EarthScope

PROGRAM SOLICITATION
NSF 11-535

REPLACES DOCUMENT(S):
NSF 09-535

National Science Foundation

Directorate for Geosciences
Division of Earth Sciences

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

July 16, 2011

July 16, Annually Thereafter

IMPORTANT INFORMATION AND REVISION NOTES

A revised version of the NSF Proposal & Award Policies & Procedures Guide (PAPPG), NSF 11-1, was issued on October 1, 2010 and is effective for proposals submitted, or due, on or after January 18, 2011. Please be advised that the guidelines contained in NSF 11-1 apply to proposals submitted in response to this funding opportunity. Proposers who opt to submit prior to January 18, 2011, must also follow the guidelines contained in NSF 11-1.

Cost Sharing: The PAPPG has been revised to implement the National Science Board's recommendations regarding cost sharing. Inclusion of voluntary committed cost sharing is prohibited. In order to assess the scope of the project, all organizational resources necessary for the project must be described in the Facilities, Equipment and Other Resources section of the proposal. The description should be narrative in nature and must not include any quantifiable financial information. Mandatory cost sharing will only be required when explicitly authorized by the NSF Director. See the PAPP Guide Part I: Grant Proposal Guide (GPG) Chapter II.C.2.g (xi) for further information about the implementation of these recommendations.

Data Management Plan: The PAPPG contains a clarification of NSF's long-standing data policy. All proposals must describe plans for data management and sharing of the products of research, or assert the absence of the need for such plans. FastLane will not permit submission of a proposal that is missing a Data Management Plan. The Data Management Plan will be reviewed as part of the intellectual merit or broader impacts of the proposal, or both, as appropriate. Links to data management requirements and plans relevant to specific Directorates, Offices, Divisions, Programs, or other NSF units are available on the NSF website at: http://www.nsf.gov/bfa/dias/policy/dmp.jsp. See Chapter II.C.2.j of the GPG for further information about the implementation of this requirement.

Postdoctoral Researcher Mentoring Plan: As a reminder, each proposal that requests funding to support postdoctoral researchers must include, as a supplementary document, a description of the mentoring activities that will be provided for such individuals. Please be advised that if required, FastLane will not permit submission of a proposal that is missing a Postdoctoral Researcher Mentoring Plan. See Chapter II.C.2.j of the GPG for further information about the implementation of this requirement.

Revision Summary

This revision reduces the anticipated funding amount to reflect current Program expectations. The Program Description has been updated to include illustrative examples of EarthScope scientific targets from the 2010 EarthScope Science Plan, and to include a new opportunity for proposals to request borehole instrumentation purchased during Facility construction.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Earthscope

Synopsis of Program:

EarthScope is an Earth science program to explore the 4-dimensional structure of the North American continent. The EarthScope Program provides a framework for broad, integrated studies across the Earth sciences, including research on fault properties and the earthquake process, strain transfer, magmatic and hydrous fluids in the crust

and mantle, plate boundary processes, large-scale continental deformation, continental structure and evolution, and composition and structure of the deep Earth. In addition, EarthScope offers a centralized forum for Earth science education at all levels and an excellent opportunity to develop cyberinfrastructure to integrate, distribute, and analyze diverse data sets.

The EarthScope Facility, consisting of the Plate Boundary Observatory (PBO), the San Andreas Fault Observatory at Depth (SAFOD), and the USArray, is a multi-purpose array of instruments and observatories that greatly expands the observational capabilities of the Earth sciences and permits us to advance our understanding of the structure, evolution and dynamics of the North American continent.

This Solicitation calls for single or collaborative proposals to conduct scientific research associated with the EarthScope Facility and support activities that further the scientific and educational goals of EarthScope.

