

Management and Operations of the Arecibo Observatory

PROGRAM SOLICITATION

NSF 17-538



National Science Foundation

Directorate for Mathematical & Physical Sciences
Division of Astronomical Sciences

Directorate for Geosciences
Division of Atmospheric and Geospace Sciences

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

April 25, 2017

May 04, 2017

IMPORTANT INFORMATION AND REVISION NOTES

The deadline for submission of proposals has been extended to 5 p.m. submitter's local time on May 4, 2017.

Any proposal submitted in response to this solicitation should be submitted in accordance with the revised *NSF Proposal & Award Policies & Procedures Guide* (PAPPG) ([NSF 17-1](#)), which is effective for proposals submitted, or due, on or after January 30, 2017.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Management and Operations of the Green Bank Observatory

Synopsis of Program:

The National Science Foundation (NSF) hereby solicits proposals to manage and operate the Arecibo Observatory (AO). The AO is a multidisciplinary research and education facility. AO's cornerstone research instrument is a 305-meter diameter fixed spherical reflector, located on approximately 120 acres of U.S. Federal Government-owned land near Arecibo, Puerto Rico. AO conducts research in passive radio astronomy, solar system radar astronomy, and space and atmospheric sciences.

NSF is currently preparing an Environmental Impact Statement (EIS) to evaluate proposed operational changes at AO due to funding constraints, pursuant to the National Environmental Policy Act (NEPA). In the Draft EIS released in October 2016, NSF evaluated the anticipated environmental impacts stemming from implementation of several proposed alternatives, including the Agency Preferred Alternative: Collaboration with interested parties for continued science-focused operations at AO. The current solicitation supports this Preferred Alternative.

In cooperation with NSF and within available resources, the proposer will plan and execute a viable program of research and/or education, consistent with the objectives and priorities of the scientific community. The recipient will manage the facilities and equipment provided by NSF, and will provide support and technical personnel to manage AO as a well-integrated research and/or education facility. A significant portion of the AO program should be carried out in collaboration with its stakeholder communities, and other collaborators.

NSF anticipates greatly reduced and decreasing funding over the life of this effort, to a total of \$2M per year by the end of the five-year project period (and pending availability of funds). In consideration of these reductions, operations and activities cannot be sustained at current levels without external sources of funding. A viable proposal must demonstrate a feasible and reasonable approach to managing and operating AO, and, if applicable, to obtaining and sustaining a significant share of the AO's operational costs.

This solicitation encourages creative approaches to providing continued operations of AO. Proposers must describe how they will establish appropriate partnerships with universities, industry, and/or private organizations; and obtain additional funds (beyond those provided by NSF) to support their proposed activities. Commensurate with their proposed activities, proposers must provide an overall management structure fostering observing capabilities and scientific data collection and/or an integrated program of education, training and outreach. The funding provided by

NSF, however, is contingent upon the recipient conducting passive radio astronomy and aeronomy science activities.

For increased flexibility in providing funding and activity alternatives, NSF may consider requests made by proposing entities for transfer of the AO title. A viable proposal requesting transfer of title must demonstrate a strong case for why title transfer is desirable.

The successful proposal would be awarded as a cooperative agreement or master cooperative agreement with cooperative support agreement(s) on or after 1 April 2018 with an anticipated duration of five years, and possibly renewable upon a successful review for an additional five years. A transition period may be proposed.

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.

- Joseph E. Pesce, W9159, telephone: (703) 292-7373, email: jpesce@nsf.gov
- John W. Meriwether, W8205, telephone: (703) 292-8529, email: jmeriwet@nsf.gov

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

- 47.049 --- Mathematical and Physical Sciences
- 47.050 --- Geosciences

Award Information

Anticipated Type of Award:

Cooperative Agreement or Master Cooperative Agreement with Cooperative Support Agreement(s)

Estimated Number of Awards: 1

Anticipated Funding Amount: \$20,150,000

over the five-year period, beginning in FY 2018, pending the availability of funds.

It is possible an award will not be made for this solicitation. Reimbursement of bid and proposal costs is not anticipated in connection with this effort.

Eligibility Information

Who May Submit Proposals:

Proposals may only be submitted by the following:

- Universities and Colleges - Universities and two- and four-year colleges (including community colleges) accredited in, and having a campus located in, the US acting on behalf of their faculty members. Such organizations also are referred to as academic institutions.
- Non-profit, non-academic organizations: Independent museums, observatories, research labs, professional societies and similar organizations in the U.S. associated with educational or research activities.
- For-profit organizations: U.S. commercial organizations, especially small businesses with strong capabilities in scientific or engineering research or education.
- Consortia including international collaborations, but NSF funds may be awarded only to U.S. organizations.

Who May Serve as PI:

There are no restrictions or limits.

Limit on Number of Proposals per Organization: 1

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

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Letters of Intent:** Not required
- **Preliminary Proposal Submission:** Not required
- **Full Proposals:**
 - Full Proposals submitted via FastLane: *NSF Proposal and Award Policies and Procedures Guide* (PAPPG) guidelines apply. The complete text of the PAPPG is available electronically on the NSF website at: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg.

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:**

Voluntary committed cost sharing may be included. If accepted by the Foundation, the cost sharing commitment becomes legally binding and is subject to audit.

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

Not Applicable

- **Other Budgetary Limitations:**

Other budgetary limitations apply. Please see the full text of this solicitation for further information.

C. Due Dates

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

April 25, 2017

May 04, 2017

Proposal Review Information Criteria

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

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

NSF is authorized by the National Science Act of 1950, as amended, to initiate and support basic and applied scientific research and to initiate and support programs to strengthen scientific research potential. To achieve these goals, NSF supports facilities that provide research capabilities in various scientific disciplines. One such facility, AO, currently provides instrumentation for research in radio astronomy, planetary radar studies, and space and atmospheric sciences.

The mission of AO has been to:

- Support, sustain, and advance research in areas of astronomy, planetary studies, and space and atmospheric sciences for the benefit of the scientific research community;
- Acquire, analyze, archive and disseminate AO data;
- Develop instruments and techniques as necessary to support AO-enabled research in partnership with scientists from related sectors, including academia, industry, government and the international community;
- Develop and maintain a skilled and diverse workforce, as necessary to support the sciences served by AO;
- Provide integrated and effective education and training programs that utilize the knowledge and discoveries made at AO and that strengthen education and public awareness of AO-related science, engineering and technology;
- Develop and sustain appropriate partnerships with universities, industry, private organizations and the international community to enhance AO's scientific productivity and educational impact.

