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Center for the Environmental Implications of Nanotechnology (CEIN)

Program Solicitation

NSF 07-590



National Science Foundation

Directorate for Biological Sciences

Directorate for Education & Human Resources

Directorate for Engineering

Directorate for Geosciences

Directorate for Mathematical & Physical Sciences

Directorate for Social, Behavioral & Economic Sciences



Environmental Protection Agency

Preliminary Proposal Due Date(s) (*required*):

December 10, 2007

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

March 17, 2008

Full proposals may ONLY be submitted by invitation from NSF

REVISION NOTES

In furtherance of the President's Management Agenda, NSF has identified programs that will offer proposers the option to utilize Grants.gov to prepare and submit proposals, or will require that proposers utilize Grants.gov to prepare and submit proposals. Grants.gov provides a single Government-wide portal for finding and applying for Federal grants online.

In response to this program solicitation, proposers may opt to submit proposals via [Grants.gov](https://www.grants.gov) or via the [NSF FastLane](#) system.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Synopsis of Program:

This solicitation requests proposals to create a national Center to conduct fundamental research and education on the implications of nanotechnology for the environment and living systems at all scales. The Center will address interactions of naturally derived, incidental and engineered nanoparticles and nanostructured materials, devices and systems (herein called nanomaterials) with the living world. Essential elements of this Center will include understanding the interactions of nanomaterials with organisms, cellular constituents, metabolic networks and living tissues; understanding environmental exposure and bioaccumulation and their effects on living systems; and determining the biological impacts of nanomaterials dispersed in the environment. Additional elements of the Center may include the development of methods and instrumentation for the detection and characterization of nanomaterials. For the purpose of this solicitation, nanomaterials have at least one dimension with a length of approximately 1 to 100 nm. A multidisciplinary research approach involving the biological, chemical, physical, computational, mathematical, social and behavioral sciences will be needed to understand the fundamental processes associated with the interaction of nanomaterials with the environment and living systems. This Center is expected to interact with other Nanotechnology Science and Engineering Centers as appropriate.

Cognizant Program Officer(s):

- Alan J. Tessier, Lead Program Officer, BIO/Division of Environmental Biology, 635, telephone: (703) 292-7198, email: nsfcein@nsf.gov
- Nora Savage, Lead Program Officer, EPA/Office of Research & Development, National Center for Environmental Research, 3319L, telephone: (202) 343-9858, email: nsfcein@nsf.gov
- Judy Raper, ENG/Division of Chemical, Bioengineering, Environmental & Transport Systems, 565, telephone: (703) 292-5382, email: nsfcein@nsf.gov
- Enriqueta Barrera, GEO/Division of Earth Sciences, 785, telephone: (703) 292-8551, email: nsfcein@nsf.gov
- Ulrich Strom, MPS/Division of Materials Research, 1065, telephone: (703) 292-4938, email: nsfcein@nsf.gov
- Rita Teutonico, SBE/Office of the Assistant Director, 907, telephone: (730) 292-7118, email: nsfcein@nsf.gov
- Alphonse DeSena, EHR/Division of Research on Learning in Formal & Informal Settings, 885, telephone: (703) 292-5106, email: nsfcein@nsf.gov
- Helen G. Hansma, BIO/Division of Biological Infrastructure, 615, telephone: (703) 292-8470, email: nsfcein@nsf.gov

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

- 47.041 --- Engineering
- 47.049 --- Mathematical and Physical Sciences
- 47.050 --- Geosciences
- 47.074 --- Biological Sciences
- 47.075 --- Social Behavioral and Economic Sciences
- 47.076 --- Education and Human Resources
- 66.509 --- Environmental Protection Agency

Award Information

Anticipated Type of Award: Cooperative Agreement

Estimated Number of Awards: 1

Anticipated Funding Amount: \$5,000,000 Award is expected to be up to \$5,000,000 per year for up to 5 years pending

the availability of funds, with the possibility of one 5-year renewal depending on the availability of funds and successful review. The award is expected to consist of up to \$4,000,000 per year from the National Science Foundation plus \$1,000,000 per year from the Environmental Protection Agency for the initial 5 year award period.

Eligibility Information

Organization Limit:

Proposals may only be submitted by the following:

- Academic Institutions located in the U.S.: U.S. universities and colleges located in the U.S.
- 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.