Cognizant Program Officer(s):

- Gregory J. Anderson, 785 N, telephone: (703) 292-4693, email: greander@nsf.gov
- Charles H. Estabrook, 785 N, telephone: (703) 292-8722, email: cestabro@nsf.gov

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

- 47.050 --- Geosciences

Award Information

Anticipated Type of Award: Standard Grant or Continuing Grant or Cooperative Agreement

Estimated Number of Awards: 15 to 25

Anticipated Funding Amount: $8,000,000 for FY 2012, pending availability of funds

Eligibility Information

Organization Limit:

None Specified

PI Limit:

None Specified

Limit on Number of Proposals per Organization:

None Specified

Limit on Number of Proposals per PI:

None Specified

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Letters of Intent:** Not Applicable
- **Preliminary Proposal Submission:** Not Applicable
- **Full Proposals:**
  - Full Proposals submitted via FastLane: NSF Proposal and Award Policies and Procedures Guide, Part I: Grant Proposal Guide (GPG) Guidelines apply. The complete text of the GPG is available electronically on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg.
  - 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: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide)

B. Budgetary Information

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

C. Due Dates

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

  July 16, 2011

  July 16, Annually Thereafter

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

The EarthScope Program is part of the Division of Earth Sciences (EAR). EAR provides funding for the conduct of research in most areas of the solid Earth and surface-terrestrial sciences. EAR focuses on improving our understanding of the Earth's structure, composition, evolution, and the interaction with the Earth's biosphere, atmosphere, and hydrosphere. In addition, EAR provides support for instrumental and observational infrastructure, cyberinfrastructure, and innovative educational and outreach activities. Projects may employ any combination of field, laboratory, and computational studies with observational, theoretical, or experimental approaches. Support is available for research and research infrastructure through grants, contracts, and cooperative agreements awarded in response to investigator-initiated proposals. EAR will consider co-funding of projects with other agencies and supports international work and collaborations.

II. PROGRAM DESCRIPTION

The rich fabric of tectonic provinces in North America provides a solid scientific framework for a major program to investigate the relationships among processes and structures over a wide range of scales within the crust, lithosphere, and mantle, with the goal of understanding the tectonic and geologic processes that have constructed the continents. The North American continent is also ideally located with respect to global seismicity to provide unprecedented views of the deep Earth. EarthScope addresses fundamental questions about the evolution of continents and the processes responsible for earthquakes and volcanic eruptions. Through the integration of scientific information derived from geology, geochemistry, geophysics, and geodesy, the EarthScope program is yielding a comprehensive time-dependent picture of the continent far beyond that which any single discipline or technology can achieve. EarthScope includes new observational technologies that are linked through high performance computing and telecommunication networks. The EarthScope Facility provides a framework for broad, integrated studies across the Earth sciences, including research on active deformation of the North American continent; continental evolution through geologic time; deep Earth structure and dynamics; earthquakes, faults, and the rheology of the lithosphere; magma, water, and volatiles in the crust and mantle; topography and tectonics; aspects of studies of the hydrosphere, cryosphere, and atmosphere that EarthScope can illuminate; and associated educational topics.

The integrated observing systems that comprise the EarthScope Facility include: USArray that maps in 3-D the earth's interior by means of seismic and magnetotelluric systems; Plate Boundary Observatory (PBO) that monitors the deformation of the earth's surface by means of geodetic systems; and the San Andreas Fault Observatory at Depth (SAFOD) that defines the conditions and physics of an active plate boundary fault at depth. These systems capitalize on recent developments in sensor technology and communications to provide Earth scientists with comprehensive, high-resolution data derived from a variety of geophysical sensors. All data from the EarthScope Facility will be openly available in near-real-time to maximize participation from the scientific

community and to provide on-going educational outreach to students and the public.

The EarthScope Program is committed to supporting the most meritorious research in any relevant area, including interdisciplinary and multidisciplinary research, as well as research involving international collaboration. The program is especially interested in proposals in emerging fields. Where appropriate, proposals may be considered for joint support with other programs in EAR or with other divisions at the National Science Foundation. In some cases, proposals may be transferred to other programs within EAR or to other divisions within the National Science Foundation when it is deemed appropriate by Program Officers from the respective programs or divisions. Principal Investigators (PIs) are encouraged to contact the cognizant program officers regarding proposals that may cross disciplinary boundaries before submission.