In the NSF Division of Astronomical Sciences' (AST) Portfolio Review Committee Report (2012), AO was not in the list of "essential AST facilities" given in Recommendation 9.15. Instead, it was in the list of additional facilities ranked in Recommendation 9.16: "Based on their capabilities and current cost, the committee ranks the remaining facilities in the priority order (highest to lowest): Gemini-North, Arecibo, Mayall, VLBA, NIST, GBT, SOAR, WIYN, and McMath-Pierce." In this context, the committee recommended "continued AST involvement in Arecibo...be re-evaluated later in the decade in light of the science opportunities and budget forecasts at that time."^[1] The *New Worlds, New Horizons: Midterm Assessment* (15 Aug 2016) reinforced this, with Recommendation 3.1 noting: "The NSF should proceed with divestment from ground-based facilities that have a lower scientific impact..."^[2]

The Geospace Section (GS) Portfolio Review Committee (PRC) was charged by the NSF Advisory Committee for Geosciences (AC/GEO) to review the most promising Geospace science strategies and critical capabilities and to reconcile these with the science goals described by the 2013 Decadal Survey for Solar and Space Physics. The GS is associated with the Division of Atmospheric and Geospace Sciences (AGS) in the Geosciences Directorate. Science grant programs supporting research in aeronomy, magnetospheric physics, and solar-terrestrial physics combined with program support for ionospheric radar and lidar (Geospace Facilities) and Space Weather observations (SuperDARN and AMPERE) constitute the GS portfolio. This PRC review was carried out using the assumption of an inflation-adjusted, flat budget for GS over the next decade to FY 2026. The PRC recommendations include the reduction of annual NSF/AGS Arecibo Observatory funding from \$4.1 million to \$1.1 million by 2020. The NSF/GEO Directorate commissioned a review from a second panel assembled by the National Academy of Science that was given the charge of assessing the process by which the PRC findings and recommendations were reached. The results of this review are expected in early 2017.

NSF is currently preparing an Environmental Impact Statement (EIS) to evaluate proposed operational changes at AO due to funding constraints, pursuant to the National Environmental Policy Act (NEPA). NSF is also completing its compliance obligations with the National Historic Preservation Act (NHPA), and the Endangered Species Act (ESA). A draft version of the EIS (Draft EIS) was released on 28 October 2016.^[3] In the Draft EIS NSF evaluated the anticipated environmental impacts stemming from implementation of several proposed alternatives, including: 1) No-Action Alternative; 2) *Alternative 1* - Collaboration with interested parties for continued science-focused operations at Arecibo Observatory (identified in the Draft EIS as the Agency Preferred Alternative; the current solicitation supports this alternative); 3) *Alternative 2* - Collaboration with interested parties for continued education-focused operations at Arecibo Observatory; 4) *Alternative 3* - Mothballing of facilities (suspension of operations in a manner such that operations could resume efficiently at some future date); 5) *Alternative 4* - Partial deconstruction and site restoration; and 6) *Alternative 5* - Full deconstruction and site restoration.

Following the 45-day public comment period that ended on 12 December 2016, NSF is preparing a Final EIS. Concurrently with the EIS process, NSF is working with consulting parties under Section 106 of the NHPA to find ways to avoid, minimize, and/or mitigate any adverse effects on nationally significant historic properties at AO as a result of implementation of any of the proposed alternatives. Likewise, NSF is working with the U.S. Fish and Wildlife Service to evaluate the anticipated impacts from implementation of the proposed alternatives on threatened/endangered species and/or their habitats.

After the conclusion of NSF's compliance with these federal statutes, NSF will prepare a Record of Decision that documents its chosen course of action with regard to AO. If a decision is made to transfer AO title to another owner, that transfer may require agreements to protect threatened/endangered species and their habitats and/or certain measures to address impacts to significant historic properties.

AO is currently funded at about \$8.3M per year from NSF (\$4.2M from AST and \$4.1M from AGS), supplemented by National Aeronautics and Space Administration (NASA) funding at a level of approximately \$3.6M per year. NSF anticipates funding for future AO management and operations, as described in Section III, to be reduced from current levels.

AO is currently managed through a cooperative agreement with SRI International (SRI) who together with Universities Space Research Association (USRA) and Universidad Metropolitana (UMET) form the Arecibo Management Team. The National Science Board has adopted the principle that NSF awards should be competed to assure the best use of NSF funds for supporting research and education.

Through this program solicitation, NSF hereby requests proposals for the management and operation of AO through a cooperative agreement beginning on or after 1 April 2018, and continuing for a five-year award period. Award is possibly renewable upon a

successful review for an additional five years. A transition period may be proposed.

[1] https://www.nsf.gov/mps/ast/ast_portfolio_review.jsp

[2] <https://www.nap.edu/catalog/23560/new-worlds-new-horizons-a-midterm-assessment>

[3] https://www.nsf.gov/mps/ast/env_impact_reviews/arecibo/arecibo_drafteis.jsp

II. PROGRAM DESCRIPTION

A. Description of the Arecibo Observatory

AO is a multidisciplinary research and education facility. AO's cornerstone research instrument is a 305-meter diameter, fixed, spherical reflector, located on approximately 120 acres of U.S. Government-owned land in Barrio Esperanza, Arecibo, Puerto Rico, some 10 miles inland from the city of Arecibo. AO conducts passive radio astronomy, solar system radar astronomy, and observations of the upper atmosphere and ionosphere.

In the 1990s, a major upgrade was conducted in which the telescope was equipped with aberration-correcting Gregorian optics and outfitted with a suite of state-of-the-art, low-noise receivers that cover frequency bands ranging from 400 MHz to 10 GHz. A seven-feed array receiver, the Arecibo L-band Feed Array (ALFA), was commissioned in FY 2006 and is now conducting routine science observations. Operating near 1.4 GHz, ALFA consists of a cluster of seven cooled dual-polarization feeds, a fiber-optical transmission system, and digital back-end signal processors. The installation and commissioning of new, wide-band spectrometers in FY 2008 allows up to three observing programs to be conducted simultaneously on each sky pointing.

Additionally, a 1 MW 2380 MHz radar system is available for solar system studies, and a 430 MHz incoherent scatter radar is used for space and atmospheric sciences research. Several lidars and other optical instruments are also located on-site. An ionospheric high-frequency heating facility is now operational at AO at frequencies of 5.1 MHz and 8.175 MHz, with an effective radiated power of approximately 200 MW. The 12-meter steerable radio antenna to be used for phase-referencing Very Long Baseline Interferometric (VLBI) and geodesic observations is scheduled to be operational by March 2018.

The AO-Remote Observing Facility is operational on the island of Culebra, approximately 95 miles east of Arecibo. The remote, and undeveloped, nature of the island allows for the simultaneous use of optical instruments and the Arecibo 430 MHz radar, with considerably greater probability of clear skies.

Currently, AO is staffed at approximately 120 Full-time Equivalent (FTE) employees, of which about 100 are funded by NSF. The remaining FTEs are supported by a grant from NASA, by the Angel Ramos Foundation Visitor Center, and by other funding sources. Further details about the facilities and operations managed by AO may be found on the AO web site at <http://www.naic.edu/>.

