

# Enabling Quantum Leap: Convergent Accelerated Discovery Foundries for Quantum Materials Science, Engineering and Information (Q-AMASE-i)

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## PROGRAM SOLICITATION

NSF 18-578

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### National Science Foundation

Directorate for Mathematical & Physical Sciences  
Division of Materials Research  
Division of Mathematical Sciences

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

Directorate for Engineering  
Division of Electrical, Communications and Cyber Systems

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

September 17, 2018

Due Date

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

November 05, 2018

Due Date

## IMPORTANT INFORMATION AND REVISION NOTES

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

## SUMMARY OF PROGRAM REQUIREMENTS

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### General Information

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#### Program Title:

Enabling Quantum Leap: Convergent Accelerated Discovery Foundries for Quantum Materials Science, Engineering and Information (Q-AMASE-i)

#### Synopsis of Program:

The Division of Materials Research (DMR), the Division of Mathematical Sciences (DMS), the Division of Electrical, Communications and Cyber Systems (ECCS), and the Office of Advanced Cyberinfrastructure (OAC) seek to rapidly accelerate quantum materials design, synthesis, characterization, and translation of fundamental materials engineering and information research for quantum devices, systems, and networks. The new program of Enabling Quantum Leap: Convergent Accelerated Discovery Foundries for Quantum Materials Science, Engineering, and Information (Q-AMASE-i) aims to support these goals by establishing Foundries with mid-scale infrastructure for rapid prototyping and development of quantum materials and devices. The new materials, devices, tools and methods developed by Q-AMASE-i will be shared with the science and engineering communities through a Foundry-operated network. Technology transfer of Foundry activities will be enabled by close cooperation with industrial partners.

Six-year awards totaling \$20,000,000 to \$25,000,000 for the award period are anticipated. Q-AMASE-i Foundries will be awarded as cooperative agreements with an initial commitment of six years, with the possibility of one six-year renewal, subsequent to a rigorous and favorable review by NSF. The annual performance review includes NSF's evaluation of the annual report after the first year, an annual site visit after the second and fourth year of Foundry activities, and a reverse or program management site visit after the third and fifth year. Funding after the second year will depend on the quality of progress and performance documented during the site visits

**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.

- Tomasz Durakiewicz, telephone: (703) 292-4892, email: [tdurakie@nsf.gov](mailto:tdurakie@nsf.gov)
- Victor Roytburd, telephone: (703) 292-8584, email: [vroytbur@nsf.gov](mailto:vroytbur@nsf.gov)
- Dominique Dagenais, telephone: (703) 292-2980, email: [ddagenai@nsf.gov](mailto:ddagenai@nsf.gov)
- Amy Walton, telephone: (703) 292-4538, email: [awalton@nsf.gov](mailto:awalton@nsf.gov)

**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

## Award Information

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**Anticipated Type of Award:** Cooperative Agreement

**Estimated Number of Awards:** 1 to 5

The final number of awards will depend on the availability of funds and the quality of the proposals.

**Anticipated Funding Amount:** \$20,000,000 to \$25,000,000

Awards totaling \$20,000,000 to \$25,000,000 over a six year period are anticipated. The budget must be commensurate with the scope of the project and thoroughly justified in the proposal. Annual budget may not exceed \$7,000,000 in any of the award years.

## Eligibility Information

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**Who May Submit Proposals:**

Proposals may only be submitted by the following:

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

**Who May Serve as PI:**

There are no restrictions or limits.

**Limit on Number of Proposals per Organization: 1**

One (1) per organization as lead institution. Potential PIs are advised to contact their Sponsored Projects Office regarding processes used to select proposals for submission. In case of multiple submissions from the same institution, only the first submission will be considered, and all subsequent submissions will be returned without review.

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

Individuals may appear as Senior Personnel (Principal Investigator/Project Director, co-PI, and Faculty Associate or equivalent) on only one Q-AMASE proposal. In the event that any individual exceeds this limit, any proposal submitted to this solicitation with this individual listed as PI, co-PI, or Senior Personnel after the first proposal is received at NSF will be returned without review. No exceptions will be made. For this purpose, a multi-institution collaborative project is treated as one proposal. The lead institution must submit a single collaborative proposal managed by the lead institution, with subawards. Linked collaborative proposals submitted by participating institutions are not allowed.