Examples of projects supported by the program can be found at http://www.earthscope.org (Funded Proposals under Quick Links) and using the NSF Award Search (Program Information) engine by entering Element Codes 007F, 017F, and 1741.

Scientific Targets

EarthScope encompasses a broad array of scientific targets within the context of the North American continent. Some illustrative examples include:

- **Active deformation of the North American continent**
  - What lithospheric and mantle processes and properties govern the geometry, evolution, and behavior of plate boundaries and continental interiors?
  - How do fault slip rates evolve temporally and spatially? How do slip rate estimates derived from geodetic data compare to slip rate estimates derived from geologic data?
  - What drives intraplate earthquakes, and how is the cycle of stress buildup and release different from plate boundary earthquakes?
- **Continental evolution through geologic time**
  - How can we identify and characterize the geologic evolution of a region from subsurface images, geologic data, and geochronology?
  - How did North America's cratonic core grow? Are comparable processes operating today?
  - How has the composition and thermal structure of the lithosphere and asthenosphere evolved, and how has that affected the boundary between them?
  - How do thick cratonic roots survive erosion and how can zones of downwelling and upwelling be recognized in the geologic record?
  - What are the controls on Appalachian along-strike heterogeneity and Appalachian topography?
- **Deep Earth structure and dynamics**
  - How are large-scale lithospheric and asthenospheric structural features affected by the transition zone and deeper mantle beneath North America, and vice versa?
  - What are the relative contributions of temperature, composition, and melt to lithospheric and asthenospheric rheology and transition zone structure?
  - What causes the observed large-scale patterns of mantle anisotropy beneath North America?
  - What can EarthScope data reveal about the nature, structure, and dynamics of the deep mantle and core?
- **Earthquakes, faults, and rheology of the lithosphere**
  - How do earthquakes initiate, propagate, and terminate, and what determines the ultimate size of rupture?
  - What is the rheology and state of friction at the depth where large earthquakes rupture?
  - What are the roles of fluids, rheology, and physical processes in driving the spectrum of fault slip behavior, including ETS, post-seismic deformation, and other transient behavior; background or secular slip; and earthquakes?
  - What factors control earthquake heterogeneity, and does earthquake complexity scale with magnitude?
  - Can we develop an integrated model of the earthquake cycle on major faults in North America?
- **Magma, water, and volatiles in the crust and mantle**
  - How do the nature, concentration, and movement of fluids and volatiles influence crustal and mantle rheology, temperature, and composition; the growth of continental lithosphere; volcanic and magmatic processes; and the spectrum of fault slip behavior?
  - How does volatile flux change over time at active volcanoes and through subduction zones, and what are the implications for global climate change?
  - How do melt/volatile enrichment and the structure of zones chemically altered by melt extraction vary in 3D?
- **Topography and tectonics**
  - How do crust and mantle buoyancy and flow influence topography in the tectonically active western North America?
  - How has subducted lithosphere beneath the western North American plate boundary interacted with the surface evolution of the continent through time?
  - Why does Appalachian topography still exist?
  - Do different types of structural basins reflect or affect deep crustal and mantle structure?
- **EarthScope and the hydrosphere, cryosphere, and atmosphere**
  - How can EarthScope data be used to further our understanding of climate systems; atmospheric processes, structure, and dynamics; and temporal and spatial models of North America hydrology?
  - What additional EarthScope data products could be produced to support studies of hydrology, infrasound, the cryosphere, and the atmosphere?

The 2010 EarthScope Science Plan, available from http://www.earthscope.org/ESSP, provides further details for these examples, and articulates additional scientific targets of interest to EarthScope.

