **The Host as the Universe** - Identifying host-pathogen tipping points that dictate control or spread of an infection

Theme 4: **Human Systems** - The role of human behavior, activities and environments in disease emergence, transmission, and response or mitigation

These components directly support the NSF's strategic goals by funding cutting edge science aimed at societal challenges and opportunities that face the Nation, while concurrently working to develop a globally competitive and diverse science, engineering and technology-adapted workforce.

The Directorates for Biological Sciences (BIO), Computer Information Science and Engineering (CISE), Engineering (ENG), Social, Behavioral and Economic Sciences (SBE), and Mathematics and Physical Sciences (MPS) are jointly collaborating to support the PIPP Phase II activities. Involvement of and collaboration with other research communities with significant effort in related spaces, including use-inspired research is highly encouraged.

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.

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- Mitra Basu, telephone: (703) 292-8649, email: PIPP@nsf.gov
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Applicable Catalog of Federal Domestic Assistance (CFDA) Number(s):

- 47.041 --- Engineering
- 47.049 --- Mathematical and Physical Sciences
- 47.070 --- Computer and Information Science and Engineering
- 47.074 --- Biological Sciences
- 47.075 --- Social Behavioral and Economic Sciences

Award Information

Anticipated Type of Award: Cooperative Agreement

Estimated Number of Awards: 4 to 7

In total, 4 (four)-7 (seven) awards in the amount of \$15-18M each (total over 7 years) are anticipated over the entire competition, subject to the availability of funds and the outcome of the proposal review process.

Anticipated Funding Amount: \$126,500,000

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

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:

The Lead PI must be a faculty member or equivalent at the lead organization. A letter of commitment from the Dean or equivalent at the lead organization must be submitted as part of the proposal given the broad focus of the centers.

NOTE: Submission or award of a **Development Grant** (PIPP Phase I) **is not required** to participate in the PIPP Phase II Centers Program competition.

Limit on Number of Proposals per Organization: 1

An organization may submit no more than one Letter of Intent to this solicitation as lead organization. An organization may submit up to one full proposal that corresponds to a Letter of Intent submitted to this solicitation. A full proposal that does not correspond to a Letter of Intent submitted to the program will be returned without review.

Limit on Number of Proposals per PI or co-PI: 1

An individual may be designated as PI or co-PI (this doesn't include non PI/co-PI senior personnel) on at most one full proposal to this solicitation. In the event that an individual exceeds this limit at the full proposal submission stage, proposals will be accepted based on earliest date and time of submission, i.e., the first compliant 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:** Submission of Letters of Intent is required. Please see the full text of this solicitation for further information.
- **Preliminary Proposal Submission:** Not required
- **Full Proposals:**
 - Full Proposals submitted via Research.gov: *NSF Proposal and Award Policies and Procedures Guide* (PAPPG) guidelines apply. The complete text of the PAPPG is available electronically on the NSF website at: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg.
 - Full Proposals submitted via Grants.gov: *NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov* guidelines apply (Note: The *NSF Grants.gov Application Guide* is available on the Grants.gov website and on the NSF website at: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide).

B. Budgetary Information

- **Cost Sharing Requirements:**

Inclusion of voluntary committed cost sharing is prohibited.
- **Indirect Cost (F&A) Limitations:**

Not Applicable
- **Other Budgetary Limitations:**

Not Applicable

C. Due Dates

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

August 25, 2023
- **Full Proposal Deadline(s)** (due by 5 p.m. submitter's local time):

December 08, 2023

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:

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

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I. INTRODUCTION

Despite decades of research, scientists do not fully understand the dynamic nature of pathogen and disease emergence. Emerging (and re-emerging) pathogens represent a continuing risk to national security because they threaten health (animal, human, and ecosystem) and economic stability. Often, society falls short on the coordination and breadth of expertise needed to respond to such threats. Effective responses to emerging pathogens will require sustained, global-scale efforts of researchers and organizations. This can only be accomplished by synergistic integration of innovative scientific and technological advances across disciplines and scales, and effective knowledge transfer into practice. As part of these efforts, NSF is organizing a set of activities around the broad theme of **Predictive Intelligence for Pandemic Prevention (PIPP)**.

The PIPP initiative focuses on foundational research and development activities needed to **tackle grand challenges in infectious disease pandemics through prediction and prevention**. The PIPP Phase II Centers Program expands upon the Phase I Development Grant Program and is the NSF's flagship program to establish a network of Centers or large-scale awards/investments that will support interdisciplinary team-based approaches to accelerate research and development activities in emerging infectious diseases and pandemics. The overall goal of the PIPP Phase II Centers program is to support research and development activities needed to **transform society's ability to forecast the likelihood of pandemic-scale events, detect outbreaks early, and respond efficiently**.

Each PIPP Phase II Center is envisioned as a catalytic force that:

- **Builds** a deeper understanding of foundational research issues that are critical in predictive intelligence for pandemic prevention.
- **Innovates** in a multitude of science and engineering fields within each theme, including, but not limited to: environmental, biological, social, behavioral, economic, mathematical, computer and information science and engineering science.

- **Provides** use-inspired insights to critical problems relating to predictive intelligence for pandemic prevention that accelerate translation of research results to practice with societal impact.

Successful Centers are motivated by clear and compelling foundational and *interdisciplinary research questions and pursue activities that are focused in one of themes below*. While each theme has a clear focus in some disciplines, *research and development activities must draw together data, theory, tools, infrastructure and ideas that* **cross all relevant disciplinary boundaries** (e.g., environmental, biological, chemical, physical, materials, social, behavioral, economic, mathematical, computer and information science and/or engineering science), and **reflect this in balanced expertise on the team of collaborators and participants**.

Themes:

Theme 1: **Pre-emergence** - Predicting and detecting rare events in complex, dynamical systems

Theme 2: **Data, AI/ML and Design** - Computing, manufacturing and technology innovation for pandemics

Theme 3: **The Host as the Universe** - Identifying host-pathogen tipping points that dictate control or spread of an infection

Theme 4: **Human Systems** - The role of human behavior, activities and environments in disease emergence, transmission, and response or mitigation

NSF expects that any new Center will implement an innovative range of approaches to generate new research questions, supporting the conceptualization of novel observations and experimental approaches that are enabled by cutting-edge technological advances, and developing educational and training activities that will facilitate future pandemic preparedness.