PI Limit:

Principal Investigators are required to be at the faculty level or equivalent.

Limit on Number of Proposals per Organization: 1

Only one Preliminary Proposal may be submitted by any one organization as the lead organization. Full proposals may be submitted by invitation only.

Limit on Number of Proposals per PI: 1

An individual may be the Principal Investigator for only one Preliminary Proposal. Full Proposals may be submitted by invitation only.

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Letters of Intent:** Not Applicable
- **Preliminary Proposals:** Submission of Preliminary Proposals is required. Please see the full text of this solicitation for further information.
- **Full Proposals:**
 - Full Proposals submitted via FastLane: 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/bfa/dias/policy/docs/grantsgovguide.pdf>)

B. Budgetary Information

- **Cost Sharing Requirements:** Cost Sharing is not required by NSF.
- **Indirect Cost (F&A) Limitations:** Not Applicable
- **Other Budgetary Limitations:** Not Applicable

C. Due Dates

• Preliminary Proposal Due Date(s) (required):

December 10, 2007

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

March 17, 2008

Full proposals may ONLY be submitted by invitation from NSF

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: Standard NSF award conditions apply

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

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I. INTRODUCTION

Rapid progress is being achieved in science, engineering and technology, based on the ability to organize, characterize, and manipulate matter systematically at the nanoscale. Far-reaching outcomes for the 21st century are envisioned in scientific knowledge and a wide range of technologies in most industries, healthcare, conservation of materials and energy, biology, environment and education. The current surge in research and development and the proliferation of nanotechnology requires concurrent visionary research on the impact of naturally derived and engineered nanomaterials on the living world for both immediate and long-term timescales.

A significant challenge associated with this research is the diversity of nanomaterials and their derivatives. By definition, nanomaterials have sizes of approximately 1 to 100 nanometers in at least one dimension; they may display new physical, chemical, or biological properties unique to materials of this small size. Nanomaterials can be organic or inorganic; they vary in shape, size, structure and surface properties. While most nanomaterials are passive, new active nanostructures are being developed that change or evolve their state during their operation. Research to understand and anticipate the implications of nanomaterials for environmental health and safety must include strategies that address both the intrinsic diversity of nanomaterials and the evolving nature of nanotechnology. Also required will be the education and training of a new class of interdisciplinary scientists and engineers capable of dealing with the environmental health and safety challenges resulting from the development and proliferation of nanomaterials in the living world.

The NSF, as the lead federal agency for the National Nanotechnology Initiative (NNI), provides critical support for research and education in fundamental Nanoscale science and engineering, as well as research to understand the likely impacts of nanotechnology on society. EPA supports research to meet its mission of protecting human health and the environment. Supported research is expected to be used by the engineering and scientific community in risk assessment, specifically in hazard identification and exposure assessment. EPA is interested in funding research on the possible risks and exposure routes of newly produced chemicals and materials at the nanoscale. This solicitation requests proposals to create a National Center that will conduct fundamental research and education on the short- and long-term impact of nanotechnology on the environment and living systems at all scales. A multidisciplinary research approach involving the biological, chemical, physical, computational, mathematical, social and behavioral sciences will be needed to understand the fundamental processes and related risks associated with the interaction of naturally derived and engineered nanomaterials with the environment and living systems. In addition, the research outcomes from this Center are expected to yield knowledge on how characteristics unique to the nanoscale realm play a role in living and non-living systems in the natural world.

The Center will inaugurate new opportunities to educate and train interdisciplinary scientists and engineers who are capable of exploring and understanding the complex interface between nanomaterials and natural systems, as well as the potential impact of nanomaterials on the living world.

The success of this Center will require effective and frequent formal and informal networking that assembles researchers from various disciplines in academia, industry, and government who are engaged in nanoscience research, education and development, as well as effective education at all levels regarding the implications of nanotechnology for environmental health and safety.

This solicitation, previous program announcements, and additional information concerning related activities such as workshops and publications, are available on-line (<http://www.nsf.gov/nano>; <http://nano.gov>).