Development of Information Technology Resources and Related Activities

The infrastructure provided by the EarthScope Facility (USArray, PBO and SAFOD) presents a multidisciplinary field laboratory that can stimulate new mechanisms for collaboration, data integration, and data management of a diverse suite of geologic, geochemical, and geophysical data sets. Proposals are encouraged that show evidence of collaborative arrangements between academic and/or industry groups. Activities related to support of EarthScope community coordination, planning, workshops, and development of community resources and products are also welcomed.

EarthScope is committed to providing an integrated database and archive access capability applying the tools from modern data management and information technologies. Proposals are invited that will extend the power and capabilities of this database through information technology advances, and that will provide standardized data, visualization and analysis tools, and data integration products to the scientific and education communities. This includes facilitating the adoption of standards for data exchange for geologic data and the transcription of existing data into these standards. Pilot projects or prototype development for producing and distributing EarthScope products such as multi-parameter models derived from integrated analyses, etc. are also encouraged.

Proposals to this competition should include aspects of the following elements:

- Internet-accessible and dynamically updated databases to facilitate the exchange of information among persons and groups likely to be interested in these findings;

- Participation in or establishment of an Internet-accessible knowledge network to disseminate the information resulting from this activity; and
- A clear commitment to make data products and tools openly accessible through EarthScope and other cooperating data and products facilities.

EarthScope Education and Outreach (E&O)

The EarthScope program invites proposals to address program-wide education and outreach objectives. EarthScope E&O projects should strive to integrate research components of EarthScope with activities that are broadly defined to include formal instruction at all levels and informal education for the community-at-large. Partnerships or collaborations are strongly encouraged among the members of the EarthScope or other educational communities. Proposals may include demonstration products or pilot projects that may be scalable to support larger EarthScope E&O activities in future years. For example, these may include community data products that are accessible to students and non-specialists, and teaching modules that will allow EarthScope resources to be incorporated into an inquiry-based learning experience consistent with national educational standards. Supplemental proposal preparation instructions and review criteria for education and outreach proposals are given in Sections V and VI.

Earth Science (EarthScope)/Earthquake Engineering (NEES) Research Opportunities

The George E. Brown Jr. Network for Earthquake Engineering Simulation (NEES) is a national, shared use experimental resource for advancing understanding and improving the design and performance of the Nation's constructed civil and mechanical infrastructure when subjected to earthquake excitation and tsunamis. NEES is a shared national research and education network of 15 experimental facilities and centralized data and model repositories, linked by high-speed Internet2 connections. These resources enable collaboration and advanced research based on experimentation and computational simulations of earthquakes and how buildings, infrastructure, coastal regions, and geologic materials perform during seismic events. NEES will enable engineers and researchers to develop more cost-effective ways to mitigate damage from natural and man-made disasters through the use of improved materials, designs, monitoring tools and construction techniques.The NEES and EarthScope facilities provide complementary capabilities to extend the continuum and interface of knowledge and technology in Earth Sciences and earthquake engineering. Co-funding opportunities will be considered between EAR, through this solicitation, and by the Directorate for Engineering, Division of Civil and Mechanical Systems, for projects that propose research requiring coordinated use of both NEES and EarthScope facilities. Proposals should address both the requirements of this solicitation and the George E. Brown Jr. Network for Earthquake Engineering Simulation Research (NEESR) solicitation (http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf11512). Proposals will be co-reviewed by ad hoc mail reviews and/or panels formed to review proposals under both solicitations.

EarthScope Borehole Instrumentation Opportunities

EarthScope borehole strainmeter and seismometer instrumentation purchased, but not installed, during PBO construction is available for PI-driven research that benefits the goals of the EarthScope program defined above, as determined by the EarthScope Program Directors.