PIPP Phase II Centers are intended to be national nexus points for collaborative efforts in pandemic research and prevention. We urge broad and creative thinking about the form, structure, and activities of these new Centers, with the mandates that it includes the broadest possible community and disseminate results through cooperative interactions among scientists and society. Participation of other relevant entities beyond institutions of higher education is highly encouraged (e.g., federal agencies, industry, non-profits, foundations, museums, etc).

Appropriate expertise must be well integrated in an interdisciplinary team that works across scientific, disciplinary, geographic, and organizational divides to implement an effective convergent approach to pandemic predictive intelligence and must be well justified in the Center's vision. To that effect, well supported and compelling research 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.

Each successful PIPP Phase II Center will have interacting initial components that reach beyond the foundational research questions. Chiefly, Centers should accelerate the transition of innovations into relevant economic and/or policy sectors, and nurture and grow the next generation of talent necessary to respond to future pandemic challenges.

Hence, Center activities must include workforce development and participation of the full spectrum of diverse talent in STEM, at all participant levels.

The components above directly support the NSF's strategic goals by funding cutting edge science aimed at societal challenges and opportunities that face the Nation, while concurrently working to develop a globally competitive and diverse science and engineering workforce.

Foundational Research and Use-Inspired Insights

Foundational research on grand challenges in predictive intelligence for pandemic prevention is the primary focus of this program and projects should seek to develop or advance theory and methods that are independent of any particular domain of application. However, in the context of this solicitation use-inspired, solution-oriented aspects of foundational research are particularly encouraged and may include research components and broader impacts. The long term goal of PIPP Phase II Centers is to enable an iterative cycle of co-design and co-creation by teams of researchers, practitioners and users that catalyze and discover game-changing technologies and solutions to address societal and economic challenges related to pandemics. A natural extension of this iterative cycle is to advance the Nation's vast and diverse talent pool and grow the Nation's future workforce in epidemic and pandemic preparedness and global health security.

II. PROGRAM DESCRIPTION

II. A. Program Vision

The recent COVID-19 pandemic has had devastating effects on human health and livelihoods. However, future pandemics may be substantially different. They may be caused by as yet unknown pathogens, affect a broader range of hosts, or have more dire impacts on health or the economy. Biological pathogens do not respect borders, they vary greatly in their properties, including their replication strategies, their hosts, and routes of spread. Environmental change is likely to affect the frequency of pandemics, human behaviors, activities and environments affect disease emergence and transmission, and human responses to disease outbreaks also vary greatly.

Hence, the goal of this effort is to transform society's ability to forecast the likelihood of pandemic-scale events, detect outbreaks early, and respond quickly, thereby limiting transmission before an epidemic, let alone a pandemic, can occur.

The PIPP initiative provides an opportunity for multidisciplinary teams to work across scientific, disciplinary, geographic, and organizational divides to implement an effective approach to pandemic predictive intelligence. Critical to achieving effective approaches that reduce the risk of recurrence and impact of pandemics is the One Health framework, which recognized the interconnection between people, animals (domestic and wildlife), plants, and the environment. Hence this program accepts Center proposals that work in any or across multiple organismal systems.

Pandemic preparedness in the context of a One Health approach requires foundational research on integrating biological knowledge about molecular, cellular, physiological and behavioral properties of organisms and interactions of pathogens, their hosts and the host ecosystems with information about pathogen transmission and evolutionary dynamics, especially in the face of environmental change. A priority is strategic identification of genetic or molecular signatures and understanding of host-pathogen-environment interaction mechanisms that can be used to discover, track, minimize or prevent emerging diseases. However, the foundational capabilities needed to transform this biological knowledge into outbreak prediction and prevention cannot be advanced without convergent and interdisciplinary approaches and technological advances in computing, data collection, modeling and simulation, distributed sensing technology and capacity, and artificial intelligence (AI). Hence, insights and innovation from computer and information science and engineering are critical in generating and integrating knowledge for infectious disease pre-emergence, outbreak, prediction and prevention. Additionally, how human attitudes and activities, social behavior and human environments and the drivers underlying these contribute to disease transmission, prediction and/or prevention, including through their determination of policy and regulations, must be considered.

II.B. Program Scope

Building on visioning exercises and the [PIPP Phase I Development Grant Program](#), the PIPP Phase II program will fund Centers comprised of scientists, engineers, practitioners, and/or educators united by a common focus on advancing the research frontiers of epidemic and pandemic preparedness and national and global health security. The program seeks to build a broad, nationwide set of centers to pursue transformational advances in a range of science and engineering fields – see Center Themes, below. PIPP Phase II Centers will have as their primary focus the advancement of multidisciplinary, multi-stakeholder pandemic research on larger-scale, longer-time-horizon challenges than are supported in typical research grants.

Against this broad and ambitious scope, it is expected that each Center will pursue their vision in ways that are best suited to its selected research focus, facilities, collaborations, and other unique circumstances. Proposers are encouraged to convey the unique qualities of the proposed Center, while addressing the following:

- Centers are coherent **multidisciplinary groups of scientists, engineers, practitioners, and/or educators** appropriate for a large-scale, long-term research agenda for the advancement of pandemic research and innovation in application sectors of national importance. The multidisciplinary nature of these Centers will catalyze coordinated, convergent, and nimble responses to pandemics and pandemic research needs that are not hindered by silos and lack of shared data. Additionally, the individual projects that a Center may carry out should meaningfully integrate into fundamental contributions beyond the sum of the individual projects.
- PIPP Phase II Centers innovate and **advance foundational research** that will have broad and lasting impact, contributing new knowledge or methods toward understanding the rise, spread and response to pandemics (see the program vision specified above). Centers aimed at advancing established lines of research should demonstrate the potential to radically advance these areas beyond the state of the art. For Phase II Center proposals that arise from a PIPP Phase I Development grant, proposals are expected to address how new foundational research and development priorities arose and advanced from previous funding. **PIPP Phase II Center proposals that do not describe a clear plan to achieve ambitious advances in foundational research will not be responsive to this solicitation. It is critical** that proposals clearly specify how the use-inspired context for Center research reveals the opportunities for *foundational* advances and how those *foundational* advances in turn contribute to the related sectors that define the use-inspired context. This dimension of a center-scale proposal will feature clear and compelling goals to enhance the transfer of knowledge through the meaningful exchange of scientific and technical information with external stakeholders such as industrial partners, public policy makers and users, or international organizations, as well as with the broader scientific and educational community. Through use-inspired contexts, Centers have the potential to create and share new community infrastructure, including data and software and/or analytical capacity, to further research, promote data and research reproducibility, and support education.
- PIPP Phase II Centers **actively build the next generation of talent** for a diverse, well-trained workforce. Specifically, a Center should leverage the visionary nature of their research foci to drive new and innovative education and development tailored toward e.g., undergraduates, graduate students, and post-doctoral researchers, as well as through community colleges and skilled technical workforce training and other opportunities as appropriate that advance knowledge and education of pandemic related research. This could include innovative pedagogy, curricula and instructional materials, advanced learning technologies, project-driven training, cross-disciplinary and collaborative research, industry partnerships, and new career pathways. Centers should offer broad, deep, and diverse experiences to build the next generation of a workforce ready to deal with pandemic threats, with a focus on broadening participation among the full range of groups currently under-represented in science and engineering. Centers should maximize their unique position to grow the next generation of talent that will provide new discoveries and leadership.