## Proposal Preparation and Submission Instructions

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**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:**

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

## B. Budgetary Information

- **Cost Sharing Requirements:**

Inclusion of voluntary committed cost sharing is prohibited.

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

Not Applicable

- **Other Budgetary Limitations:**

Not Applicable

## C. Due Dates

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

September 17, 2018

Due Date

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

November 05, 2018

Due Date

## Proposal Review Information Criteria

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### Merit Review Criteria:

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

## Award Administration Information

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### Award Conditions:

Standard NSF award conditions apply.

### Reporting Requirements:

Standard NSF reporting requirements apply.

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# I. INTRODUCTION

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The "Quantum Leap: Leading the Next Quantum Revolution" is one of NSF's "Ten Big Ideas" which aims to empower U.S. scientists and engineers to propel the science and engineering of quantum phenomena through high-risk, high-pay off projects. As a part of the Quantum Leap, Q-AMASE-i Foundries are expected to produce advances such as: transformative breakthrough fundamental research; novel materials, tools, devices, algorithms, and simulations integrated with industrial technologies; quantum systems research; new application domains; and the next generation of a highly-trained workforce. Accelerated engineering of quantum technologies supporting quantum sensing, quantum communications, or quantum computing systems is the ultimate goal of a Q-AMASE-i Foundry.

Proposed activities should include transdisciplinary teams of scientists and engineers and should propose new concepts involving quantum materials that enable robust, efficient devices and novel system architectures, while deploying and integrating a data-harnessing community infrastructure within the discovery process. The activities should be designed to accelerate fundamental understanding of the physics of materials, their structure, property, and processing relationships, as well as associated device performance optimization for rapid technology development.

Research topics of interest include discovery, understanding, and optimization of materials for specific applications, modeling, design, fabrication, and characterization of quantum devices. Demonstration of superior functionalities for scalable and robust operation, and integration of those functionalities into circuits for system delivery is expected. Specifically, the demonstration is achieved by integration of accelerated materials manufacturing, characterization, and machine-learning tools with silicon-chip technology, or other industrial technologies. Such research should also demonstrate data-harnessing methods embodied in shareable and scalable tools that enable new understanding of the integrated system.

For the materials aspect, the scope of Q-AMASE-i should focus on specific classes of materials as outlined below:

- materials directly serving novel quantum technologies by exploring the paradigms of spintronics, valleytronics, twistrionics, and hybrid 2D materials design principles where properties can be tuned and controlled, for example, by changing the parameters of stacking;
- materials based on topological electronic phases, such as topological insulators, and topological semimetals, including but not limited to Dirac and Weyl systems, but also materials exploring quantum collective phenomena like superconductivity, charge order, or nematic order; and
- materials whose properties emerge from the interplay of many-body interactions and topology, such as materials hosting non-Abelian quasiparticles, topological superconductivity, Majorana quasiparticles, or spin liquids.

For all these classes of materials there is a growing need to develop mathematical models and computational strategies. In view of the infeasibility of direct quantum-mechanical computations, it is important to develop continuum mathematical models that facilitate understanding materials properties and device behavior and therefore have a direct impact on design. Furthermore, it is important to develop computationally-effective methods for discovering optimal material structure.

The education of transdisciplinary scientists and engineers with expertise in quantum technologies and in the use of advanced cyberinfrastructure, who are able to work collaboratively with researchers in physics, materials sciences, computer science, and mathematics, is a crucial aspect of the Q-AMASE-i goals. Achieving this goal requires the development of a collaborative cross-sector approach to science and engineering, but also the development of new courses, curricula, and/or graduate degree programs that cross departmental boundaries and are meant to grow the workforce for the next generation of quantum scientists and engineers. The impact of research and education is expected to be multiplied by the formation of a national network, whose purpose will be to cross-educate, leverage accelerated discoveries, identify bottlenecks, and share information and data between the Foundry and the community.

Participation of the private sector is required. To push the frontiers of fundamental research while enabling a measurable translational approach, elements of technological connection between accelerated materials development and applications is an essential part of the Q-AMASE-i program. First, the connection to existing or future mass-production technologies and ability to produce specific devices, systems, and platforms for quantum computing, quantum communications, and quantum sensing are an integral part of the Q-AMASE-i program. Secondly, the industry role in a Foundry is expected to go beyond being a recipient of results: industry partners are expected to be actively involved in proposing and executing directions of research that offer the best chance of translation into industry by, e.g., participating in the Foundry's advisory board, research and curriculum collaborations, and entrepreneurship, and providing industrial internships to students. Industrial partners are expected to play an active and documentable role in a Foundry.