Proposals to use this instrumentation are invited from US institutions; prospective PIs are strongly encouraged to contact the EarthScope Program Directors prior to proposal submission. PIs wishing to make use of this equipment must obtain support to install and operate the instrumentation for no less than three years. Installation will be performed by PBO, and proposals must include a support commitment letter from PBO. If the equipment is installed within the current PBO footprint, operations and maintenance support will be provided through PBO at no cost to the PI(s). If the equipment is installed outside of the current PBO footprint, the PI(s) must obtain support for full operations and maintenance for a minimum of three years after installation. All data collected using this equipment must be made freely available to the community via the EarthScope archives in commonly used standard formats and without excessive delay, in keeping with the EarthScope data policy (http://www.earthscope.org/es_doc/data/esdatapolicy.pdf).

III. AWARD INFORMATION

Under this Solicitation, proposals may be submitted for up to five years. The program expects to make approximately 15 to 25 standard or continuing grants or cooperative agreements with durations of one to five years depending on the quality of submissions and the availability of funds. Approximately $8,000,000 is expected to be available in FY2012 to support proposals received under this Solicitation, subject to availability of funds.

IV. ELIGIBILITY INFORMATION

The categories of proposers eligible to submit proposals to the National Science Foundation are identified in the Grant Proposal Guide, Chapter I, Section E.

Organization Limit:

None Specified

PI Limit:

None Specified

Limit on Number of Proposals per Organization:

None Specified

Limit on Number of Proposals per PI:

None Specified

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 Grant Proposal Guide (GPG). The complete text of the GPG is available electronically on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg. Paper copies of the GPG 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: (http://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.

In determining which method to utilize in the electronic preparation and submission of the proposal, please note the following:

Collaborative Proposals. All collaborative proposals submitted as separate submissions from multiple organizations must be submitted via the NSF FastLane system. Chapter II, Section D.4 of the Grant Proposal Guide provides additional information on collaborative proposals.

The following information provides instructions that supplement the Grant Proposal Guide and the NSF Grants.gov Application Guide.

Proposals that require facility (PBO, SAFOD, and/or USArray) and/or other agency support outside that requested in the submitting organization(s) proposal budget(s), or that require permits, etc., should include support commitment letters and/or permits as Supplementary Documentation.

Proposals requesting EarthScope borehole instrumentation must include support commitment letters from PBO.

For EarthScope Education and Outreach (E&O) proposals, the following items should be included in the 15-page Project Description and will be considered in the review:

- A description of previous educational efforts of the investigators. This might include how the investigator has: 1) influenced his or her research discipline; 2) incorporated or integrated contemporary research questions, processes, and results into educational experiences; 3) contributed to the literature of teaching and learning; 4) mentored others to conduct research and to educate students; or 5) demonstrated leadership among colleagues in promoting the above.
- A description of the activities to be undertaken related to EarthScope research and to exploring and experimenting with ways to integrate education and research.
- A plan for assessing and evaluating the effectiveness of the E&O activities.
- A plan to disseminate those activities that are found to be effective.

Investigators are encouraged to view the EarthScope Education and Outreach Implementation Goals (http://www.earthscope.org/es_doc/eno/ES_E&O_Impl_Plan_2_07.pdf) and to tie their proposed activities to specific EarthScope E&O goals:

1. Create a high-profile public identity for EarthScope that emphasizes the integrated nature of the scientific discoveries and the importance of EarthScope research initiatives.
2. Establish a sense of ownership among scientific, professional, and educational communities and the public so that a diverse group of individuals and organizations can and will make contributions to EarthScope.
3. Promote science literacy and understanding of EarthScope among all audiences through informal education venues.
4. Advance formal Earth science education by promoting inquiry-based classroom investigations that focus on understanding Earth and the interdisciplinary nature of EarthScope.
5. Foster use of EarthScope data, discoveries, and new technology in resolving challenging problems and improving our quality of life.

B. Budgetary Information

Cost Sharing: Inclusion of voluntary committed cost sharing is prohibited

C. Due Dates

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

  July 16, 2011

  July 16, Annually Thereafter

D. FastLane / Grants.gov Requirements

- **For Proposals Submitted Via FastLane:**

  Detailed technical instructions regarding the technical aspects of preparation and submission via FastLane are 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.