AO administers observing time to the astronomy, planetary science, and space and atmospheric sciences communities via competitive observing proposals. Typically, each year AO evaluates approximately 100 proposals and allocates observing time to several hundred users. Approximately 75 percent of astronomy users conduct their observing programs remotely via networked control software, while for radar and lidar observations users are typically on-site.

Researchers use the AO observational facilities to study such diverse areas as the origin and evolution of magnetic fields, pulsars and fundamental physics, complex and pre-biotic molecules in the interstellar medium, and the formation and evolution of galactic structure, as well as topics in solar system astronomy such as the physical properties of asteroids, planetary surfaces and moons, and the post-discovery characterization and orbital refinement of near-Earth asteroids.

The AO incoherent scatter radar is part of an NSF-supported network of radars strategically distributed to observe the transport of radiative energy and charged particles, from their origins at the sun to their deposition in Earth's upper atmosphere. The sensitivity of the AO radar system allows it to measure the density, temperature and motion of plasma in Earth's ionosphere with high temporal and spatial resolution.

In addition to supporting a multidisciplinary user community, AO has provided educational and public outreach programs at all levels. These programs include observing support for graduate students, Research Experiences for Undergraduates (REU), Research Experiences for Teachers (RET), web-based public outreach, and the operation and maintenance of the Angel Ramos Foundation Visitor Center. The REU and RET programs are funded through a separate NSF award. Partnership programs in education and public outreach have reached tens of thousands of K-12 students in public and private school systems in Puerto Rico with enrichment programs in astronomy, space and atmospheric sciences.

B. Description of Recipient Responsibilities

In responding to this solicitation, proposing organizations are encouraged to consider alternative models of operations and governance, changes to programmatic scope, and effective partnerships that would leverage NSF support to sustain AO as a national, multi-user facility that is responsive to its stakeholders in the scientific community and in the Commonwealth of Puerto Rico. Within available resources, and consistent with the expectations and criteria identified in this solicitation, the viable proposal will present a compelling, sustainable vision for AO that supports an optimal suite of user-driven research and/or education activities through effective structures for management and operations. Proposals for science-focused operations, educational-focused operations, or a mix of the two will be considered under this solicitation. Proposals may include a suite of science activities (for example, as provided currently), or a subset of these activities. **However, the funding provided by AST (see below) is contingent upon the recipient conducting passive radio-astronomy-science activities, and that from AGS (see below) is contingent upon the recipient conducting aeronomy-science activities.**

CORE EXPECTATIONS

As the AO managing organization, the recipient will work closely with NSF and the scientific research community to ensure that AO supports, sustains, and advances science as enabled by AO's research capabilities. The recipient will be accountable for fulfilling AO's mission through a strategy that capitalizes on the Federal investment to serve the scientific community, and, to the extent possible, to promote research. Note this mission may change based on the response to this solicitation.

The recipient will be responsible for the overall management and performance of AO, including the infrastructure, instrumentation and staff, and for maximizing the benefits to the scientific research community through a strategically planned scope of activities.

In cooperation with NSF, AO will plan and execute a viable and coherent program of research. The recipient will manage facilities and equipment provided by NSF, will provide additional facilities and equipment as necessary, and will develop a diverse and inclusive team of expert support and technical personnel to manage AO as a scientifically competitive research and/or education facility. AO is a multidisciplinary resource; as such, a significant portion of the AO research program should be carried out in collaboration with its stakeholder communities.

The recipient will be expected to meet the highest standards for service and delivery to the scientific community and to demonstrate a proactive and effective approach to performance management. The recipient will ensure that AO operates with integrity and transparency, maintaining quality and responsiveness in administration and management.

NSF may consider proposals requesting the transfer of title to AO from the NSF to the recipient (whether for the entire facility and land, or some subset). Proposals requesting such a title transfer must make a compelling case for, and demonstrate the necessity and viability of, the transfer. NSF may elect at its sole discretion to engage one or more proposing entity or entities to explore the details of a transfer request.

If proposed activities require more than the funding provided by the NSF, the responder must show detailed plans for how funding will be obtained, and the role, if any, of collaborations and partnerships. If partnerships and collaborations are proposed, the responder should discuss partnership risks. The responder will provide a compelling management structure commensurate with the scientific and/or educational activities they propose.

Specific Duties

The proposer will describe in detail the specific activities they expect to conduct under their management and operations plan. These may include, as appropriate:

- Operating and maintaining AO buildings and facilities, and managing AO staff and all activities according to best practices and in full compliance with all relevant laws and regulations;
- Providing upgrades, enhancements and new services, as required and within available resources, to ensure community access to state-of-the art facilities, data and support;
- Developing and maintaining an outstanding scientific, engineering and administrative staff, as necessary to support the AO mission within the defined programmatic scope;
- Developing and executing a competitive and inclusive science program of user-driven research enabled by AO that reflects the mission, core values and goals articulated in the NSF Strategic Plan and that demonstrably complements the research carried out in the broader scientific disciplines served by AO;
- Seeking and implementing strategic partnerships with U.S. universities, Federal, and non-Federal entities that will enhance the scientific and educational capabilities and support available to AO's stakeholder communities.

Management

The management plan should be presented in sufficient detail to allow its viability to be assessed. Elements to consider:

- An effective governance and advisory structure to provide guidance, advice and oversight for all AO activities, consistent with the responder's vision, goals, and objectives.
- A structured framework for planning, review and performance management, including the development and use of appropriate mechanisms to aid both the managing organization and AO's stakeholders in assessing performance and identifying areas for improvement.

Operations

The recipient will be responsible for staffing and managing the AO to ensure that on-site instruments are able to operate in response to high-priority scientific research conducted by qualified scientists. To this end the proposer will articulate a strategic plan for maintaining a viable, community-driven scope of observatory operations and will employ mechanisms for reviewing and scheduling user access through an open process (at least for NSF-funded portions of research). **The proposer should identify which existing AO infrastructure they plan to utilize for their proposed activities.**

The proposer will provide a data management plan that describes the acquisition, analysis, archiving and dissemination of all the AO data, including the definition of proprietary periods and appropriate cyberinfrastructure and cybersecurity to meet the proposed scope of user community support.

Science (as appropriate)

Commensurate with the level of funding provided by NSF, the proposer will define a scientific program plan for AO that demonstrates responsiveness to community-based scientific objectives, an innovative vision built on existing and potential capabilities of AO, a well-defined scope of high-priority activities, and a credible plan for establishing the necessary resources to support the proposed suite of activities. Science activities beyond those supported by NSF may be supported by proposed cost-sharing activities.

As defined by the proposed science program, the proposer will ensure that AO has sufficient internal or external expertise to (1) support outside users, (2) help guide decisions relating to current and future instrumentation and observing modes, (3) develop and maintain data acquisition and data processing software, and (4) develop and implement policies and strategies for data availability and data archiving.