Foundries are expected to implement an iterative loop where theory/modelling/simulation, in conjunction with experiment and data-centric methods supported by a shared cyberinfrastructure, lead to increased predictive power and improved use of data and enhanced data analytics. The development of robust data-harnessing approaches with the assistance of data scientists is anticipated, facilitating new methods and advanced cyberinfrastructure tools for automated discovery protocols and algorithms.

In addition to advancing interdisciplinary research, Q-AMASE-i will operate as a national resource that actively engages the science and engineering communities by: 1) providing samples (e.g., materials, devices, data, etc.) and characterization of materials, devices,

and systems, 2) serving as a focal point for accelerated information sharing and exchange, and 3) serving as a hub for networking with other established centers, institutes, national labs, and industry.

## II. PROGRAM DESCRIPTION

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The Q-AMASE-i program aims to substantially accelerate the development of novel quantum materials and devices, with translation to customer-ready products through cooperation with industry. Of particular interest are new materials and device structures for transport of charge and spin, including valleytronics, spintronics, and low-power electronics. Materials providing platforms for qubits or quantum sensors, such as complex heterostructures, vacancy-hosting materials, or topological systems, and systems that utilize proximity effects, and non-Abelian quasiparticles, can be considered by Q-AMASE-i.

Techniques of exfoliation and twistrionics are expected to provide high-throughput methods and access to out-of-equilibrium methods currently difficult to attain with, e.g., molecular-beam epitaxy. Ultrahigh purity of starting materials should come with an established and well-documented single-crystal growth expertise. Acceleration of materials discovery will be facilitated by the automation of the material synthesis and characterization process, including generation and sharing of large amounts of data structured in a way that enables robust data-harnessing, and the development of community tools that leverage machine-learning algorithms. Exploitation of fundamental science and engineering research to customer-oriented solutions includes integration of novel quantum materials and structures with device-oriented technologies, such as silicon-chip, flip-chip, or backend technology, leading to the integration of readout, amplification, and control elements of the device with novel materials and structures.

Q-AMASE-i aligns with the [Materials Genome Initiative \(MGI\)](#), which strives to “discover, manufacture, and deploy advanced materials in half the time and at a fraction of the cost.” Novel theory, data, computation, and simulation approaches are a central element of Q-AMASE-i. Foundries are expected to address and follow the paradigm of MGI, where the iterative loop of theory/modelling/simulation, experiment, and digital data leads to increased predictive power. Desired outcomes include the development of new methods utilizing data-harnessing for automated discovery protocols and algorithms.

The NSF Harnessing the Data Revolution Big Idea pursues fundamental data science and engineering research, to develop a cohesive, national-scale approach for research data infrastructure and to enable a 21st-century workforce capable of working effectively with data. Q-AMASE-i Foundries will generate large amounts of data and will enable new approaches in data-driven discovery for quantum materials science and engineering, through the exploration and use of a robust, and shared data infrastructure supporting research driven capabilities such as visualization, data mining, machine learning, and curated data.

The convergent-research Foundry approach requires participation of complementary disciplines. Demonstration of a convergent, transdisciplinary collaboration starting from the composition of the leadership and participant teams is required. Participation of researchers representing materials science, computer and data sciences, engineering, physics, chemistry, mathematics, and industrial research will provide the needed breadth of scientific expertise and will promote cross-fertilization of ideas.

A national network mechanism for exchange of data, information, education and collaboration will be developed by a Foundry within the first two years of operation. This network will also provide necessary close contact with the community and will serve as an interface with broader industrial partners or potential collaborators. Specifically, Foundries are expected to have established a cooperative network with other related Foundries and institutes, as well as with industry through the availability of new materials, devices, data, algorithms, etc., as well as through information sharing and exchange with the broader research community and potential collaborators.