II. PROGRAM DESCRIPTION

RESEARCH AND EDUCATION FOCUS

The focus of this Center is on fundamental research and education on the interactions of naturally derived, incidental (i.e., derived from human activity) and engineered nanoparticles and nanostructured materials, devices and systems (herein called “nanomaterials”) with the environment and living world at all scales. The goal of this Center is to understand the potential implications of nanotechnology for environmental health and safety. For the purpose of this solicitation, essential elements of this Center will include:

1. Understanding the bioaccumulation of nanomaterials and their effects on living systems including their routes of environmental exposure, deposition, transformation, bio-persistence, clearance, and translocation, as well as mechanisms for their absorption, distribution, metabolism, and excretion by organisms.
2. Understanding the interactions of nanomaterials with cellular constituents, metabolic networks and living tissues

including interactions at the molecular, cellular, organ, and systemic levels, and effects on organism ontogeny and multi-generational life histories.

3. Determining the biological impacts of nanomaterials dispersed in the environment including the ecological and evolutionary effects of nanomaterials on aquatic and terrestrial ecosystems such as: species interactions, factors that contribute to bioaccumulation and biomagnification of nanomaterials in food webs, distribution of nanomaterials and their byproducts within ecosystems, biotic processes that influence the persistence and chemical transformations of nanomaterials in the environment, and the mode and duration of effects on ecosystems.

Proposals are expected to incorporate aspects of the three research areas enumerated above. Proposals may include supporting activities such as the development of sensors to detect and characterize nanomaterials and strategies to address the diversity of nanomaterials including standard reference materials, measurement standards and protocols. Proposals should emphasize the integration of research and education at all levels, as well as appropriate community and public understanding and outreach according to the nature of the project(s).

This Center will not support pilot plant efforts, research requiring security classification, the development of products for commercial marketing or market research for a particular project or invention. Research with disease-related goals, including work on the etiology, diagnosis or treatment of physical or mental disease, abnormality or malfunction in human beings will not be supported. The development or testing of drugs or other procedures for the treatment of disease also is not eligible for support.

MODE OF SUPPORT

CENTER FOR THE ENVIRONMENTAL IMPLICATIONS OF NANOTECHNOLOGY (CEIN)

Goals and Structure

The CEIN will address the implications of nanotechnology on environmental health and safety through fundamental research on the interactions of nanomaterials with the living world at all scales.

The CEIN will address complex and multi-faceted research opportunities that are beyond the capability and resources of an individual investigator or small group of investigators. The Center will bring together researchers with diverse expertise to address complex, interdisciplinary challenges and to integrate research with education both internally and through a variety of partnership activities. The Center, whether based at a single institution or distributed across a number of institutions, must have an overarching research and education focus, well-integrated programs, and a coherent and effective management plan.

The CEIN proposal must include all the following components:

- A plan to achieve major goals that requires the coherence and critical mass of a university-based center;
- A well integrated, cross-disciplinary research program distinguished by intellectual excellence and driven by a clear vision;
- Justifications for specific research foci;
- A strong emphasis on education, incorporating extensive student participation in the Center's interdisciplinary research;
- Partnerships with industry, government laboratories and agencies, non-governmental organizations, and/or users of research outcomes where applicable and appropriate;
- Activities to foster human resource development and enhanced participation of under-represented groups in relevant fields;
- A long-term Center vision for reducing uncertainty about the environmental health and safety implications of nanotechnology through research, education, public outreach and dissemination;
- Plans for collaboration with other Nanotechnology Science and Engineering Centers (NSEC) where appropriate, including but not limited to the Center for Nanotechnology in Society (CNS), the Center for Learning and Teaching in Nanoscale Science and Engineering (NCLT), and the Nanoscale Informal Science Education Network (NISE Net).

The CEIN may also choose to include optional activities, as appropriate, such as (but not limited to):

- Collaboration with other U.S. and/or international centers, laboratories, and groups, which may include exchange programs for students and faculty;
- Shared experimental facilities, including fabrication and/or characterization equipment, equipped and maintained for the benefit of users within and outside the center;
- Collaboration with and access to unique capabilities offered by existing national nanotechnology facilities and

resources such as the National Nanotechnology Infrastructure Network, the Center for Biological and Environmental Nanotechnology (CBEN), the Nano/Bio Interface Center (NBIC), and the Network for Computational Nanotechnology (and advanced computational facilities and resources through partnership with national laboratories and other institutions and centers);

- Collaboration with and access to unique capabilities offered by existing and anticipated national ecological research facilities and resources including the National Ecological Observatory Network (NEON) and the Long-Term Ecological Research (LTER) Network; and
- Collaboration with and access to unique capabilities offered by other government agencies such as NIST, NIH, EPA etc. where appropriate.