- Each Center will be comprised of **multiple organizations/entities working together to create significant new research capabilities**. NSF seeks to grow new Centers of pandemic research leadership throughout the country and encourages leveraging existing Centers of excellence as appropriate. Centers are strongly encouraged to include organizations that directly contribute to NSF's commitment to broadening participation by engaging a diverse, globally engaged research community, integrating research with education and building capacity, and expanding efforts to include the participation of the full spectrum of diverse talent in STEM and diverse institutions across all geographical regions. Participants should be meaningfully integrated into a diverse Center. Each Center will have a lead PI with demonstrated vision, experience, and capacity to manage a complex, multi-faceted, and innovative enterprise that integrates research, education, broadening participation, and knowledge transfer. Each Center will also be staffed with a Managing Director or Project Manager (distinct from the lead PI) and a suitable Management Team to oversee the operations of the Center.
- PIPP Phase II Centers are **nexus points for collaborative efforts**. The "nexus point" function in this program is not a mere state of being, but rather an active set of priorities, programs, mechanisms, etc., whereby a Center pursues the continuing growth of collaborations with external partners to bring together people, ideas, problems, and technical approaches for maximum impact beyond the members and the boundaries of the Center itself. As nexus points, Centers have the potential to continue to connect with new partners with the best teams and approaches from institutions of higher education, federal agencies, industry, nonprofits/foundations, centers/institutes, and national networks. As nexus points, Centers promote organizational collaborations and linkages within and between campuses, schools, and the world beyond, and further the Center's mission to broaden participation in research, education, and knowledge transfer activities through a network of partners and affiliates.

II. C. Center Themes

Building on previous visioning exercises and funding opportunities through the PIPP Phase I Developmental Grant effort, in this round, proposals are being solicited in the following high-priority areas, described below. The descriptions for each theme are only intended to provide a broad, principal focus, they are not exhaustive reviews of respective fields. Also, while each theme has a clear center of gravity in some disciplines, successful Center-scale proposals will integrate and innovate across all relevant areas of **environmental, biological, chemical, physical, materials, social, behavioral, economic, mathematical, computer and information science and engineering science, and reflect this in balanced expertise on the team of collaborators and participants**. Full proposal submissions MUST identify as a principal focus one of the themes described below. This principal theme must be reflected in the Title of the Project. However, the themes below are not mutually exclusive, and it is expected that connectivity exists between themes.

Theme 1: **Pre-emergence** - Predicting and detecting rare events in complex, dynamical Systems

Natural and social systems are dynamic, stochastic, nonlinear, multi-scale and complex, making both the theoretical prediction and modeling of its states challenging. Some examples in a predictive context include: epidemiological transitions from a pre-emergence stage to localized emergence (epidemic) and/or a pandemic; transition of an individual or a community from resistant to susceptible to disease; transition of a microbe from harmless to pathogenic.

Usually, these systems spend protracted periods of time in various metastable states and only very rarely, and at seemingly random times, transition to other states, often producing effects that cross spatial and organismal scales in the process. Predicting the dynamics of such systems across scales requires the development of frameworks of contextual predictive intelligence to understand how transition paths interact with a series of additional and often seemingly unrelated events and/or dynamic variables.

One challenge to innovation in data-driven and contextual predictive intelligence for pandemics is the need to develop Artificial Intelligence (AI)- and machine learning (ML)-based computational approaches that meaningfully analyze multiple biological data points (e.g., from bio-surveillance, host-pathogen interactions, at scale ecology) to timely (real-time, just-in-time) identify events that are biologically relevant and significant for pandemics. This will require robust mathematical and physical models, and new biologically-cognizant computational approaches to (1) detect and analyze data that are being collected continuously and across scales, and (2) identify the key events (which may appear unrelated at the onset) that precede pandemics. Another, related challenge is the integration of data-driven approaches with mechanistic models to facilitate our understanding of the biological underpinnings of the complex process of emergence. This will require integrating molecular to environmental scale data and models, with novel computational systems to identify biological, environmental, and/or sociological drivers of rare events and transition states that influence emergence.

Theme 2: **Data, AI/Machine Learning and Design** - Computing, sensing, manufacturing and technology innovation for pandemics

With the current and emerging challenges of increased spill-over risk of pathogens it is important that a paradigm shift occurs in how pathogens and diseases are identified across ecosystems and hosts in either real time, or times well ahead of outbreaks (see Theme 1 above). This shift involves improving the granularity and timeliness of available epidemiological information, with hybrid systems augmenting rather than supplanting traditional surveillance systems. On the data collection and information integration domain, most available technologies are designed for humans. Move towards new ideas to develop methods and devices grounded in advances of wireless technologies, computing software and hardware, algorithms, and machine learning that enable data monitoring, acquisition, and analysis for animal hosts and humans is warranted. We envision that information gained on

changes in animal behavior and welfare, physiology, or range to intelligently and timely identify pre-pandemic conditions.