As appropriate, recipients will be responsible for managing radio frequency interference (RFI) and frequency licensing and certifications. The recipient must maintain a vigilant awareness of the radio frequency environment of AO through a program of RFI monitoring, and take all appropriate steps to mitigate to the extent possible the impact of such signals on the observational mission of AO. The recipient will cooperate with NSF's efforts to shape national and international regulations and policies for the purpose of maintaining a manageable RFI environment in which to conduct AO science operations, if required.

Access

U.S. national telescope facilities are open to all astronomers regardless of institutional or national affiliation, at a level commensurate with funding provided by NSF. For any NSF-funded observing time, the proposer should adhere to the Principles for Access to Large Federally Funded Astrophysics Projects and Facilities, recommended by the Astronomy and Astrophysics Advisory Committee (AAAC) in March 2014. These include the following key principles applicable to an operating observatory:

- Open Data
- Open Access
- Opportunity to Contribute
- Reciprocity

For further details, see https://www.nsf.gov/mps/ast/aaac/aaac_2014_principles_for_access-v2.pdf

Partnership agreements that dedicate blocks of user time in exchange for financial or personnel contributions to AO must be consistent with the proposed AO mission and justified in their overall benefit to the AO user community and the broader scientific research community.

Education and Public Outreach (as appropriate)

AO currently operates a vigorous program of education, outreach and community development activities that includes collaborative partnerships with undergraduate and minority-serving institutions, student involvement in AO research, a significant base of tourism and public visitors, and resources for K–12 students and teachers in the Commonwealth of Puerto Rico. The responder may propose an innovative, integrated program of research and education that builds on AO's scientific strengths and on its local context, incorporating the Angel Ramos Foundation Visitor Center.

Maintenance

Proposing organization should provide a maintenance plan commensurate with their proposed activities.

Staffing

Proposing organization should provide a staffing plan commensurate with their proposed activities.

Diversity

The proposer will demonstrate leadership in employing best practices for broadening participation in science and engineering at all levels within the Facility's activities.

Collaborations, Partnerships or Other Arrangements

The proposer may develop collaborations, partnerships or arrangements with universities/colleges, national laboratories, research museums, private sector research laboratories and observatories, state and local government laboratories, other federal entities, and/or private-sector organizations that enable the proposer to attain its strategic goals. The recipient is responsible for planning, operating, and managing all AO activities, including any resources provided by other organizations.

Transition Plan

Proposing organizations may be funded for an initial transition period preceding the five-year award. If a new recipient is selected to operate AO, the incumbent will cooperate with the successor to the extent necessary to facilitate uninterrupted support for AO during the transition period. NSF will support additional, appropriate, transition costs.

The transition plan must include, at a minimum:

- A proposed duration and schedule for the transition period;
- Estimated resource needs for the transition period;
- Plans for recruitment, orientation and training;
- Plans for changes to staffing, facilities or operational modes;
- A plan to manage the transfer of assets, inventory, commitments, plans and documents from the current recipient, and acquire office infrastructure as needed;
- Identification of assumptions that underlie the transition plan.

C. General Information

Additional information about AO, including NSF responses to all pertinent questions and a FAQ document will be made available through the resource library associated with this solicitation, access to which may be provided by the Cognizant Program Officer.

Proposing organizations may also consider the following studies and planning documents relevant to AO:

- *New Worlds, New Horizons in Astronomy and Astrophysics* (2010; NAS; DOI: 10.17226/12951);
- *Advancing Astronomy in the Coming Decade: Opportunities and Challenges. Report of the National Science Foundation Division of Astronomical Sciences Portfolio Review Committee* (14 August 2012);
- *Opportunities for High-Power, High-Frequency Transmitters to Advance Ionospheric/Thermospheric Research* (2014; NAS;

DOI: 10.17226/18620);

- *Investments in Critical Capabilities for Geospace Science 2016 to 2025. A Portfolio Review of the Geospace Section of the Division of Atmospheric and Geospace Science* (5 February 2016);
- *New Worlds, New Horizons: A Midterm Assessment* (2016; NAS; DOI: 10.17226/23560).

Informational Site Visit

For representatives of potential proposing organizations NSF intends to conduct site visits to AO headquarters in Arecibo, Puerto Rico. These visits are expected to take place in February/March 2017 and will be guided and managed by NSF staff. This will provide an opportunity for potential proposers to view the buildings, facilities and equipment, and to acquire information relevant to the development of a proposal. Attendees will be responsible for their own expenses.

Eligible organizations that are interested in submitting a proposal and wish to send representatives to one or more of the site visits should email the Cognizant Program Officers no later than 08 February 2017.

III. AWARD INFORMATION

The successful proposal will be awarded as a Cooperative Agreement or as a Master Cooperative Agreement with Cooperative Support Agreement(s) with a duration of five years, beginning on or after 1 April 2018. The anticipated NSF funding profile (pending availability of funds) is:

Project Year	FY	NSF		
		MPS/AST	GEO/AGS	TOTAL
1	18/19	\$3,600,000	\$3,550,000	\$7,150,000
2	19/20	\$2,500,000	\$2,500,000	\$5,000,000
3	20/21	\$1,750,000	\$1,750,000	\$3,500,000
4	21/22	\$1,250,000	\$1,250,000	\$2,500,000
5	22/23	\$1,000,000	\$1,000,000	\$2,000,000

Table Note: Assumes Year 1 begins on or about 1 April 2018

Subject to availability and appropriations of funds, NASA intends to support continuing operation of the planetary radar during the timeframe of this solicitation. More information regarding NASA's interest in the AO planetary radar program can be found at:

<http://science.nasa.gov/researchers/sara/library-and-useful-links/psd-radar/>

The viable proposal will demonstrate a science and/or education plan, and a business model, assuming NSF funding as above, supplemented by cost-sharing arrangements as required to reach the proposer's goals.

Subsequent annual funding increments will be determined on the basis of annual program plans submitted by the recipient to NSF and approved by NSF, subject to the availability of appropriated funds and to the performance of the recipient.

NSF may fund additional, appropriate, transition costs through a cooperative support agreement with the recipient for a transition period preceding the five-year cooperative agreement. During this transition period, the recipient will have appropriate access to AO personnel and facilities.

IV. ELIGIBILITY INFORMATION

Who May Submit Proposals:

Proposals may only be submitted by the following:

- Universities and Colleges - Universities and two- and four-year colleges (including community colleges) accredited in, and having a campus located in, the US acting on behalf of their faculty members. Such organizations also are referred to as academic institutions.
- Non-profit, non-academic organizations: Independent museums, observatories, research labs, professional societies and similar organizations in the U.S. associated with educational or research activities.
- For-profit organizations: U.S. commercial organizations, especially small businesses with strong capabilities in scientific or engineering research or education.
- Consortia including international collaborations, but NSF funds may be awarded only to U.S. organizations.