A successful Q-AMASE-i Foundry will include training programs for the broader community as well as for the Foundry's own students working with Foundry participants and industrial partners. A broadening participation plan focusing on training students from diverse backgrounds is required; collaborations with Historically Black Colleges and Universities and institutions from the Partnerships for Research and Education in Materials program is encouraged. Workforce development must include building close relationships with industry by exposing students to translational aspects of research and by supporting industry-driven projects.

A Foundry must include industry partners as co-PIs, collaborators, or members of an Advisory Board. Industrial partners are expected to be actively involved in providing specific directions of research, integration with industrial technology, and may provide samples, expertise, software, or data that promise to resonate with respective markets. Since transformative technologies are expected to be developed by Q-AMASE-i Foundries, readiness for addressing Intellectual Property issues must be demonstrated by providing NSF with written documentation confirming an existing understanding between the Foundry's hosting institutions and the industry partners before the initiation of funding.

Q-AMASE-i Foundries will reside at institutions where the appropriate infrastructure, including laboratory, common space, and equipment sharing already exists to assist in the proposed research and to add value to the Foundry. The tools (or the suite of tools) acquired or developed through a Q-AMASE-i award should be novel and/or unique, going beyond the scope and scale of those that are acquired through other NSF modes of support, such as the Major Research Instrumentation (MRI) Program.

The Q-AMASE-i Program will NOT support proposal requests for any of the following:

- Construction, renovation or modernization of rooms, buildings or research facilities;
- General-purpose and supporting equipment. Supporting equipment refers to basic, durable components of a research facility that are integral to its operation (e.g., fume hoods, elevators, laboratory casework, and cryogen storage systems);
- Sustaining infrastructure and/or building systems. This category may include: electrical and plumbing systems, routine multi-purpose computer networks, standard safety features, and other general-purpose systems (e.g., HVAC, electrical generation and distribution systems, toxic waste removal systems, and telecommunications equipment); or
- General-purpose platforms or environment. This category may include (but is not limited to) general-purpose fixed or non-fixed structures or manned vehicles whose role is to host or transport an instrument.

Service contracts and warranties on purchased equipment over the award period are allowed.

The Q-AMASE-i Program will support equipment purchases, instrument and software development, and professional staffing including

support for the PIs, scientific experts, technicians, and a limited number of students and postdoctoral associates.

Six-year awards totaling \$20,000,000 to \$25,000,000 for the award period are anticipated. Q-AMASE-i proposals are expected to be front loaded with equipment, however, the annual budget may not exceed \$7,000,000 in any of the award years. Q-AMASE-i Foundries are awarded as cooperative agreements with an initial commitment of six years, with the possibility of one six-year renewal, subsequent to a rigorous and favorable review by NSF.

### III. AWARD INFORMATION

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

### IV. ELIGIBILITY INFORMATION

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#### Who May Submit Proposals:

Proposals may only be submitted by the following:

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

#### Who May Serve as PI:

There are no restrictions or limits.

#### Limit on Number of Proposals per Organization: 1

One (1) per organization as lead institution. Potential PIs are advised to contact their Sponsored Projects Office regarding processes used to select proposals for submission. In case of multiple submissions from the same institution, only the first submission will be considered, and all subsequent submissions will be returned without review.

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

Individuals may appear as Senior Personnel (Principal Investigator/Project Director, co-PI, and Faculty Associate or equivalent) on only one Q-AMASE proposal. In the event that any individual exceeds this limit, any proposal submitted to this solicitation with this individual listed as PI, co-PI, or Senior Personnel after the first proposal is received at NSF will be returned without review. No exceptions will be made. For this purpose, a multi-institution collaborative project is treated as one proposal. The lead institution must submit a single collaborative proposal managed by the lead institution, with subawards. Linked collaborative proposals submitted by participating institutions are not allowed.

#### Additional Eligibility Info:

Linked collaborative proposals submitted by participating institutions are not allowed. For multi-institutional collaborations the lead institution hosting the Foundry facilities must submit a single collaborative proposal managed by the lead institution, with subawards.

### V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

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#### A. Proposal Preparation Instructions

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##### Letters of Intent (required):

Submission of Letters of Intent is required. Letters of Intent must be submitted prior to Full Proposal submission (see "Due Dates"). Only one Letter of Intent per organization as the lead institution is allowed, and individuals may appear as Senior Personnel (Principal Investigator/Project Director, co-PI, and Faculty Associate or equivalent) on only one Q-AMASE-i Letter of Intent.