  Submission of Electronically Signed Cover Sheets. The Authorized Organizational Representative (AOR) must electronically sign the proposal Cover Sheet to submit the required proposal certifications (see Chapter II, Section C of the Grant Proposal Guide for a listing of the certifications). The AOR must provide the required electronic certifications within five working days following the electronic submission of the proposal. Further instructions regarding this process are available on the FastLane Website at: https://www.fastlane.nsf.gov/fastlane.jsp.

- **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. The Grants.gov's Grant Community User Guide is a comprehensive reference document that provides technical information about Grants.gov. Proposers can download the User Guide as a Microsoft Word document or as a PDF document. The Grants.gov User Guide is available at: http://www.grants.gov/CustomerSupport. In addition, the NSF Grants.gov Application Guide provides additional technical guidance regarding 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.

VI. NSF PROPOSAL PROCESSING AND REVIEW PROCEDURES

Proposals received by NSF are assigned to the appropriate NSF program where they will be reviewed if they meet NSF proposal preparation requirements. 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 who are experts in the particular fields represented by the proposal. These reviewers are selected by Program Officers charged with the 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.

A. NSF Merit Review Criteria

All NSF proposals are evaluated through use of the two National Science Board (NSB)-approved merit review criteria: intellectual merit and the broader impacts of the proposed effort. In some instances, however, NSF will employ additional criteria as required to highlight the specific objectives of certain programs and activities.

The two NSB-approved merit review criteria are listed below. The criteria include considerations that help define them. These considerations are suggestions and not all will apply to any given proposal. While proposers must address both merit review criteria, reviewers will be asked to address only those considerations that are relevant to the proposal being considered and for which the reviewer is qualified to make judgements.

What is the intellectual merit of the proposed activity?
How important is the proposed activity to advancing knowledge and understanding within its own field or across different fields? How well qualified is the proposer (individual or team) to conduct the project? (If appropriate, the reviewer will comment on the quality of the prior work.) To what extent does the proposed activity suggest and explore creative, original, or potentially transformative concepts? How well conceived and organized is the proposed activity? Is there sufficient access to resources?

What are the broader impacts of the proposed activity?
How well does the activity advance discovery and understanding while promoting teaching, training, and learning? How well does the proposed activity broaden the participation of underrepresented groups (e.g., gender, ethnicity, disability, geographic, etc.)? To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships? Will the results be disseminated broadly to enhance scientific and technological understanding? What may be the benefits of the proposed activity to society?

Examples illustrating activities likely to demonstrate broader impacts are available electronically on the NSF website at: http://www.nsf.gov/pubs/gpg/broaderimpacts.pdf.

Mentoring activities provided to postdoctoral researchers supported on the project, as described in a one-page supplementary document, will be evaluated under the Broader Impacts criterion.

NSF staff also will give careful consideration to the following in making funding decisions:

Integration of Research and Education
One of the principal strategies in support of NSF's goals is to foster integration of research and education through the programs, projects, and activities it supports at academic and research institutions. These institutions provide abundant opportunities where individuals may concurrently assume responsibilities as researchers, educators, and students and where all can engage in joint efforts that infuse education with the excitement of discovery and enrich research through the diversity of learning perspectives.

Integrating Diversity into NSF Programs, Projects, and Activities
Broadening opportunities and enabling the participation of all citizens -- women and men, underrepresented minorities, and persons with disabilities -- 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.

Additional Review Criteria:

Proposals that create synergy among the various EarthScope components and activities are encouraged. Proposals will be judged additionally on their relevance to defining community products, developing community tools, and other similar activities.

