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Social-Computational Systems (SoCS)

PROGRAM SOLICITATION
NSF 10-600

REPLACES DOCUMENT(S):
NSF 09-559

National Science Foundation

Directorate for Computer & Information Science & Engineering
Division of Information & Intelligent Systems
Division of Computer and Network Systems
Division of Computing and Communication Foundations

Directorate for Social, Behavioral & Economic Sciences
Division of Behavioral and Cognitive Sciences
Division of Social and Economic Sciences

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

November 23, 2010

November 11, 2011

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.

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

The deadline for submissions has been changed.

The program description has been updated to continue to reflect its scientific scope.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Social-Computational Systems (SoCS)

Synopsis of Program:

The Social-Computational Systems (SoCS) program seeks to reveal new understanding about the properties that systems of people and computers together possess, and to develop theoretical and practical understandings of the

purposeful design of systems to facilitate *socially intelligent computing*. By better characterizing, understanding, and eventually designing for desired behaviors arising from computationally mediated groups of people at all scales, new forms of knowledge creation, new models of computation, new forms of culture, and new types of interaction will result. Further, the investigation of such systems and their emergent behaviors and desired properties will inform the design of future systems.

The SoCS program will support research in socially intelligent computing arising from human-computer partnerships that range in scale from a single person and computer to an Internet-scale array of machines and people. The program seeks to create new knowledge about the capabilities these partnerships can demonstrate - new affordances and new emergent behaviors, as well as unanticipated consequences and fundamental limits. The program furthermore seeks to build models informed by disciplines ranging from computational complexity theory to behavioral sciences that will enable a scientific understanding of fundamental limits for such systems. The program seeks to foster new ideas that support even greater capabilities for socially intelligent computing, such as the design and development of systems reflecting explicit knowledge about people's cognitive and social abilities, new models of collective, social, and participatory computing, and new algorithms that leverage the specific abilities of massive numbers of human participants.

The SoCS program seeks to capitalize upon the collaborative knowledge and research methods of investigators in the computational and human sciences, recognizing that researchers in computer science and related disciplines often focus on the limits and capabilities of computation in isolation from the people that use computation, while researchers in the social sciences often focus on the use of technology or the capabilities of people with limited impact on how such knowledge can influence the design of new technologies. *Proposals that reflect collaborative efforts spanning computational and human centered approaches and perspectives are specifically encouraged.*

Cognizant Program Officer(s):

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

- Susan Fussell, Program Contact, 1125, telephone (703) 292-8074, email: sfussell@nsf.gov
- William S. Bainbridge, Program Director, 1125, telephone: (703) 292-8930, email: wbainbri@nsf.gov
- Petros Drineas, Program Director, 1125, telephone: (703) 292-7338, email: pdrineas@nsf.gov
- Darleen L. Fisher, Program Director, 1175, telephone: (703) 292-8950, email: dlfisher@nsf.gov
- Tanya Korelsky, CISE/IIS, 1125, telephone: (703) 292-8930, email: tkorelsk@nsf.gov
- Frederick M. Kronz, SBE/SES, 995, telephone: (703) 292-7283, email: fkronz@nsf.gov
- Betty Tuller, SBE/BCS, 995, telephone: (703) 292-7238, email: btuller@nsf.gov

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

- 47.070 --- Computer and Information Science and Engineering
- 47.075 --- Social Behavioral and Economic Sciences

Award Information

Anticipated Type of Award: Standard Grant or Continuing Grant

Estimated Number of Awards: 15 to 20 standard or continuing grants in each annual competition. Awards with annual budgets up to $250,000 and durations of up to 3 years will be made.

Anticipated Funding Amount: $10,000,000 in FY 2011 and for each annual competition thereafter, pending the 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: 1

An individual may participate in at most one proposal as PI, co-PI or Senior Personnel in any annual competition.

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):

  November 23, 2010

  November 11, 2011

Proposal Review Information Criteria

Merit Review Criteria: National Science Board approved criteria apply.

Award Administration Information

Award Conditions: Standard NSF award conditions apply.

Reporting Requirements: Standard NSF reporting requirements apply.