Letters of Intent must include the following:

- Proposal title.
- Description of the vision, key components, main activities, and major goals of the proposed Foundry.

A list of Senior Personnel (Principal Investigator/Project Director, co-PI(s), and Faculty Associate(s) or equivalent), including unfunded collaborators, and providing names, affiliations, and contact information for all participants.

- All Q-AMASE-i proposals must involve at least five Senior Personnel to ensure that all aspects of the project are adequately covered by relevant expertise. Senior Personnel need to demonstrate expertise in different areas of research, e.g. physics, materials, chemistry, mathematics, computational or data sciences, engineering in order to foster a convergent research approach.
- Estimated total budget for each year of Foundry's activities.

#### **Letter of Intent Preparation Instructions:**

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

- Submission by an Authorized Organizational Representative (AOR) is not required when submitting Letters of Intent.
- 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 Grants.gov or via the NSF FastLane system.

- Full proposals submitted via FastLane: Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG). The complete text of the PAPPG is available electronically on the NSF website at: [https://www.nsf.gov/publications/pub\\_summ.jsp?ods\\_key=pappg](https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg). Paper copies of the PAPPG may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from [nsfpubs@nsf.gov](mailto:nsfpubs@nsf.gov). Proposers are reminded to identify this program solicitation number in the program solicitation block on the NSF Cover Sheet For Proposal to the National Science Foundation. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.
- Full proposals submitted via Grants.gov: Proposals submitted in response to this program solicitation via Grants.gov should be prepared and submitted in accordance with the *NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov*. The complete text of the *NSF Grants.gov Application Guide* is available on the Grants.gov website and on the NSF website at: ([https://www.nsf.gov/publications/pub\\_summ.jsp?ods\\_key=grantsgovguide](https://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide)). To obtain copies of the Application Guide and Application Forms Package, click on the Apply tab on the Grants.gov site, then click on the Apply Step 1: Download a Grant Application Package and Application Instructions link and enter the funding opportunity number, (the program solicitation number without the NSF prefix) and press the Download Package button. Paper copies of the Grants.gov Application Guide also may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from [nsfpubs@nsf.gov](mailto:nsfpubs@nsf.gov).

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

#### **Cover Sheet.**

In addition to standard requirements described in NSF Proposal & Award Policies & Procedures Guide (PAPPG), cover sheet must include the following:

- **Program Solicitation Number.** FastLane users: Select the Q-AMASE-i Program solicitation number shown at the beginning of this solicitation from the drop -down menu. Grants.gov users: The Program solicitation will be pre-populated by Grants.gov on the NSF Grant Application Cover Sheet.
- **Proposal Title.** The proposal title must begin with "**Enabling Quantum Leap: Q-AMASE-i:** " followed by an informative project title.

Proposals that fail to comply with formatting instructions per the Proposal and Award Policies and Procedures Guide, the Cover Sheet specifications, or the instructions given below may delay processing or result in the proposal being returned without review.

#### **Project Summary.**

Project Summary must include three summary paragraphs: Project Overview, Intellectual Merit and Broader Impacts. **Limit: 1 page.**

#### **Project Description.**

The Project Description must include all of the following sections and section headers as listed below. **Total page limit for Project Description: 30 pages.**

#### **Participant List.**

Provide a list of participating senior personnel (faculty rank or equivalent) by full name, organizational and departmental affiliation, and expected major roles in the proposed Q-AMASE-i Foundry (e.g., in-house research, instrument and cyberinfrastructure development, research community interaction, industrial interaction, or education). Describe briefly the expertise of the team with respect to the proposed research topics and network building. It will be helpful to boldface the name of each Senior Personnel wherever it occurs throughout the Project Description. **Limit: 2 pages.**

#### **Results from Prior NSF support.**

All PIs and co-PIs listed on the proposal Cover Sheet who have received an NSF award with an end date in the past five years must provide information on their NSF award(s); in cases where a PI or co-PI has received more than one award they need only report on the award most closely related to the proposal. Collaborative research and Foundry management activities funded by NSF should be an emphasis of this section. There is no need for senior personnel other than the PI and co-PIs to provide Results from Prior NSF Support. **Limit: 3 pages.**