Another critical area of research to enhance prediction is in computational algorithms and frameworks for processing, analyzing, and modeling data to enable inference of difficult-to-measure information and integration of traditional computing and biological computing platforms. This highlights the effort needed to connect measurable with difficult/unmeasurable (observable versus unobservable) biological events/characteristics/processes for pre-emergence forecasting of pandemics. Progress in biological sensor technologies, in-situ sensors, and smart sensor networks to record difficult-to-measure or track in near real time cellular and molecular-scale effects as well as to monitor biological systems at all scales is critical. Monitoring systems at a higher level for effective and comprehensive disease emergence and spread prediction/analysis could benefit from coordinated solutions of in-situ detection, computation, and decision by networked sensors, actuators and processors, and physical processes, together with cybersystems (such ecosystems could be modeled as cyber-physical systems) of simulated events where the interactions between levels and systems can be simulated to enhance, understand, and generate empirically based policy. An important challenge and opportunity to advance in this field calls for a continuous and iterative feedback loop between simulated and real worlds, which must happen in either real time or at relevant time scales.

The development and strengthening of computational methods and process of data collection, analysis, storage, curation, and analytics, along with a "model commons" serving as a repository of leading-edge modeling and simulation about pathogens and pandemic disease is the basis for a successful predictive intelligence for pandemic prevention program. On the other hand, the increasing number of available models and the lack of best practices in coordination, integration and data sharing are major roadblocks in the development of the field. This solicitation calls for a clearly rationalized research plan that addresses these concerns at all steps in the design of computing and networked systems/infrastructure for predictive intelligence for pandemic prevention.

Theme 3: **The Host as the Universe** - Identifying host-pathogen tipping points that dictate control or spread of an infection

The host can be the bottleneck or the amplifier of a pathogen. The outcome of infection may change in the face of pathogen mutation and/or changes in the host environment. A concerted research effort spanning multiple research areas is required to understand the basis for host control in the spread of an infection under these changing conditions. Research submitted under this theme is expected to pursue critical aspects of molecular, cellular and physiological mechanisms that dictate the outcome of host-pathogen interactions, including disease outbreaks. This foundational knowledge could be exploited to inform insights to control or predict pathogen emergence, identify new therapeutics or vaccines, or predict and understand the emergence and maintenance of antimicrobial resistance.

A game-changer in pandemic prevention would be remote sensors that autonomously track and report on pathogens and their hosts *in situ* over time and space. Remote tools and technologies for detecting and monitoring changes in biological systems and processes that are also capable of analyzing and transmitting information from hosts could make possible the discovery of potential for outbreaks prior to society-scale dissemination. Although genome sequencing is now ubiquitous it remains difficult to use this sequence (or other -omics based methods) to accurately predict hosts for a new pathogen, or to detect transmission and amplification routes of a new pathogen. This challenge could be overcome by advances in engineering and in computational algorithms and frameworks for processing, analyzing and modeling data.

Molecular-level information exists about host responses to infection and about the bio-synthetic pathways required for a pathogen to survive in a specific host. This information can be leveraged to develop therapeutic and diagnostic tools. There is still a gap in understanding how these functions occur temporally and in concert within the entire host organism, and the hierarchy of mechanisms that result in control or spread of an infection within an individual and throughout homo- and heterogeneous hosts. An opportunity to advance in this field is developing mathematical and computational models that accurately predict infection outcomes from sub-cellular events.

Theme 4: **Human Systems** - The role of human behavior, activities and environment in disease emergence, transmission, response and mitigation.

The devastating human, economic, and social costs of the recent pandemic have highlighted the urgent need for coordinated research and actions to build resilient systems for pandemic prevention, preparedness, and response. Central to the development of resilient systems is a recognition of the role that humans and their environments play in disease and pandemic dynamics and an understanding of the complex behavior of humans at individual, group, organizational, societal, and global scales.

For the purpose of this solicitation, the term environment is broadly construed, it may include biological, physical and chemical components, and may consider a continuum of environments from those with very limited human populations (e.g., "natural" environments) to those in which human systems and processes fully dominate (e.g. cities, built environments). Research that meaningfully incorporates social and behavioral processes in epidemiological models relevant to human systems and environments is particularly critical.

Center projects submitted to this theme will therefore advance science and engineering research on human systems that are relevant to improved pandemic prevention and resilience. It is expected that research in this theme will be necessarily interdisciplinary and explore aspects of how human cognition, behavior and attitudes, and the sociocultural and socio-environmental drivers underlying these, contribute to disease emergence, transmission and mitigation. Research under this theme must address human behavior and/or social processes, and projects may, but need not, focus on human pathogens or human hosts. Understanding the human impact will also allow for the development and optimization of high impact methods for disease surveillance/prevention/suppression/containment/mitigation protocols. Examples of broad areas of focus that leverage and advance foundational research in science and engineering and support use-inspired goals include, but are not limited to: investigating how the environment and/or human attitudes, beliefs, decisions, and activity patterns contribute to disease transmission and affect pandemic resilience and responses; understanding the processes in water, soil, and/or air that trigger or amplify pathogen spread in human environments; understanding the role of organizations and policymakers in communicating disease risk, coordinating across stakeholders, shaping research efforts, and planning and implementing disease mitigation protocols; and utilizing and advancing sociocultural and economic models and theories about the ethical and logistical trade-offs between human health/privacy and economic/societal health in order to optimize disease prevention and mitigation strategies.

II.D. Webinar

NSF will hold an informational webinar soon after the release of the solicitation and post the date and registration information for this webinar on the Program Web page.

III. AWARD INFORMATION

Anticipated Type of Award: Cooperative Agreement

Estimated Number of Awards: 4 - 7

In total, 4 (four)-7 (seven) awards in the amount of \$15-18M each (total over 7 years) are anticipated over the entire competition, subject to the availability of funds and the outcome of the proposal review process.

Anticipated Funding Amount: \$126,500,000

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IV. ELIGIBILITY INFORMATION

Who May Submit Proposals:

Proposals may only be submitted by the following:

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- 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:

The Lead PI must be a faculty member or equivalent at the lead organization. A letter of commitment from the Dean or equivalent at the lead organization must be submitted as part of the proposal given the broad focus of the centers.

NOTE: Submission or award of a **Development Grant** (PIPP Phase I) **is not required** to participate in the PIPP Phase II Centers Program competition.

Limit on Number of Proposals per Organization: 1

An organization may submit no more than one Letter of Intent to this solicitation as lead organization. An organization may submit up to one full proposal that corresponds to a Letter of Intent submitted to this solicitation. A full proposal that does not correspond to a Letter of Intent submitted to the program will be returned without review.