For EarthScope Education and Outreach (E&O) proposals, the following items should be included in the 15-page Project Description and will be considered in the review:

- A description of previous educational efforts of the investigators. This might include how the investigator has: 1) influenced his or her research discipline; 2) incorporated or integrated contemporary research questions, processes, and results into educational experiences; 3) contributed to the literature of teaching and learning; 4) mentored others to conduct research and to educate students; or 5) demonstrated leadership among colleagues in promoting the above.
- A description of the activities to be undertaken related to EarthScope research and to exploring and experimenting with ways to integrate education and research.
- A plan for assessing and evaluating the effectiveness of the E&O activities.
- A plan to disseminate those activities that are found to be effective.

B. Review and Selection Process

Proposals submitted in response to this program solicitation will be reviewed by Ad hoc Review and/or Panel Review.

Reviewers will be asked to formulate a recommendation to either support or decline each proposal. 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 is striving to be able to tell applicants whether their proposals have been declined or recommended for funding within six months. The time interval begins on the deadline or target date, or receipt date, whichever is later. The interval ends when the Division Director accepts the Program Officer's recommendation.

A summary rating and accompanying narrative will be completed and submitted by each reviewer. In all cases, reviews are treated as confidential documents. Verbatim copies of reviews, excluding the names of the reviewers, 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.

In all cases, after programmatic approval has been obtained, the proposals recommended for funding will be forwarded to the Division of Grants and Agreements for review of business, financial, and policy implications and 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.

VII. AWARD ADMINISTRATION INFORMATION

A. Notification of the Award

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

B. Award Conditions

An NSF award consists of: (1) the award letter, 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 letter; (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 letter. 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 http://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 *Award & Administration Guide* (AAG) Chapter II, available electronically on the NSF Website at http://www.nsf.gov/publications/pub_summ.jsp?ods_key=aag.

Special Award Conditions: EAR and EarthScope Data Policies: Principal investigators are required to adhere to the EAR Data Policy (http://www.nsf.gov/geo/ear/EAR_data_policy_204.pdf) and the EarthScope Data Policy (http://www.earthscope.org/es_doc/data/esdatapolicy.pdf). Final reports for all awards must include a statement describing how the data policy requirements have been met.

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 at least 90 days before the end of the current budget period. (Some programs or awards require more frequent project reports). Within 90 days after 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 that PI. 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 FastLane, for preparation and submission of annual and final project reports. Such reports provide information on activities and findings, project participants (individual and organizational) publications; and, other specific products and contributions. PIs will not be required to re-enter information previously provided, either with a proposal or in earlier updates using the electronic system. Submission of the report via FastLane constitutes certification by the PI that the contents of the report are accurate and complete. The project outcomes report 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.

EAR and EarthScope Data Policies: Principal investigators are required to adhere to the EAR Data Policy (http://www.nsf.gov/geo/ear/EAR_data_policy_204.pdf) and the EarthScope Data Policy (http://www.earthscope.org/es_doc/data/esdatapolicy.pdf). Final reports for all awards must include a statement describing how the data policy requirements have been met.

VIII. AGENCY CONTACTS

General inquiries regarding this program should be made to:

- Gregory J. Anderson, 785 N, telephone: (703) 292-4693, email: greander@nsf.gov
- Charles H. Estabrook, 785 N, telephone: (703) 292-8722, email: cestabro@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, National Science Foundation Update is a free e-mail subscription service 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 Regional Grants Conferences. Subscribers are informed through e-mail when new publications are issued that match their identified interests. Users can subscribe to this service by clicking the "Get NSF Updates by Email" link on the NSF web site.

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

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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 40,000 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 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 provide funding for special assistance or equipment to enable persons with disabilities to work on NSF-supported projects. See Grant Proposal Guide Chapter II, Section D.2 for instructions regarding preparation of these types of proposals.

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

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

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- **Location:** 4201 Wilson Blvd. Arlington, VA 22230
- **For General Information** (NSF Information Center)**:** (703) 292-5111
- **TDD (for the hearing-impaired):** (703) 292-5090
- **To Order Publications or Forms:**

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  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:

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