**Rationale for the Foundry.**

Describe the overall vision for Q-AMASE-i Foundry. In separate paragraphs identify the major goals for the in-house research, national network, education/training, and diversity aspects of the proposed Q-AMASE-i. **Limit: 1 page.**

**Description of the Foundry.**

Describe the capabilities enabled through the purchased and developed tools. Include a discussion of timeline, readiness, steps and stages of development. Discuss how the Q-AMASE-i Foundry will utilize and leverage existing infrastructure, both local and external. This section must also include a description of how the Q-AMASE-i Foundry advances the three Big Ideas: Quantum Leap, Growing Convergent Research at NSF and Harnessing the Data Revolution, through in-house research, national network, and education/training. **Limit: 3 pages.**

**Scientific Program.**

Describe the targeted outcome of the Q-AMASE-i Foundry and specific in-house research activities designed to accelerate discovery of quantum materials and devices. Describe the critical needs of the scientific community that the proposed Q-AMASE-i Foundry will serve. Provide scientific justification for instrument acquisition and development. Indicate major roles of Senior Personnel. Where more than one institution is involved, the mechanisms proposed to prevent negative impact of distance on the collaborative, interactive nature of the Q-AMASE-i Foundry must be clearly described. **Limit: 6 pages.**

**National Network.**

In this section, describe the how the Foundry will establish a National Network with other Foundries and institutes, national laboratories industry, etc. and how new materials, devices, data, etc. will be made available to the research communities. **Limit: 4 pages.**

**Table of Major Infrastructure.**

List the infrastructure (primarily experimental equipment, but can include cyberinfrastructure, computers, robotics, software, data resources etc.). Include existing instruments, instruments to be purchased, and instruments to be developed. **Limit: 1 page.**

Item	Existing /Acquisition /Development	When available	Approximate Cost

**Education and human resource development.**

Describe a limited number of well-chosen education/training and outreach activities that advance the educational experiences for users, as well as graduate and undergraduate students, postdoctoral researchers, and/or others associated with the Q-AMASE-i. Include a brief description of how the education/training goals integrate strategically with the research goals of the Q-AMASE-i Foundry. Potential activities such as hands-on conferences, webinars, summer/winter schools, research experiences for undergraduates, may be considered. Describe outreach plans intended to develop the national network, to encourage non-traditional participants from diverse communities, and to reach potential users from industry, whose work could inform or benefit from instrumentation and technique development activities. Where more than one institution is involved, mechanisms to ensure distance does not negatively impact the collaborative, interactive nature of the Q-AMASE-i Foundry must be clearly described. **Limit: 2 pages.**

**Diversity strategic plan.**

Q-AMASE-i Foundries are expected to demonstrate a significant commitment to the involvement of underrepresented groups (e.g., women, underrepresented minorities, persons with disabilities) as Foundry participants (faculty participants, technicians, and, if applicable, postdoctoral researchers and students). Describe the Q-AMASE-i Foundry strategic plan to broaden participation, the metrics that will be used to measure progress, and the desired outcome for the 6 year award period. The inclusion of underrepresented groups as well as institutions that serve the national interest, such as community colleges, primarily undergraduate institutions, and minority-serving institutions, can also be discussed. **Limit: 1 Page.**

**Industry Partnership and Knowledge Transfer.**

State the specific goals for translational science approach and knowledge transfer activities and the expected impacts of the activities, including the sharing of new materials, instruments, techniques, processes and data. Given the anticipated advances expected from the real time integration of theory with experimentation and characterization, describe methodologies for providing access to existing, acquired, and developed tools for the sharing of data, algorithms, and other products, as well as the creation and utilization of community resources such as databases. As appropriate, describe plans for intellectual and resource exchanges, cooperation, and partnerships with industry and other organizations that may involve academic organizations, national laboratories, non-profit organizations, federal, state, and local governments, and others. Describe the role of industry partners (Senior Participants, facility users, collaborators, Advisory Committee and User Committee members). **Limit: 2 pages.**

**Management Plan. Limit: 4 pages.**

Management Plan must include the following elements:

- Organizational Chart: Show all critical components of the governance structure including the Executive Committee and External Advisory Committee.
- Describe functions of key leadership positions and major committees.
- Provide a description of the resources that the organization(s) will provide to the project, should it be funded. Resources such



as space, faculty release time, faculty and staff positions, capital equipment, access to existing facilities, collaborations, and support of outreach programs should be discussed, but not given as dollar equivalents.