Limit on Number of Proposals per PI or co-PI: 1

An individual may be designated as PI or co-PI (this doesn't include non PI/co-PI senior personnel) on at most one full proposal to this solicitation. In the event that an individual exceeds this limit at the full proposal submission stage, proposals will be accepted based on earliest date and time of submission, i.e., the first compliant full proposal will be accepted, and the remainder will be returned without review.

Additional Eligibility Info:

Minority Serving Institutions (MSIs) are encouraged to submit proposals. (Minority Serving Institutions as listed and defined by the US Department of Education list of MSIs: <https://www2.ed.gov/about/offices/list/ocr/edlite-minorityinst.html>).

Eligible organizations in EPSCoR jurisdictions are encouraged to submit proposals. (EPSCoR Jurisdiction websites as per NSF: <https://new.nsf.gov/funding/initiatives/epscor/state-websites>)

Federal agencies and federally funded research and development centers (**FFRDCs**) **can only participate as subawardees**.

If a proposal involves multiple organizations, it must be submitted as a **single proposal with subawards**: separately submitted collaborative proposals are not permitted and will be returned without review.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Letters of Intent (required):

Letters of Intent (LOI) are required and must be submitted via Research.gov, even if full proposals will be submitted via Grants.gov.

NOTE: Submission or award of a **Development Grant (PIPP Phase I)** is **not required** to participate in the PIPP Phase II Centers Program competition.

The Letters of Intent will be used for planning the review of proposals. If an organization submits a Letter of Intent by the deadline then the organization is automatically eligible to submit the full proposal; there is no formal invitation or other notice after the Letter of Intent has been submitted. No feedback will be given on individual Letters of Intent, but the program may share general issues/reminders via coordinated message to all prospective submitters after the submission deadline of the LOI, and prior to full proposal submission.

As a multi-organization activity, **a single, integrated Letter of Intent** must be submitted by the lead organization; information about other participating organizations, partners, and senior personnel may be given in section 4 "List of Senior Project Personnel and Participating Organizations" as described below.

Required components of the Letter of Intent are given below. It is the submitting organization's responsibility to ensure that the Letter of Intent is compliant with all applicable requirements.

The Letter of Intent must consist of the elements below. Letters of Intent DO NOT have to specify a Theme, but are encouraged to do so in the Title. No **other sections are permitted**.

The Letter of Intent must include this information:

1. Project Title

Proposal titles must indicate the PIPP Phase II program, followed by a colon, then the title of the project ("PIPP Phase II: Theme n (where n is the theme number, if known): Title"). The title should describe the project in concise, informative language that is understandable to a technically literate reader.

2. Project Information

i) Synopsis (2500 characters): The Synopsis should outline the specific goals of the Center and highlight innovative aspects of the work and the significance of potential outcomes in the field of predictive intelligence for pandemic prevention.

ii) Other Comments (2500 characters): Explain how the project will address the Additional Solicitation Specific Criteria identified in the Solicitation (Section VI.A.).

3. Optional Data Fields

iii) Research Disciplines (255 characters)

Identify the disciplines in which the research is grounded.

iv) Key References (255 characters)

Include DOI and/or ISBN for key references cited in the Letter of Intent (if applicable).

4. List of PI/coPIs and other Senior Project Personnel and Participating Organizations

v) Include PI/coPIs and other Senior Project Personnel and Participating Organizations

Letter of Intent Preparation Instructions:

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

- Submission by an Authorized Organizational Representative (AOR) is 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 10 Other Participating Organizations are permitted
- Research Disciplines is required when submitting Letters of Intent
- Key References is required when submitting Letters of Intent
- Submission of multiple Letters of Intent is not permitted

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.

Important Instructions: Full proposals will be accepted only if they are based on a Letter of Intent submitted to this program. Due to the complexity of the proposals being submitted, submitters are strongly encouraged to prepare and submit proposals with enough lead time to resolve potential compliance related issues in advance of the deadline. When preparing a full proposal for this competition, proposers are advised to review the Program Description and the Proposal Review Information found in this solicitation for general information pertinent to this program.

As a multi-organization activity, the proposal must be submitted as a single, integrated proposal by the lead organization, with proposed subawards to the other partner organizations. Linked collaborative proposals from multiple organizations will be returned without review.

1. Cover Sheet

- TITLE: The title of the proposal must be preceded by "PIPP Phase II: Theme n: ", where n is the theme number that is the primary theme to which you are submitting. The title should describe the project in concise, informative language that is broadly understandable.
- Dual Use Research of Concern (DURC) and enhanced Potential Pandemic Pathogens (enhanced PPP): NSF's current [Proposal and Award Policies and Procedures Guide \(PAPPG, NSF 23-1\)](#) contains an update to the agency's policy on [dual use research of concern \(DURC\)](#) (i.e., research that uses one of 15 select agents, produces one of 7 effects, and has the potential to be misused).

NSF is committed to preserving the benefits of life sciences research while minimizing the risk of misuse of the knowledge, information, products, or technologies provided by such research. Research aligned with PIPP Phase II themes has the potential to result in activities or outcomes that may fall within federal DURC or enhanced Potential Pandemic Pathogen (enhanced PPP) policy and guidelines.

NSF still prohibits funding DURC, but allows for research that could create [enhanced potential pandemic pathogens \(enhanced PPPs\)](#) if

the benefits of the research far outweigh the risks. Proposing organization are now required to identify submissions proposing any DURC or work with enhanced PPPs by checking a box on the proposal cover pages labeled "Potential Life Sciences Dual Research of Concern."

More information can be found in [Chapter II.E.6](#) and [Chapter XI.B.5](#) of the PAPPG.

2. Project Summary (1-page limit) The Project Summary consists of an overview, a statement on the intellectual merit of the proposed activity, and a statement on the broader impacts of the proposed activity. Include an overview of the Center description and rationale, its research objectives, education and workforce development activities, and community building activities. Proposals may incorporate a Keywords section as the last line of the Project Summary, which may be used to highlight any special emphasis in sectors relevant to the theme, or to identify relevance to themes other than the one to which the proposal is submitted.

3. Project Description The Project Description must include the sections described below and must not exceed 25 pages including tables and illustrations. In addition to these and other PAPPG requirements, the Project Description for a PIPP Phase II proposal must include the following clearly-labeled sections.