The Center Director

The Center Director will be responsible for management and staffing; for the design and maintenance of appropriate oversight; for effective communication with the research community, government agencies, and the general public; for the procurement, use, maintenance, and control of equipment, supplies, and facilities; and for management of the research funds allocated to the CEIN. The principal investigator of the proposal should be the anticipated Center Director.

Center Diversity

The NSF expects faculty, staff and administration of institutions receiving NSF funding to devote the time and effort required to ensure the diversity of the Center participants at all levels. This expectation is made with the understanding by NSF that Centers generally do not have the authority to hire faculty, accept students or grant degrees, and that federal law prohibits universities receiving federal funding from employing quotas or set-asides based on gender, race or ethnicity. However, Centers have high visibility and therefore can serve as role models for diversity within an institution and for the nation as a whole. Therefore, the Center is expected to demonstrate significant commitment to and success in involving women and underrepresented racial/ethnic minorities as Center participants. Since no set of formal requirements can ensure that a desired level of dedication to achieving diversity is engendered, the success of any diversity strategy will depend in large part on the spirit in which it is implemented by the Center and its collaborating departments and university-level schools.

III. AWARD INFORMATION

The NSF expects to make a single award of up to \$5,000,000 per year for 5 years depending on the availability of funds, with the possibility of a second 5 years of funding depending on an NSF review of the Center.

IV. ELIGIBILITY INFORMATION

Organization Limit:

Proposals may only be submitted by the following:

- Academic Institutions located in the U.S.: U.S. universities and colleges located in the U.S.
- 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.

PI Limit:

Principal Investigators are required to be at the faculty level or equivalent.

Limit on Number of Proposals per Organization: 1

Only one Preliminary Proposal may be submitted by any one organization as the lead organization. Full proposals may be submitted by invitation only.

Limit on Number of Proposals per PI: 1

An individual may be the Principal Investigator for only one Preliminary Proposal. Full Proposals may be submitted by invitation only.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Preliminary Proposals(*required*):

Preliminary proposals must be submitted via NSF FastLane by 5:00 p.m. proposer's local time on December 10, 2007.

Preliminary proposals must consist of:

1. A **Cover Sheet** showing the name of the proposed Center Director (Principal Investigator) and key participants (Co-Principal Investigators), and the preliminary proposal title.
2. A **Project Summary** (not to exceed one page), providing an executive summary highlighting the main activities, administration, infrastructure and partnerships of the Center. It must indicate, in separate statements, the intellectual merit of the proposed work and its broader impacts. (See Section VI.)
3. A **Project Description** providing a narrative, not to exceed 15 pages total, which must:
 - Provide an overview of the Center as a whole, including a comprehensive vision of the Center, a concise rationale for establishing the Center, justifications for specific research foci, and an outline of the existing and planned capabilities of the participating institutions in relevant research and education.
 - Describe the proposed research and education activities of the Center; indicating clearly which investigators and/or groups of investigators will have primary responsibility for the various aspects of the research and education program.
 - Describe the activities proposed to integrate research and education, develop human resources, and cooperate with public and private sector organizations.
 - Describe proposed shared experimental facilities and/or cooperative activities with international partners if any.
 - Give an outline of the proposed arrangements for administration and management of the Center.
 - Describe, in separate statements, the intellectual merit of the proposed work and its broader impacts.
 - Address collaboration with the other nanotechnology centers where appropriate and with centers engaged in environmental or ecological research. The new CEIN is expected to collaborate with grantees from other agencies with similar programs, and to share resources with those programs for mutual advantage.
 - Provide long-term vision for reducing uncertainty about the environmental health and safety implications of nanotechnology.
4. A **References Cited** section.
5. **Biographical Sketches** of the proposed Center Director (PI) and key participants (co-PIs), **not to exceed two pages each**.
6. **Budget**: No budget is required. **However, please enter \$2 in the Requested Amount box on the Fastlane Cover Sheet (this entry allows correct Fastlane processing).**
7. Special Information/Supplementary Documentation, consisting **only** of:
 - 7a. A **list of each participating institution, and each participating investigator** (at the faculty level or equivalent), by full name, and indicate his or her institutional and departmental affiliations. Additional biographical information is not required in the preliminary proposal. Names should be grouped by institution, and listed alphabetically within each group.
 - 7b. A **one-page synopsis of institutional and other commitments** to the proposed Center. (Letters of

support should not be included at this stage).