**Summary Table of Requested Support.**

Provide a Summary Table of Requested NSF Support. In tabular form as follows, summarize the overall support levels planned for the Q-AMASE-i Foundry. For each entry in the table, include direct and indirect costs. Include amounts for each year (only year one is shown here). Column totals must equal the total budget requested from NSF for the period shown. Include major capital equipment under shared facilities. Equipment acquisition is expected to be most significant in the first few years, but Annual budget may not exceed \$7,000,000 in any of the award years. Support for graduate students should be included under research, not under education and human resources. **Limit: 1 Page.**

SUMMARY TABLE OF REQUESTED NSF SUPPORT				
ACTIVITY	YEAR 1 (\$k)	%	6-YEAR TOTAL(\$k)	%
Q-AMASE-i Foundry in-House Research				
National Network				
Equipment and Cyberinfrastructure Development and Purchase				
Education and Human Resources				
Knowledge Transfer to Other Sectors				
Administration				
Total		100		100

The Project Description part ends here. Remaining required documents do not count against the total limit of Project Description.

**Single Copy Documents:**

- **Required:** Submit a list of individuals who might be “suitable reviewers” to act as impartial reviewers through the List of Suggested Reviewers function of FastLane. Include their names, affiliations, phone numbers, e-mail addresses, and areas of expertise. PIs can also designate persons they would prefer not review the proposal, indicating why.

Single Copy Documents are used by NSF staff, but are not available to reviewers. **Limit: 2 pages.**

**Supplementary Documents**

Include only official letters of collaboration from participating organizations. Such letters cannot contain endorsements or evaluation of the proposed project. Details about collaborative work to be done under this project should be included within the Project Description, not in supplementary documents. **Limit: 10 pages.**

**Other Documents**

Standard proposal submission requirements such as inclusion of Biographical Sketches, Collaborators and Other Affiliations information, and Current and Pending Support for participating senior personnel (faculty rank or equivalent), as well as Data Management Plan and Postdoctoral Mentoring Plan apply. For more information see: [https://www.nsf.gov/publications/pub\\_summ.jsp?ods\\_key=pappg](https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg)

**B. Budgetary Information**

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**Cost Sharing:**

Inclusion of voluntary committed cost sharing is prohibited.

**C. Due Dates**

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

September 17, 2018

Due Date

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

November 05, 2018

Due Date

**D. FastLane/Grants.gov Requirements**

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**For Proposals Submitted Via FastLane:**

To prepare and submit a proposal via FastLane, see detailed technical instructions available at: <https://www.fastlane.nsf.gov/a1/newstan.htm>. For FastLane user support, call the FastLane Help Desk at 1-800-673-6188 or e-mail [fastlane@nsf.gov](mailto:fastlane@nsf.gov). The FastLane Help Desk answers general technical questions related to the use of the FastLane system. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this funding opportunity.

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

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

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

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

## VI. NSF PROPOSAL PROCESSING AND REVIEW PROCEDURES

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

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

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

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

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

### A. Merit Review Principles and Criteria

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

#### 1. Merit Review Principles

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

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

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

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

## 2. Merit Review Criteria

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

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

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

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

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

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

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

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

### Additional Solicitation Specific Review Criteria

1.
  - How does the proposed Q-AMASE-i Foundry, through (a) in-house research and (b) its national network, meet a critical infrastructure need for the science and engineering communities to substantially accelerate quantum materials design, synthesis, characterization, and the translation of fundamental science and engineering research to new quantum devices, systems, and networks?
  - Is the education/training of cross-disciplinary scientists, engineers, and instrument developers who are well-versed in quantum technologies a strong component of the proposed work?
  - How successful is the Q-AMASE-i Foundry in establishing and sharing a cooperative national network with other related Foundries, institutes, industry, and research community? Does the Foundry provide broad and timely

community access to its outputs, including data that are shared, searchable, and suitable for mining, samples, methods, techniques, software, algorithms, and publications?

- o Is the private sector/industry role and participation adequate to secure active involvement in proposing and executing directions of research that offer the best chance of translation into industry?
- o Does the proposal include elements of strong and convincing coupling to NSF Big Ideas of Quantum Leap, Growing Convergent Research at NSF and Cyberinfrastructure for Harnessing the Data Revolution?