Deviations from the PAPPG:

You may omit the PAPPG-required section, "**Results from Prior NSF Support**". If omitted from the Project Description, the required information must be submitted, if applicable, as a supplementary document (described below).

3.a. Overview and Rationale for Center Approach: Provide a rationale for the principal theme that was identified, and a description of the importance of specific aspects of the grand challenge that the Center aspires to solve. Include timeliness of addressing this challenge. Discuss why the PIPP Phase II Centers program is particularly suited to support this effort. Discuss the long-term strategic goals and potential impact of a Center.

3.b. Description of the Research Plan of the Center: State the overall vision and long-range research goals of the Center. Describe the proposed research areas (in the context of the theme), how this plan synergistically advances foundational research and use-inspired insights in predictive intelligence for pandemic prevention and how these efforts will be integrated in service of the Center's research vision. **Clearly specify the areas of foundational research and development activities in which significant new knowledge or methods will contribute to society's ability to forecast the likelihood of pandemic-scale events, detect outbreaks early, and/or respond quickly; why those activities are selected; and the Center's unique capabilities to advance and disseminate those outcomes to the broader community (including practitioners, educators or users). Convey how those advances benefit from and contribute to the related sectors in the chosen use-inspired and translational context.** Identify key contributors to these research and development activities and demonstrate their suitability to drive and disseminate the pandemic research advances and associated disciplines/sectors. Provide a seven-year timeline for all activities. Indicate the specific role of each partner organization or participant in each research topic/goal area. The research plan should provide sufficient detail to allow assessment of the scientific merit and to justify the necessity for the proposed mode of operation. If applicable, explain how the proposed research relates to other existing research capabilities (e.g., related centers, institutes, facilities and/or national laboratories) as well as international programs in the proposed fields of research. If the Center plans include the development of shared research facilities, describe plans to build, manage, and sustain such facilities.

3.c. Broader Impacts: The Project Description **must** contain, as a separate section within the narrative, a section labeled, "Broader Impacts". **Please note that this heading must be on its own line with no other text on that line.** This section should include, at a minimum, the following three subsections.

3.c.1. Education and Workforce Development: With the goal of advancing knowledge and education related to the detection, prediction and response to pandemics, present plans to actively build the next generation of talent for a diverse well-trained workforce through new and innovative approaches to education and workforce development. Participants may include undergraduate, graduate students or post-doctoral researchers, community colleges, skilled technical workforce, K12 students, and/or professionals looking to shift career focus. Describe plans for the mentoring and professional development of participants involved in Center activities. Describe how the Center will integrate research and education. Describe all proposed activities in sufficient detail to allow assessment of their intrinsic merit, potential effectiveness, and their anticipated contribution toward a highly competent new generation of the US workforce able to help predict, prevent or mitigate pandemics. Plans may also include mechanisms to engage participants in informal settings (e.g., museums, nature centers, libraries; TV/film; citizen science; and other on-line experiences).

3.c.2. Broadening Participation Plans: Describe the broadening participation objectives and outline evidence-based strategies for achieving them, based on relevant literature. Describe plans for increasing diversity including the participation of the full spectrum of diverse talent in STEM at all organizational levels of Center activities, and cite the relevant literature on effective practices. Describe the contribution/role of partner organizations in the broadening participation plans. Explain why these organizations were selected and what they will contribute to the project. Indicate the role of students and faculty from these organizations and how they will be fully

integrated and engaged into Center activities. Explain how progress will be measured and how strategies will be adapted, if necessary. Describe the proposed activities in sufficient detail to allow **assessment** of their intrinsic merit and potential effectiveness.

3.c.3. Collaboration and Knowledge Transfer: Describe how the Center will function as a nexus point for collaborative efforts, including plans to link organizations, people, ideas, problems, and technical approaches for maximum impact. Present plans to integrate partner organizations and participants into a diverse Center that is more than just the sum of its parts. Include here plans to effect knowledge transfer. Knowledge transfer involves the exchange of scientific and technical information between the Center and external non-academic stakeholders (such as industrial partners or public policy-makers) with the objective of applying that knowledge. State the specific goals for knowledge transfer and the expected impact of the activities. Linkages should involve significant intellectual exchange and could involve, for example, mechanisms such as internships or novel use of cyberinfrastructure to enhance connections.

3.d. Key Personnel, Management and Integration Plan: Describe the multidisciplinary group of scientists, engineers, practitioners and/or educators comprising the Center and their suitability to conduct large-scale, long-term research agenda to advance innovation in research and application sectors of predictive intelligence for pandemic prevention. Describe the network of organizations comprising the Center and their relationships to one another. Include a diagram to explain the organizational relationships and reporting structure among the key areas of responsibility. Describe the specific roles of the Center Management Team, the timeline for hiring of key personnel and areas of responsibility, including in the day-to-day management and operations of the Center. Describe the relevant experience and desired qualifications of the Center Director, Project Manager (both required), and other key members of the management team to lead and manage a complex, multi-faceted, and innovative enterprise that integrates research, education, broadening participation, and knowledge transfer (see below for further description). Describe the processes to be used to prioritize Center activities; to select and integrate research projects with one another and with other Center activities; to identify and sunset projects that cease to align with Center goals; to allocate funds and equipment across Center activities and among partners; to resolve conflict; and to select a replacement for key leaders if needed.

Key Personnel, Specifics:

- **Center Director (required):** 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 should 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 Director.
- **Project Manager (required)** - It is expected that the Center will have a Project Manager (or Associate Director) with appropriate project-management training whose duties generally 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 should be designated as senior personnel in the proposal. We strongly discourage post-doctoral researchers to be placed into this position.
- **Other Key Positions:** The Center will require dedicated staff positions to foster excellence in areas such as: Education, Training & Outreach; Cyberinfrastructure & Data Management; and others to ensure that the Center is successful in carrying out a visionary and thriving program.

3.e. 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 Center will engage with and utilize the expertise of the External Advisory Committee.