Who May Serve as PI:

There are no restrictions or limits.

Limit on Number of Proposals per Organization: 1

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

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

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

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

Proposals must conform to the guidelines specified in the NSF PAPPG or the NSF Grants.gov Application Guide, except where specified in this solicitation.

Proposers are reminded to review procedures under "Proprietary or Privileged Information" in Chapter II.D.1 of the PAPPG and to mark only such information, including patentable ideas, trade secrets, privileged or confidential commercial or financial information, disclosure of which might harm the proposer, with the appropriate legend such as, "The following is (proprietary or confidential) information that (name of proposing organization) requests not be released to persons outside the Government, except for purposes of review and evaluation." Please also see the section entitled "Privacy Act and Public Burden Statements" below.

Single Copy Documents - NSF requires the following information to determine collaborators and affiliations for the review process.

- **Project Personnel:** Provide the full names and affiliations of all Key Personnel, including directors, co-directors, department heads, coordinators, and other members of the management team. The information should be entered in the Single Copy Documents section in Fastlane as "Additional Single Copy Documents."
- **Collaborators and Other Affiliations:** Provide the names of all persons, participants and affiliates as specified in Chapter II.C.1.e. of the NSF PAPPG. For each person, enter the first name, last name, and institutional affiliation(s). For each person listed on the project personnel list include all co-authors/editors and collaborators (within the past 48 months); list all graduate advisors and advisees; list individuals who would act as external advisory committee members for AO; list all subcontractors who would receive funds through the award. The information should be entered in the Single Copy Document section of FastLane under "Collaborators and Other Affiliations."

Type of Proposal - The "Center/Research Infrastructure" type of proposal should be selected in the proposal preparation module in FastLane or Grants.gov.

Project Description (including Results from Prior NSF Support) - This section of the Proposal should contain the information specified in the PAPPG, and the information presented below in the order listed. **The section is limited to no more than 50 pages.** Where noted below, necessary resource material may be marked separately and submitted as **Supplementary Documentation**. Such material is not subject to, or included in, the 50-page limit.

In cases of subrecipients, management teams must commit to the disclosure and sharing of necessary business and financial information for the effective management of the facility.

Each proposal should address the proposing organization's scientific, technical, and managerial qualifications to operate the Arecibo Observatory (AO) and should include the following (1-7) in describing how the organization will fulfill the expectations in Section I, Introduction, and Section II, Program Description, of this solicitation:

1. Overall Management Concept

Discuss the organization's proposed approach to the management of AO. Describe the role of the managing organization and include a detailed plan for integral elements of the plan.

Proposals should describe the nature of any planned partnerships and the added value to the observatory and NSF-supported

science. The commitment of partnering or collaborating institutions should be demonstrated through letters of collaboration, memoranda of agreement, or other supporting documents (submitted as **Supplementary Documentation**) that indicate the potential roles of partners and their intent to commit to the partnership or collaboration. Proposals should carefully justify plans for partnerships or collaborations in which institutions take on a substantive role in supporting, managing, or operating AO. In these cases, management teams must commit to the disclosure and sharing of necessary business and financial information for the effective management of the facility.

2. **Organization and Operations**

As appropriate, the proposed approach must include a description of each of the following:

- o Organizational structure for AO, including appropriate governance and advisory structures. Describe roles, lines of authority, communications and accountability. Describe the oversight of the facility and of each significant program area. Include a clear discussion of how the planned organization will best serve the diverse needs of the science and education activities to be performed by AO;
- o Structure of the managing organization. Identify the lead organization and the level of commitment by the lead organization to AO support. Identify any major collaborating institutions or subrecipients, clearly noted as such, along with their purpose and responsibilities;
- o Processes for planning, review and performance management within a structured framework, including the development and use of appropriate mechanisms to aid both the managing organization and AO's stakeholders in assessing performance and identifying areas for improvement;
- o The space and equipment necessary for effective performance (in coordination with NSF);
- o The strategic logistics support for short and long-term science initiatives;
- o Operation and maintenance of advanced observational facilities in support of NSF-funded science in full compliance with all applicable laws and regulations;
- o Plans for implementing and monitoring compliance with relevant environmental regulations, risk management, and health and safety;
- o Mechanisms for reviewing and scheduling user access through a process that demonstrates NSF core values;
- o A data management plan that describes the acquisition, analysis, archiving and dissemination of all AO data, including the definition of proprietary periods and adequate cyberinfrastructure, connectivity and cybersecurity to meet the proposed scope of user community support;
- o Plans for managing radio frequency interference (RFI) and frequency licensing and certifications, as appropriate;
- o Plans for existing infrastructure and buildings to be utilized for the proposed activities.

3. **Science and Facility Plan**

Provide an initial five-year science and facility plan for AO, showing how the managing organization would develop and execute a program of services, facilities and research that would support and enhance the astronomy, atmospheric, and related scientific communities, as appropriate. Identify the major research instruments to be made available to the observing community and the primary scientific objectives that drive the programmatic scope of the science and facility plan. Include sufficient detail for reviewers to judge how work will be accomplished and identify the resources to be used.

Show the relationship between the science and facility plan and the planned organizational structure detailed in Organization and Operations (above). Describe how an AO strategic plan will be maintained during the award and how the AO science and facility plan will be reviewed and developed in response to ongoing community input and emerging needs. The plan must explain how the management of AO is directed toward accomplishing scientific objectives and how the priorities for these objectives will be determined.

4. **Education and Outreach Plan**

As appropriate, provide a plan for education and outreach that should engage and develop the Nation's intellectual talent, including groups underrepresented in the sciences, mathematics and engineering disciplines. If science activities are proposed, the education and outreach plan should be closely integrated with those programs and activities.

The current program at AO includes support for graduate students, Research Experiences for Undergraduates (REU), Research Experiences for Teachers (RET), Web-based public outreach, and operating and maintaining the Angel Ramos Foundation Visitor Center. The REU and RET programs are funded through a separate NSF award. Proposing organizations may consider the continuation, expansion or reduction of these programs as appropriate to their overall strategic vision for AO.

5. **Business Model for Cost-sharing, if applicable**

Provide a viable business model for collaborations, partnerships, or other mechanisms and activities to raise the available yearly operating funds beyond those provided by NSF. Provide a risk assessment of the partnership.

Include details relating to how and from where the funds will come, including a detailed timeline. Sufficient details for this funding model should be included so that assessment can be made as to the viability of the plan and funding model, its reasonableness from a business perspective and how reliable it is. See Section V.B Budgetary Information for additional guidance and budget preparation instructions when proposing cost sharing.