8. Single Copy Document

Provide a list, in a single alphabetized table or spreadsheet of the full names and institutional affiliations of all people with **conflicts of interest** for the PI, any senior personnel, and any named personnel whose salary is requested in the project budget. The table should specify the nature of the conflict including: (1) PhD thesis advisors or advisees; (2) collaborator or co-authors, including postdocs, for the past 48 months; and (3) any other individuals or institutions with which the PI or Co-PIs have financial ties.

Preliminary proposals that exceed the page limitations or fail to include any required information will be ineligible for consideration and will be returned without review.

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 pubs@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/bfa/dias/policy/docs/grantsgovguide.pdf>). 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 pubs@nsf.gov.

CEIN proposal preparation instructions that supplement or deviate from the standard GPG or NSF Grants.gov Application Guide instructions follow.

Full Proposal Preparation and Submission Instructions

By invitation from NSF (and only with invitation) full proposals must be submitted via NSF FastLane or Grants.gov by 5:00 p. m. proposer's local time on March 17, 2008. A clear disclosure must be made on the Cover Sheet if a related proposal has been submitted or is planned to be submitted to another federal agency. A brief explanation of overlap (up to one page) should be provided in the supplementary documentation section of the proposal preparation module.

The proposal must contain the following items. **Proposals that exceed the indicated page limitations or fail to include any required information will be ineligible for consideration and will be returned without review.**

1. **NSF Cover Sheet.** Proposers must identify the program solicitation number (found on the cover sheet of this document) in the program announcement/solicitation block on the Cover Sheet. (Grants.gov users: The program solicitation number will be pre-populated by Grants.gov on the NSF Grant Application Cover Page.) The title must begin with "CEIN." Compliance with this requirement is critical to determining the relevant proposal processing guidelines. **Failure to follow these instructions may delay processing.**
2. **Table of Contents.** Will be generated automatically by FastLane or Grants.gov.
3. **Executive Summary** (to be entered in the **Project Summary** section). Describe, in separate statements, the intellectual merit of the proposed work and its broader impacts. In addition, provide a clear vision for and overarching description of the proposed Center and its potential impact. Briefly describe the institutional setting(s) of the Center, its proposed scope and organization, activities in research and education and their integration, development of human resources, collaborative activities with industry and other sectors, links with related major

research teams or Centers on or off campus, and management plan. **Limit: 3 pages.**

4. **Project Description.** Elaborate the long-term vision for addressing concerns about the environmental health and safety implications of nanotechnology through research, education, outreach and dissemination. Provide a concise description of the long-term research goals and intellectual focus of the Center, and describe the planned research activities in sufficient detail to enable their scientific and engineering merit and significance to be assessed. Justifications for specific research foci should take into account the overall goal of the center. Describe the role and intellectual contribution of each faculty-level participant, and briefly outline the resources available or planned to accomplish the research goals (it will be helpful to underline the name of each investigator wherever it occurs). The need for an interactive, interdisciplinary approach involving a team of investigators, and the means of achieving this, should be clearly established. Describe, in separate statements, the intellectual merit of the proposed work and its broader impacts. **Limit for this section: 15 pages, including diagrams, figures and illustrations.** IMPORTANT NOTE: Even if diagrams, figures and illustrations are submitted in the supplementary documentation section of the FastLane or Grants.gov proposal preparation module, they must still be counted in the 15-page limit for this section.
5. In the Supplementary Docs section include the following appendices:

Appendix A1: **List of Participants.** List each participating institution, and each participant (faculty level or equivalent), by full name, and indicate his or her institutional and departmental affiliation. Names should be grouped by institution, and listed alphabetically within each group.