4. Budget and Budget Justification Provide a budget for each of the seven years. Research.gov or Grants.gov will automatically provide a cumulative budget. **Important information for Grants.gov users:** Grants.gov supports proposal budgets for up to five years. After the proposal is submitted to NSF via Grants.gov and successfully transferred to NSF for processing, Grants.gov applicants should use the Proposal File Update feature in Research.gov to enter the proposal budget for the 6th and 7th years. The proposed budget should be consistent with the needs and complexity of the proposed activity. Provide a detailed budget for each of the seven years, roughly reflecting three phases: Phase 1: The Acceleration Phase – Years 1 and 2 (ca 25% of total award size); Phase 2: The Steady-State Phase – Years 3, 4 and 5 (ca. 60% of the total award size); and Phase 3: The Wrap-Up Phase – across Years 6 and 7 (ca. 15% of the total award size). Note that funding for Phase 2 and/or Phase 3 is contingent upon a successful site visit during Year 2 and/or 5 (see Special Award Conditions). The budget should include funds for travel for at least two PIs/coPIs, one key senior personnel and one student/trainee to attend each PI meeting during the life of the project, in years 2, 5, and 7.

5. Facilities, Equipment and Other Resources Provide a synopsis of organizational resources that will be available to the Center (dedicated space, access to facilities and instrumentation, faculty and staff positions, access to programs that assist with curriculum development or broadening participation, or other organizational programs that could provide support to the Center). In order for NSF to assess the scope of a proposed project, all resources (including those from collaborating organizations) available to the project, must be described in this section. Note that inclusion of voluntary committed cost sharing is prohibited. The description should be narrative in nature and must not include any quantifiable financial information.

6. Special Information and Required Supplementary Documents

- *Senior Personnel List Spreadsheet*: An additional spreadsheet listing all PIs, CoPIs 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 international collaborators (if applicable). 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 PIPP@nsf.gov within **one business day** of the full proposal submission.
- *Results of Prior NSF Support* (Up to one page). This supplementary document may be used to report Results of Prior NSF Support as required in the PAPPG if applicable to any PI or co-PI per the PAPPG and not addressed in Project Description. This document may also contain results of support from other funding agencies listed in this solicitation following the same content guidelines as given for the NSF requirement.
- *Ethics Plan* (required, up to one page). Provide a clear statement of the proposed Center's policies on ethics training, responsible conduct of research, and intellectual property rights. Discussion should address the nature of the research, methodologies used, ownership of research and ideas, and roles and responsibilities regarding intellectual property. A program of training in ethics and responsible conduct of research within the cross-disciplinary and multi-organizational context of the Center, for all Center and subawardee staff, including faculty, visiting faculty, industrial fellows, postdoctoral researchers, and graduate and undergraduate students is required. Training topics should include the nature of the research, methodologies used, ownership of research and ideas, and roles and responsibilities regarding intellectual property. Proposers are encouraged to address the relationship between the Center's ethics plan and the broader consideration of ethics in pandemic research, especially in human systems. This plan does not supplant any IRB requirement arising from the proposed project (see PAPPG).
- *Data Management Plan* (required, up to two pages). The PAPPG requires the inclusion of a Data Management Plan (DMP) with all full proposal submissions. The DMP can be no longer than two pages and must be inclusive of the entire project. All projects must adhere to FAIR (Findable, Accessible, Interoperable, and Reusable) practices, and ensure that data, biological materials and/or other resources are collected, archived, digitized, and made available using methods that allow current and future investigators to access data and material. Funded projects must disseminate project data broadly in a timely and responsible manner, *using* widely accepted electronic data standards, a named community-accepted, publicly-accessible data repository with as few restrictions as possible. Data and digital products should be identified, and the following described for *each* of them:
 - Format and standard of primary data;
 - Metadata to be collected and disseminated with the primary data;
 - Timetable of release of ALL data, consistent with privacy and other concerns regarding sensitive information;
 - Repository to be used;
 - License for use, with an emphasis on open source licenses;
 - Strategy for data attribution, curation, storage, sharing, and authentication;
 - Any constraints on release, which must be clearly justified; and
 - Person(s) responsible for the release.

All software and code must be in a versioned code repository. The PIPP initiative strongly encourages release of ready-to-use software and code through integration with computing resources. Published results should always include information on how to access the supporting data.

- *Postdoctoral Researcher Mentoring Plan* (as applicable). In addition to the general elements of the postdoctoral mentoring plan described in the PAPPG, address how the activities of the Center will especially enhance the professional development of postdoctoral researchers (e.g., by virtue of access to multiple projects and organizations comprising the Center).
- *Letters of Collaboration* (as applicable). Letters should document collaborative arrangements of significance to the proposal and **MUST** stay within the PAPPG requirement to state only the intent to collaborate. They should not contain endorsements or evaluation of the proposed project. Letters of Collaboration will be provided in the Supplementary Documents section of the proposal and should follow the format instructions specified in the NSF PAPPG. Note that letters of collaboration are not necessary for subawardee organizations, whose commitment is explicit in the proposal.

- *Letter of Commitment (required, up to one page)*. A letter of commitment from the Dean or equivalent at the lead institution must be submitted as part of the proposal given the broad focus of the Centers. The letter should confirm the institution's support of faculty involvement in the Center as well as the existing resources, as described in the project description and/or facilities document, and that these resources will be available to the Center for its lifespan.
- *Intellectual Contribution and Credit Plan (required, up to one page)*: 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.

7. Single Copy Documents Optional: List of suggested reviewers or reviewers not to include (with a brief explanation or justification for why the reviewer should be excluded).

B. Budgetary Information

Cost Sharing:

Inclusion of voluntary committed cost sharing is prohibited.

Budget Preparation Instructions:

Proposal budgets should include funds for travel for at least two PIs/coPIs, one key senior personnel and one student/trainee to attend each PI meeting during the life of the project, in years 2, 5, and 7.

Important information for Grants.gov users: Grants.gov supports proposal budgets for up to five years. After the proposal is submitted to NSF via Grants.gov and successfully transferred to NSF for processing, Grants.gov applicants should use the Proposal File Update feature in Research.gov to enter the proposal budget for the 6th and 7th years.

C. Due Dates

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

August 25, 2023

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

December 08, 2023

D. Research.gov/Grants.gov Requirements

For Proposals Submitted Via Research.gov:

To prepare and submit a proposal via Research.gov, see detailed technical instructions available at:

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

For Proposals Submitted Via Grants.gov:

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

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

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

VI. NSF PROPOSAL PROCESSING AND REVIEW PROCEDURES

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

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

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

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

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

A. Merit Review Principles and Criteria

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

1. Merit Review Principles

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

- All NSF projects should be of the highest quality and have the potential to advance, if not transform, the frontiers of knowledge.
- NSF projects, in the aggregate, should contribute more broadly to achieving societal goals. These "Broader Impacts" may be accomplished through the research itself, through activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to, the project. The project activities may be based on previously established and/or innovative methods and approaches, but in either case must be well justified.