6. **Human Resources, Workforce and Diversity**

Describe the proposed techniques for recruiting and developing a scientific, engineering and administrative staff, consistent with proposed activities. Proposing organizations may identify specific individuals for key staffing positions, or present clear plans for seeking and hiring highly qualified individuals for those positions. Include details of the following:

- o Personnel qualifications, to include appropriate expertise in the multiple sciences and professions required to support the AO mission and defined programmatic scope;
- o The organization's minimum qualifications for all managerial and supervisory positions should be provided as a **Supplementary Document**;

Key Personnel. Resumes for each Director, Co-Director and each named senior participant should be provided in the Biographical Sketches section of the proposal (see below). Resumes for other personnel who will occupy key positions and be specified in the awarded agreement may be attached as a **Supplementary Document**. The submission of resumes for additional qualified personnel is encouraged. A signed letter of collaboration for a minimum of twelve months should be provided by each named personnel and attached as a **Supplementary Document**. *If individuals for these key positions are unavailable at the time of the proposal preparation, provide a list of qualities required for the position, and show a plan and timeline for recruiting these key personnel;*

- o Strategy for the recruitment and retention of staff from underrepresented groups, including people with disabilities, and the promotion of diversity among the workforce, students and researchers;
- o Policies and practices to be employed in recruiting, developing and evolving an expert scientific, technical and administrative staff with the skill set appropriate for a leading national scientific facility.

7. Other Supporting Materials

Within the 50-page limit for the Project Description, the proposing organization may provide additional material it believes will be of assistance in evaluating the proposal but that does not fit into any of the defined sections above.

Biographical Sketches - A resume, limited to 2 pages, should be provided for each Director, Co-Director and each individual named as a senior participant, including department heads and other members of the management team. The PAPPG guidelines on order and format do not apply to this section of the proposal.

Budget - See the instructions in Section V.B, below.

Supplementary Documentation - Except where specified in this solicitation and in the NSF PAPPG (see PAPPG, Chapter II.C.2.j), special information and supplementary documentation must be included as part of the *Project Description (or as part of the budget justification)*, if it is relevant to determining the quality of the proposed work. Exceptions include, but are not limited to, documentation of collaborative arrangements of significance to the proposal through letters of collaboration, and the required submission of a Postdoctoral Researcher Mentoring Plan for each proposal that requests funding to support postdoctoral researchers.

For this solicitation, the Data Management Plan is provided as part of the Project Description, under 2. Organization and Operations. To enable FastLane to accept the proposal, insert text or upload a document in this section that states "See Project Description."

Additional **Supplementary Documents** include:

1. Transition Plan

Proposing organizations may be funded for a transition period preceding the five-year award. If a new recipient is selected to operate AO, the incumbent will cooperate with the successor to the extent necessary to facilitate uninterrupted support for AO during the transition period and will provide transfer of legal rights to relevant property and equipment. NSF will support additional, appropriate, transition costs by a successor recipient if different from the current recipient.

Organizations should provide, as a supplementary document not to exceed 10 pages, a detailed transition plan and budget for a transition period preceding the new award.

The transition plan must include, at a minimum:

- o A proposed duration and schedule for the transition period;
- o Estimated resource needs for the transition period;
- o Plans for recruitment, orientation and training;
- o Plans for changes to staffing, facilities or operational modes;
- o A plan to acquire office infrastructure and manage the transfer of assets, inventory, commitments, plans and documents from the current recipient;
- o Identification of assumptions that underlie the transition plan.

Proposing organizations also must provide a detailed budget for a transition period preceding the new award. This information must be provided as a supplementary document identified as **Transition Budget**. The budget must be presented in the same style with all applicable budget line items as for the budget for each year of the proposal. If a new recipient is selected to manage and operate AO, the incumbent will cooperate with the successor to the extent necessary to facilitate uninterrupted support for AO during the transition period and will provide transfer of legal rights to relevant property and equipment. NSF will support additional, appropriate transition costs by a successor recipient if different from the current recipient.

The transition budget should not include non-renewal costs of the incumbent, including medical insurance, severance pay, or other costs incurred by the incumbent under the current cooperative agreement, including costs related to the nonrenewal of subawards. If a new operator is selected, the incumbent may submit to NSF costs related to the cooperative agreement non-renewal, and these costs will be considered separately.

2. Financial Capability

In a supplementary document labeled **Financial Capability**, proposing organizations must provide the following in support of the organization's financial condition and capability:

- o A detailed structure and plan for implementing and monitoring business systems and internal controls for financial management and accounting, property standards, equipment standards, procurement standards, reporting and records management.
- o Total compensation plan setting forth proposed salaries and fringe benefits for professional employees, with supporting information such as recognized national and regional compensation surveys, and studies of professional, public and private organizations used in establishing the total compensation structure.

- o If available, the organization's annual audited financial statements (e.g. Balance Sheet, Profit and loss Statement and Annual Reports) for the three most recent fiscal years and/or other documentation to clearly explain its current financial strength and resource capability.
- o A current indirect cost rate proposal and supporting financial data. If the organization's indirect cost rates have been approved by another Federal agency, provide copies of such agreements. NSF does not participate in or contribute to the cost of Independent Research and Development (IR&D) and such costs shall bear a proportionate share of overhead and G&A costs; therefore, IR&D costs should be excluded from indirect expense pools and included in the appropriate distribution bases. If the organization has no IR&D costs, a statement to that effect should be included with the indirect cost rate proposal;
- o A current Cost Accounting Standards Board (CASB) Disclosure Statement, if applicable.

3. **Work Breakdown Structure Dictionary (text-searchable PDF up to 20 pages in length)**

Include a supplementary document that provides detailed information about each element in the WBS, such as a brief definition of the scope of work, deliverables, bases for budget and schedule estimates, assessment measures, and milestones.

B. Budgetary Information

Cost Sharing:

Voluntary committed cost sharing may be included. If accepted by the Foundation, the cost sharing commitment becomes legally binding and is subject to audit.

Other Budgetary Limitations:

Other budgetary limitations apply

Budget Preparation Instructions:

The proposal must identify all staffing and budgetary information necessary to describe how the organization will fulfill the expectations in Section I, Introduction, and Section II, Program Description, of this solicitation. Requested budget amounts for each year of the proposal should reflect the level considered necessary to perform the NSF-funded activities described in the proposal. Proposers also should be cognizant of budget constraints implied by the estimated funding levels provided under Section III, Award Information.