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I. INTRODUCTION

Innovations in computing and communications technologies and the increasing integration of rich digital resources in all realms of

human activity are bringing humans and computers together in powerful new ways. Massive numbers of Internet-based volunteer communities collaboratively write encyclopedia articles of unprecedented scope and scale, craft enormously successful open source software, solve collective problems and perform massive, complex computations that exploit the unused power of millions of computers worldwide. Commerce has been revolutionized; online marketplaces harness the collective behaviors of their participants, create vast storehouses of consumer-supplied reviews, recommend products by matching a consumer's shopping behavior with other customers with similar behaviors, and set marketplace prices via computationally mediated auctions. Interactive theorem provers and computer-assisted proofs have expanded mathematical prowess to new levels. Search engines are prioritizing pages based on the extent to which each page has been linked to by others across the entire World Wide Web. Political movements are creating new forms of engagement and collective action in political systems worldwide. "Citizen" scientists learn from and collaborate with professional scientists in the production of knowledge. Millions of people who have never met work together in teams to develop and execute complex activities in online games and virtual worlds. We are witnessing the creation of richly interconnected worlds where people and computers together demonstrate new forms of learning, collaboration, communication, and emergent intelligence that were not previously achievable by people or computers alone.

Yet, as powerful and evocative as such examples may be, they are merely suggestive of the intensely powerful systems of the future that this program targets. NSF defines such systems as *socially intelligent computing*. *Social* refers to the interactions among people and increasingly more sophisticated computing technologies; *intelligent* refers to the emerging intelligence exhibited by such systems as well as their increasing knowledge about people and their interactions with one another and with computers; *computing* refers to the computation technologies that act as mediators among people, as tools used by people, and as equal or complementary participants with people. These systems generate new, emergent behaviors that arise out of the complex and dynamic interactions among people and computers. Yet there are no adequate theories that explain the behavior of these systems and that can guide us in their purposeful design. Can we understand how such systems give rise to emergent behaviors? What values do they embody and what affordances do they provide? How do we create systems that by design harness the essential characteristics of both people and computers to achieve our ambitions and embody desired behaviors? Ultimately these systems comprise more than computation or human intelligence as we currently think of them in isolation, letting us rethink questions as fundamental as "What is intelligence?" and "What is computable?"

II. PROGRAM DESCRIPTION

The Social-Computational Systems (SoCS) program seeks to reveal new understanding about the properties that systems of people and computers together possess, and to develop a practical understanding of the purposeful design of systems to facilitate *socially intelligent computing*. By better characterizing, understanding, and eventually designing for desired behaviors arising from computationally mediated groups of people at all scales, new forms of knowledge creation, new models of computation, new forms of culture, and new types of interaction will result. Further, the investigation of such systems and their emergent behaviors and desired properties will inform the design of future systems.

The SoCS program will support research in socially intelligent computing arising from human-computer partnerships that range in scale from a single person and computer to an Internet-scale array of machines and people. The program seeks to create new knowledge about the capabilities these partnerships can demonstrate - new affordances and new emergent behaviors, as well as unanticipated consequences and fundamental limits. The program also seeks to foster new ideas that support even greater capabilities for socially intelligent computing, such as the design and development of systems reflecting explicit knowledge about people's cognitive and social abilities, new models of collective, social, and participatory computing, and new algorithms that leverage the specific abilities of massive numbers of human participants.

The SoCS program seeks to capitalize upon the collaborative knowledge and research methods of investigators in the computational and human sciences, recognizing that researchers in computer science and related disciplines often focus on the limits and capabilities of computation in isolation from the people that use computation, while researchers in the human sciences often focus on the use of technology or the capabilities of people with limited impact on how such knowledge can influence the design of new technologies. *Proposals that reflect collaborative efforts between computational and human scientists are specifically encouraged.*

Representative questions and research challenges of interest to the SoCS program are listed below.