- Meaningful assessment and evaluation of NSF funded projects should be based on appropriate metrics, keeping in mind the likely correlation between the effect of broader impacts and the resources provided to implement projects. If the size of the activity is limited, evaluation of that activity in isolation is not likely to be meaningful. Thus, assessing the effectiveness of these activities may best be done at a higher, more aggregated, level than the individual project.

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

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

2. Merit Review Criteria

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

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

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

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

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

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

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

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

Additional Solicitation Specific Review Criteria

In addition to the National Science Board merit review criteria, reviewers will be asked to apply the following criteria when reviewing proposals submitted to this solicitation:

1. **Foundational research and development activities:** How well does the proposed Center contribute new knowledge or methods toward predictive intelligence for pandemic prevention?
2. **Use-inspired insights to critical problems:** How well does the proposed Center leverage the use-inspired research context to provide insights to critical problems relating to predictive intelligence for pandemic prevention that accelerate translation of research results to practice.

3. **Strategic impact:** What is the potential for the Center to make a lasting strategic impact beyond its research outcomes? Specifically:
- How will the proposed Center actively **nurture and grow the next generation of talent**?
 - To what extent is the proposed Center **comprised of a multidisciplinary group of scientists, engineers, practitioners and/or educators** appropriate to the project?
 - How well does the proposed Center **leverage multiple organizations** to create significant new research capabilities in new Centers of pandemic preparedness and leadership and create a network for broadening participation from groups underrepresented in STEM to encourage participation of the full spectrum of diverse talent that society has to offer and diverse institutions?
 - How well does the proposal exhibit plans to operate as a **nexus point for collaborative efforts for research across a multitude of science and engineering fields, and** engages externally to add to a diverse Center that is more than just the sum of the parts?

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 Reverse Site Review.

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

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

Reverse Site Visit: Some proposals will be selected for a 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:

Dual Use Research of Concern and enhanced PPP: If a decision is made to fund a proposal, where the use of a select agent (but not an enhanced PPP) as identified by the Policy is proposed, the proposer must submit evidence of registration of the select agent with the CDC or USDA as required by the [Select Agent Regulations](#) and the proposer must submit a justification from the Institutional Review Entity (IRE) demonstrating how the potential benefits of the research using the select agent far outweigh the risks. If a decision is made to fund a proposal using or potentially resulting in enhanced PPP, the proposer must submit a justification from the IRE demonstrating benefits outweigh the risks, but registration with CDC or USDA is not required.

In the rare cases where NSF funds research that involves the creation, transfer, or use of enhanced potential pandemic pathogens, then special award conditions will be applied to ensure adequate oversight by the cognizant NSF program officer or other NSF official. Award terms and conditions also will specify the establishment of a risk mitigation plan for the research that must be reviewed and approved by the IRE and NSF, as well as the requirement of maintenance of records of institutional review of the research and risk mitigation activities for three years after completion of the project. Other special award terms and conditions may be applied to ensure compliance with U.S. policy and mitigate the potential for misuse of results of NSF funded research.

Site Visits and Release of Funds: PIPP Phase II Center awards are made in the form of cooperative agreements. 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.

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. It is anticipated that each PIPP Phase II Center project will be merit reviewed in two site visits (or reverse site visits) conducted during Year 2 and Year 5. The evaluation during Year 2 will assess project progress and determine if the project warrants continued support in Years 3 through 5. The evaluation during year 5 will assess the project progress and determine if the project warrants support for Years 6 and 7. If deemed necessary, NSF may conduct additional site visits and/or reverse site visits as part of annual review of Center performance. These visits will be led by cognizant agency staff and may include a panel of external evaluators.

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. An example of such an acknowledgement would be: "This material is based upon work supported by the PIPP Phase II Center Program supported by NSF under Award Title and No. [Recipient enters project title and awards number(s)]."

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 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](https://www.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](https://www.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](https://www.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.

In addition, *PIPP Phase II* awardees must:

1. Produce one project outcome "highlights" annually for Years 4 through 7 that is prepared for a lay audience; these highlights will be used in NSF reporting and outreach;
2. Create and maintain an active project web site that shares information about the project; and
3. Attend three PI meetings to share information about the project (please make provisions for travel for at least two PIs/coPI, one senior personnel and one student/trainee to attend each PI meeting during the life of the project, in years 2, 5, and 7).

Additional reporting requirements may be required as part of the award terms and conditions of individual awards.

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:

- Katharina Dittmar, telephone: (703) 292-7799, email: PIPP@nsf.gov
- Mitra Basu, telephone: (703) 292-8649, email: PIPP@nsf.gov
- Goli Yamini, telephone: (703) 292-8910, email: PIPP@nsf.gov
- Rebecca Ferrell, telephone: (703) 292-7850, email: PIPP@nsf.gov
- Zhilan J. Feng, telephone: (703) 292-7523, email: PIPP@nsf.gov
- Daniel McAdams, telephone: (703) 292-4654, email: PIPP@nsf.gov
- Joanna Shisler, telephone: (703) 292-5368, email: PIPP@nsf.gov
- Joseph M. Whitmeyer, telephone: (703) 292-7808, email: PIPP@nsf.gov
- Catalina Achim, telephone: (703) 292-2048, email: PIPP@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.

PIs should send inquiries to PIPP@nsf.gov in place of contacting individual program directors.

IX. OTHER INFORMATION

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

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

ABOUT THE NATIONAL SCIENCE FOUNDATION

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

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

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

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

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

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

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

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

- **Location:** 2415 Eisenhower Avenue, Alexandria, VA 22314
- **For General Information** (703) 292-5111
(NSF Information Center):
- **TDD (for the hearing-impaired):** (703) 292-5090
- **To Order Publications or Forms:**
 - Send an e-mail to: nspubs@nsf.gov
 - or telephone: (703) 292-8134
- **To Locate NSF Employees:** (703) 292-5111

PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

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

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

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

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

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