## B. Review and Selection Process

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

Proposals submitted in response to this Program solicitation will initially be evaluated by ad hoc and panel review. If determined necessary by Management Team, finalists may be invited for a reverse site visit at NSF. During the reverse site visit, finalists will make oral presentations to a second panel and NSF staff and engage in a question and answer session. NSF reserves the option to conduct a site visit prior to making an award.

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

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

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

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

## VII. AWARD ADMINISTRATION INFORMATION

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### A. Notification of the Award

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

### B. Award Conditions

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

\*These documents may be accessed electronically on NSF's Website at [https://www.nsf.gov/awards/managing/award\\_conditions.jsp?org=NSF](https://www.nsf.gov/awards/managing/award_conditions.jsp?org=NSF). Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from [nsfpubs@nsf.gov](mailto:nsfpubs@nsf.gov).

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

## C. Reporting Requirements

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

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

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

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

## VIII. AGENCY CONTACTS

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

General inquiries regarding this program should be made to:

- Tomasz Durakiewicz, telephone: (703) 292-4892, email: [tdurakie@nsf.gov](mailto:tdurakie@nsf.gov)
- Victor Roytburd, telephone: (703) 292-8584, email: [vroytbur@nsf.gov](mailto:vroytbur@nsf.gov)
- Dominique Dagenais, telephone: (703) 292-2980, email: [ddagenai@nsf.gov](mailto:ddagenai@nsf.gov)
- Amy Walton, telephone: (703) 292-4538, email: [awalton@nsf.gov](mailto:awalton@nsf.gov)

For questions related to the use of FastLane, contact:

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

For questions relating to Grants.gov contact:

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

## IX. OTHER INFORMATION

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

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

## ABOUT THE NATIONAL SCIENCE FOUNDATION

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

NSF funds research and education in most fields of science and engineering. It does this through grants and cooperative agreements to

more than 2,000 colleges, universities, K-12 school systems, businesses, informal science organizations and other research organizations throughout the US. The Foundation accounts for about one-fourth of Federal support to academic institutions for basic research.

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

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

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

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

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

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

- **Location:** 2415 Eisenhower Avenue, Alexandria, VA 22314
- **For General Information** (NSF Information Center): (703) 292-5111
- **TDD (for the hearing-impaired):** (703) 292-5090
- **To Order Publications or Forms:**
  - Send an e-mail to: [nsfpubs@nsf.gov](mailto:nsfpubs@nsf.gov)
  - or telephone: (703) 292-7827
- **To Locate NSF Employees:** (703) 292-5111

## PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

The information requested on proposal forms and project reports is solicited under the authority of the National Science Foundation Act of 1950, as amended. The information on proposal forms will be used in connection with the selection of qualified proposals; and project reports submitted by awardees will be used for program evaluation and reporting within the Executive Branch and to Congress. The information requested may be disclosed to qualified reviewers and staff assistants as part of the proposal review process; to proposer institutions/grantees to provide or obtain data regarding the proposal review process, award decisions, or the administration of awards; to government contractors, experts, volunteers and researchers and educators as necessary to complete assigned work; to other government agencies or other entities needing information regarding applicants or nominees as part of a joint application review process, or in order to coordinate programs or policy; and to another Federal agency, court, or party in a court or Federal administrative proceeding if the government is a party. Information about Principal Investigators may be added to the Reviewer file and used to select potential candidates to serve as peer reviewers or advisory committee members. See Systems of Records, *NSF-50*, "Principal Investigator/Proposal File and Associated Records," 69 Federal Register 26410 (May 12, 2004), and *NSF-51*, "Reviewer/Proposal File and Associated Records," 69 Federal Register 26410 (May 12, 2004). Submission of the information is voluntary. Failure to provide full and complete information, however, may reduce the possibility of receiving an award.

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

Suzanne H. Plimpton  
Reports Clearance Officer  
Office of the General Counsel  
National Science Foundation  
Alexandria, VA 22314



National Science Foundation, 2415 Eisenhower Avenue, Alexandria, Virginia 22314, USA  
Tel: (703) 292-5111, FIRS: (800) 877-8339 | TDD: (703) 292-5090 or (800) 281-8749

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