- What design techniques and computational, technical, and social substrates and abstractions enable and facilitate the design of and fullest breadth of behaviors from socially intelligent computing systems? How can we design socially intelligent computing systems for desirable properties and values?
- How does sociality scale? How does the way we interact change as we move from face-to-face interaction, through small groups, through organizations and to mass interactions? How does sociality change as we blur the distinction of an interaction with another person or an interaction with a machine?
- What behavioral, computational, and mathematical methods are effective in studying socially intelligent computing? How can we effectively compare various types of socially intelligent computing?
- How can we better understand what types of behaviors and what new affordances can emerge or be demonstrated by socially intelligent computing? Can we model or parameterize such systems, helping us understand what is "computable" or what behaviors are achievable or unachievable by socially intelligent computing?
- How does socially intelligent computing arise in scales ranging from a single person and computer to an Internet-scale cloud of machines and people? Can we model or parameterize such systems, helping us to understand what is "intelligence" when humans and computers are most effectively or integrally connected?
- How does one express requirements and implement systems when system goals, tasks and resources will be a combination of people and computers, or communities of people and computer-communication infrastructures?
- What system design processes, methods and tools harness the collective capabilities of humans and computers to produce systems that meet their requirements with high confidence and reliability? How can large social computational systems design and develop new collectively intelligent systems?
- Can greater capabilities be achieved if our computational creations - whether as mediators between people, as tools wielded by people, or as equal or complementary participants with people - were explicitly designed with knowledge of the cognitive, social, cultural, and emotional factors that impact our behaviors?
- How can we leverage unexpected behaviors of socially intelligent computing systems? Can we build systems that are robust to the vagary of motivations, calculation, and communication?
- How are value systems embedded in the algorithms and collective participations and what form do they take? For example, volunteerism is a well-established and studied behavior among people, but what distinctive aspects feature strongly in socially intelligent computing where encyclopedia entries, software elements, and product reviews are created by millions of often anonymous, uncompensated people?
- Communities are central to the lives of people as social creatures, but what distinctive aspects feature strongly in people playing together in virtual world games or socializing through the myriad Internet communities and social networking

resources?
- Are there general ways to harness those capabilities in which people currently outperform computers - such as image understanding - with complementary capabilities of computing to achieve behaviors that transcend those of people or computers in isolation?
- Can we reason in an integrated way about cognitive models of human capabilities and complexity-theoretic models of machine capabilities to gain an understanding of the computational power of Social-Computational Systems?

The SoCS program does not seek to rebuild or incrementally improve on existing exemplary systems. Instead, SoCS is targeting a new horizon of computationally mediated human and machine interactions that reframe what it means to think, learn, compute, work, interact and play. Submissions must make clear how the proposed work would ultimately expand our body of knowledge about designing socially intelligent computing systems. *Proposals that describe socially intelligent computing experiments designed to address contemporary economic and social issues are specifically encouraged.*

III. AWARD INFORMATION

Approximately 15-20 awards with annual budgets up to $250,000 and durations of up to 3 years will be made in each annual competition. Typical awards will reflect collaborations between investigators in the computational and human sciences. Estimated program budget, number of awards and award size/duration are subject to the availability of funds.

IV. 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: 1

An individual may participate in at most one proposal as PI, co-PI or Senior Personnel in any annual competition.

Additional Eligibility Info:

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.

Addressing Proposal Fit to SoCS Program

Proposals are encouraged to include a small section in their Project Description explaining how they are defining "Social Computational Systems" and how their proposed work will address or extend "SoCS" research. While each research project is unique and SoCS research spans different disciplines and different topic domains, some questions which might address fit to the program include:

- How and to what extent does the proposed project increase our understanding of properties that systems of people and computers together posses, especially emergent intelligence or behaviors not present in people or computers alone?
- How and to what extent does the proposed project develop or contribute to new theories of integrated social-computational systems?
- To what extent does the proposed project and research team span both the computational and social perspectives?
- How and to what extent would the proposed project go beyond simply rebuilding or incrementally improving on existing systems?
- How and to what extent could results of the project lead to the design of systems reflecting explicit knowledge of human cognitive and/or social abilities, new models of social computing, or new algorithms that depend on massive numbers of humans?

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):

  November 23, 2010

  November 11, 2011

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. Comprehensive information about using Grants.gov is available on the Grants.gov Applicant Resources webpage: http://www07.grants.gov/applicants/app_help_reso.jsp. 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.

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.

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.

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:

- Susan Fussell, Program Contact, 1125, telephone (703) 292-8074, email: sfussell@nsf.gov
- William S. Bainbridge, Program Director, 1125, telephone: (703) 292-8930, email: wbainbri@nsf.gov
- Petros Drineas, Program Director, 1125, telephone: (703) 292-7338, email: pdrineas@nsf.gov
- Darleen L. Fisher, Program Director, 1175, telephone: (703) 292-8950, email: dlfisher@nsf.gov
- Tanya Korelsky, CISE/IIS, 1125, telephone: (703) 292-8930, email: tkorelsk@nsf.gov
- Frederick M. Kronz, SBE/SES, 995, telephone: (703) 292-7283, email: fkronz@nsf.gov
- Betty Tuller, SBE/BCS, 995, telephone: (703) 292-7238, email: btuller@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.

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 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.

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Last Updated: 11/07/06
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