A budget justification, not to exceed 15 pages, tied directly to the integrated WBS and WBS Dictionary for the proposal must be submitted with the budgets for each year, and must be in sufficient detail to show how the proposer reached the amounts specified in the budget. NSF anticipates performing a cost analysis of the successful proposal budget in accordance with NSF's Large Facilities Manual (LFM; the latest version is available here https://www.nsf.gov/bfa/fo/fo_documents.jsp). A draft version of LFM Section 4.2 (Cost Estimating and Analysis) will be provided for proposal preparation. Proposing organizations are required to follow the instructions in the PAPPG (17-1), effective January 30, 2017 (see Budget and Budget Justification in: https://www.nsf.gov/pubs/policydocs/pappg17_1/nsf17_1.pdf)

Enter the anticipated total level of subrecipient support on line G5, Subawards, of the FastLane budget or line F5 of the R&R Budget Form in Grants.gov. Proposals require the inclusion of separate budgets for subawards that exceed \$250,000 per year, with a budget justification and detailed explanation of the proposing organization's cost analysis of that budget, for a maximum of 3 pages each. Examples include budgeted months and salaries for personnel, quotations to support budgeted equipment, itemized listing of material and supplies with support quotations, statements of risk assessments and monitoring plans for each subrecipient, cost price analysis to support that the proposed subaward amounts are reasonable and copies of the subrecipient responsibility determinations, including adequacy of accounting system and financial capability. For subawards valued at less than \$250,000 year, include the costs in the aggregate on the subaward line in the budget.

Proposing organizations may include a fee in their proposed budget for completion of the work effort under the award. The fee must be clearly identified as such in the budget justification. If submitting through Fastlane, fee is entered on line "G (6) Other", of the NSF budget form. Fee may not be burdened with indirect rate or any other costs. Fees will be evaluated for reasonableness by NSF using a structured approach as prescribed in Agency procedures.

NSF will provide guidelines for recipients that receive fee to encourage the utmost discretion and appropriate consideration in the use of fee, to include examples of inappropriate uses of fee (e.g., including but not limited to not using fee on alcoholic beverages or lobbying as set forth at 2 CFR § 200.450 and 48 CFR 31.205-22). NSF will reserve the authority to review a recipient's actual use of fee. Accordingly, recipients must separately track and account for uses of fee provided under NSF awards. The terms and conditions of the award will specify the fee arrangement including the basis for incremental fee payments. NSF will consider reductions in future fee if a recipient's actual use of fee is in contravention with the guidelines on inappropriate uses.

Cost Sharing: Any proposed cost sharing in the budget and/or budget justification is considered *voluntary committed cost sharing*. When voluntary committed cost sharing is included in the budget justification, and accepted by the Foundation, the commitment of funds becomes legally binding and is subject to audit. Proposing organizations must provide full details of the cost-sharing plan and related activities – including an explanation of the source, nature, amount and availability of any proposed cost sharing – in the budget justification.

When applicable, the estimated value of any in-kind contributions also should be included. An explanation of the source, nature, amount and availability of any proposed cost sharing must be provided in the budget justification. Contributions may be made from any non-Federal source, including non-Federal grants or contracts, and may be cash or in-kind. 2 CFR § 200.306 describes criteria and procedures for the allowability of cash and in-kind contributions in satisfying cost sharing and matching requirements. It should be noted that contributions derived from other Federal funds or counted as cost sharing toward projects of another Federal agency must not be counted towards meeting the specific cost sharing requirements of the NSF award.

Failure to provide the level of cost sharing required by the NSF solicitation and reflected in the NSF award budget may result in termination of the NSF award, disallowance of award costs and/or refund of award funds to NSF by the awardee.

Organizations that have not previously received NSF awards should review the NSF [Prospective New Recipient Guide](#) for additional guidance in preparing their budget submission.

C. Due Dates

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

April 25, 2017

May 04, 2017

D. FastLane/Grants.gov Requirements

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. 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. 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

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 *Investing in Science, Engineering, and Education for the Nation's Future: NSF Strategic Plan for 2014-2018*. These strategies are integrated in the program planning and implementation process, of which proposal review is one part. NSF's mission is particularly well-implemented through the integration of research and education and broadening participation in NSF programs, projects, and activities.

One of the strategic objectives in support of NSF's mission is to foster integration of research and education through the programs, projects, and activities it supports at academic and research institutions. These institutions must recruit, train, and prepare a diverse

STEM workforce to advance the frontiers of science and participate in the U.S. technology-based economy. NSF's contribution to the national innovation ecosystem is to provide cutting-edge research under the guidance of the Nation's most creative scientists and engineers. NSF also supports development of a strong science, technology, engineering, and mathematics (STEM) workforce by investing in building the knowledge that informs improvements in STEM teaching and learning.

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

A. Merit Review Principles and Criteria

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

1. Merit Review Principles

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

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

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

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

2. Merit Review Criteria

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

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

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

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

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

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

Broader impacts may be accomplished through the research itself, through the activities that are directly related to specific research

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

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

Additional Solicitation Specific Review Criteria

Reviewers also will be asked to identify and analyze the following:

- Strengths and weaknesses of the proposed approach;
- Opportunities and potential benefits that the proposed approach presents for AO;
- Risks to the future success of AO in the proposer's approach that are not satisfactorily addressed;
- Cost reasonableness and cost efficiency of the proposed approach.

Reviewers will consider the following specific criteria in each of the areas below (provided as appropriate), as well as the integration of these areas into a coherent and viable management and operations plan for AO.

1. Overall Management Concept

Reviewers will consider:

- The quality, relevance and extent of the proposing organization's strategic vision for fulfillment of the AO mission;
- The viability of the organization's management strategy to maintain and develop AO's position as a multi-user research and/or education facility;
- The role of the managing organization in relation to AO and NSF;
- The extent and quality of the plan to engage the multidisciplinary community served by AO, with clear lines of communication, understanding of community needs and issues, and the means to engage the community in planning, research, education and development of relevant instruments and technology;
- The suitability, credibility and risks of proposed partnerships and their added value to AO and to NSF-supported science, education and outreach;
- The applicability of proposed methodologies for identifying, estimating and prioritizing future requirements, including demonstrated awareness of potential directions of the relevant sciences and responsiveness to stated community needs and ambitions.

2. Organizations and Operations

Reviewers will consider:

- The feasibility, relevance to AO stakeholders, and potential for success of the proposed approach, including organizational structure, resource integration, provision of space and equipment, logistics support for scientific initiatives, data management and information technology, management of radio frequency interference, and maintenance, safety and security of systems and facilities;
- The sufficiency, and potential for achieving effective results, of the proposed methodology for assessing and improving AO performance.

3. Human Resources, Workforce and Diversity

Reviewers will consider:

- The adequacy and appropriateness of the organization's named personnel and proposed labor categories for fulfilling the AO mission;
- The suitability and potential for success of the proposed methods for recruitment and retention, promoting diversity at all levels in the organization, invigorating and training the workforce, and infusing new ideas and approaches in AO programs and administration.

4. Science and Facility Plan (as appropriate)

Reviewers will consider:

- The degree to which the proposed scientific programs, priorities and technical capabilities reflect the needs of AO stakeholder communities and utilize the research capabilities of AO;
- The scope, feasibility and innovation of the planned activities;
- The ability to respond to and prioritize evolving scientific and engineering needs and opportunities in the community;
- The extent to which the plan identifies challenging scientific and technical questions or barriers to be overcome, proposes high-quality research projects to address the stated goals, identifies performance measures for the planning and delivery process, and reflects appropriate and effective use of resources where possible.

5. Education Plan (as appropriate)

Reviewers will consider:

- The extent and quality of the proposed education programs, their potential for success, and the resulting impacts on identified target audiences;
- The relevance of the proposed plan to engage and develop intellectual talent, including groups underrepresented in

the sciences, mathematics and engineering, in the conduct of AO research, education and operational support activities;

- o The effectiveness of the plan to engage local, regional and national public audiences in AO activities and the extent to which the knowledge and discoveries made at AO will be used to strengthen public awareness of AO-related science;
- o The suitability of proposed mechanisms to ensure broad and equitable access to AO among the relevant scientific research communities;
- o The adequacy of the proposed plan to assess and improve AO education activities as based on defined goals and objectives.

6. **Business Model**

Reviewers will consider:

- o Feasibility, reliability, and viability of business model & proposed activities;
- o Likelihood of success and viability of any proposed cost-sharing activities;
- o The timeline for activities (and any required transition period);
- o For those proposers requesting transfer of title, the need and justification for title transfer, and the viability of the title-transfer plan.

7. **Transition Plan**

The Transition Plan will be evaluated to assess the proposing organization's ability to assume full responsibility for the management and operation of AO upon completion of the transition period without degradation of high-quality services, research efforts and facilities.

8. **Other Supporting Materials**

Reviewers will consider materials provided in this section to help form an overall impression of the proposal.

9. **Budget and Financial Review**

NSF will assess the organization's budgetary and financial information as requested under Section V.B of this solicitation. The organization will be assessed for the adequacy of its internal accounting and operational controls (including human resources, property control and procurement systems), potential for attracting qualified employees, and the adequacy of its financial resources for managing AO. The proposed fee (if any) and proposed direct and indirect rates will be evaluated for reasonableness and potential impact on funding available for science and related activities. The impact of rates and any proposed fee will be evaluated relative to other organizations' proposed rates and fees.

In addition:

- a. Is the proposed budget appropriate, clear, detailed, and well justified?
- b. Does the proposal include specific activities associated with the work to be performed and the activity-based resource descriptions?
- c. Are FTE levels appropriate? Are all labor costs used in the budget appropriately and correctly identified? Are the activities and unit costs associated with the project scope clearly identified and defined in the budget?
- d. Are project resources effectively allocated to all personnel tasks, activities, and equipment and material and supply costs?
- e. Is the cost of the proposed capabilities reasonable and adequate when compared with previous history and current market prices?
- f. Is the budget consistent with the schedule?
- g. Are the schedule and budget adequate for maintaining the facility?
- h. Are the assumptions that have been used to develop the budget clearly identified and defined? Have all uncertainties in the project scope and budget been identified?
- i. Where applicable, how feasible is any proposed cost-sharing plan? Are cost-sharing elements viable? Are risks identified and a mitigation plan developed? What happens if planned cost-sharing activities are not forthcoming and/or change over the lifetime of the award?

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.

In addition to individual reviews of each proposal by outside experts, a panel of reviewers will be convened to assess the relative merits of all proposals submitted for consideration by the NSF Program Officer. To further clarify the panel's understanding of the proposal(s), the evaluation may include one or more reverse site visits to be held at the NSF offices in Virginia. Based on their evaluation, the panel will be asked to formulate a recommendation to either support or decline each proposal.

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.

In any case, the Program Officer's final recommendation will not be made until the Environmental Impact Statement (EIS) process described in Section I, Introduction, is complete. Depending on the outcome of the EIS process, an award may not be made.

After programmatic approval has been obtained, the proposal recommended for funding will be forwarded to 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 a Grants and Agreements Officer in the Division of Acquisition and Cooperative Support. 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) 292-7827 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=papppg.

Special Award Conditions:

The award associated with this solicitation will be a cooperative agreement, not a standard grant or a contract. Individual cooperative support agreements will be issued under the terms and conditions of the overall agreement. Any special requirements not stated herein will be negotiated at time of award.

Programmatic Terms and Conditions: The cooperative agreement(s) awarded as a result of this competition will be administered by AST in cooperation with AGS. The following measures will be employed in providing oversight for the cooperative agreement:

- Review of annual reports, program plans and performance metrics;
- Review of research and education activities and management performance approximately midway through the five-year award;
- Site visits annually, or as necessary.

Financial and Administrative Terms and Conditions: Costs to be reimbursed in accordance with Subpart E of 2 CFR 220 – Uniform Administrative Requirements, Cost Principles and Audit Requirements for Federal Awards, or Federal Acquisition Regulation (FAR) Part 31, as applicable.

The recipient will be required to submit to a Business Systems Review at least once during the five-year award period. Further information may be obtained here: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf13100

Standard cooperative agreement terms and conditions, including supplements for managers of Large Facilities, are available at https://www.nsf.gov/awards/managing/co-op_conditions.jsp?org=NSF. Specific terms and conditions will be negotiated at time of award.

C. Reporting Requirements

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

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

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

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

The managing organization will be required to provide annual program plans, including long-range plans, and quarterly reports for all programs at AO, along with other reports as may be required by NSF. In addition, as a requirement under the Government Performance and Results Act (GPRA), NSF is required to report on the Federal Performance Goals for Facilities. Any and all facilities with an annual budget exceeding a specific threshold must report on their operations activities; and any and all construction/upgrade projects that exceed a total project cost of a specific threshold must report on their construction/upgrade activities. Therefore, the recipient will be required, upon request of the cognizant NSF program officer, to submit annual reports related to the GPRA performance goals. This may include the collection and submission of specific data related to the NSF GPRA requirements.

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:

- Joseph E. Pesce, W9159, telephone: (703) 292-7373, email: jpesce@nsf.gov
- John W. Meriwether, W8205, telephone: (703) 292-8529, email: jmeriwet@nsf.gov

For questions related to the use of FastLane, contact:

- FastLane Help Desk, telephone: 1-800-673-6188; e-mail: 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.

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

Sources of Additional Information:

National Science Foundation, Division of Astronomical Sciences:

<https://www.nsf.gov/div/index.jsp?div=AST>

National Science Foundation, Division of Atmospheric and Geospace Sciences:

<https://www.nsf.gov/div/index.jsp?div=AGS>

National Science Foundation, Directorate for Mathematical and Physical Sciences:

<https://www.nsf.gov/dir/index.jsp?org=MPS>

National Science Foundation, Directorate for Geosciences:

<https://www.nsf.gov/dir/index.jsp?org=GEO>

Arecibo Observatory:

<http://www.naic.edu>

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

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

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

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

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

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

PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

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

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

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

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