Appendix A2: **Education, Human Resources, and Outreach.** Describe the proposed activities of the Center in education and human resource development, including plans for participation by undergraduates, pre-college students and teachers, and members of underrepresented groups. Outline plans for seminar series, colloquia, workshops, conferences, summer schools and related activities, as appropriate. Describe any additional outreach programs not included in other sections of the proposal. Describe evaluation plans for all education programs. Describe how the project will foster public understanding of environmental health and safety issues related to nanotechnology, as well as understanding of the research carried out by the Center. **Limit: 5 pages.**

Appendix A3: **Project Management Plan.** Describe the organizational structure of the Center including plans for administration of the Center, and the functions of key personnel. Describe plans for external oversight and reporting that include the roles of an internal Center Executive Committee and an external Advisory Committee. Do **NOT** list individual names, but describe the range of expertise needed to constitute an efficient and functional external Advisory Committee and how such a committee will be constituted and recruited. Explain the selection criteria and mechanisms for visiting or fixed-term personnel, individuals and groups, including those for ensuring broad participation by the scientific community. Describe the procedures and criteria used to select, administer, and evaluate the research programs of the Center, including collaborative programs with other groups and institutions as appropriate. Describe plans for implementing and evaluating the educational programs and outreach activities of the Center. **Limit: 3 pages.**

Appendix A4: **Information Management Plan.** Provide a clear statement of how the center will manage data, software tools and other digital resources that result from the activities supported by the NSF award, and that result from activities at the Center regardless of the source of support. The plan should address long-term archiving, intellectual property rights and means of dissemination. **Limit: 2 pages.**

Appendix A5: **Institutional Facilities.** Provide a description of how the capabilities and resources of the host institution will facilitate the proposed activities of the Center. Include information on organizational leadership and technical expertise as well as infrastructure and technologies for synthesis, analysis, and communication. Describe how the probable location of the Center will affect its success, including any unique characteristics of the institution or location. Outline access to capital equipment and existing facilities and resources, and commitments for collaboration and outreach programs. **Limit: 2 pages.**

Appendix A6: **Collaborations with Industry, Public and Private Sector Organizations and NSE grantees.** Describe the proposed interactions and collaborations with industry, non-governmental organizations and, where appropriate, with other institutions and sectors, including government laboratories and national user facilities. If applicable and appropriate, describe existing connections and plans to collaborate with other Nanotechnology Science and Engineering (NSE) grantees (including grantees of NSF and of other agencies). Define the goals and planned activities of the collaborations. Describe the roles of the senior participants, the mechanisms planned to stimulate and facilitate knowledge transfer, and the potential long-term impact of the collaborations. **Limit: 3 pages.**

Appendix A7: **Letters of Commitment/Collaboration.** Include a copy of a letter from each collaborating

individual or entity specifying the nature and expected term of the commitment or collaboration.

Appendix A8: **International Collaboration.** If applicable and appropriate, describe the nature of the collaboration and the expected international and scientific or engineering benefits to the research and education program. Include a description of the research facilities at the foreign site, as appropriate, and of the division of effort and expertise among the collaborators. **Limit: 1 page.**

Appendix A9: **Shared Research Facilities.** If applicable and appropriate describe the shared facilities to be established or collaborated with, including specific major instrumentation and plans for instrument development if any. Describe plan for maintaining and operating the facilities or resources, including staffing and provision for user fees for outside users if appropriate. **Limit: 2 pages.**

Appendix A10: **Emerging Areas:** If applicable and appropriate describe a mechanism by which the Center can respond quickly and effectively to new opportunities by identifying and supporting exploratory efforts in emerging areas relevant to the Center's intellectual focus. **Limit: 1 page.**

6. **References Cited Section.** (No page limit)

7. **Biographical Sketches.** Include a biographical sketch for each faculty-level (or equivalent) participant, listing mentors and collaborators, and up to ten publications most pertinent to this proposal. **Limit: 2 pages for each investigator.**
8. **Budget Pages.** Submit budget pages for the Center for each year of support (1 through 5). FastLane or Grants.gov will generate a five-year cumulative budget automatically. Provide separate budget pages for the lead institution and any other subawards irrespective of amount. Also provide budget justification for the five-year cumulative budget, for the lead institution and for all participating sub-awardees. The budget justification for the entire project is **limited to 5 pages.**

A grantees' conference will be held at NSF (Arlington, Virginia) of principal investigators from the CEIN, Nanoscale Interdisciplinary Research Teams (NIRTs) and Nanotechnology Science and Engineering Centers (NSECs) to review progress, exchange information, and promote collaborations. At least one investigator from the CEIN will be required to participate. Funds should be included in the CEIN proposal budget for attendance at this conference.

9. **Current and Pending Support.** List current and pending support for the Center Director (PI) and co-Principal Investigators in the "Current and Pending Support" FastLane form.
10. **Reviewer Information:** Reviews of proposals submitted to NSF are solicited from peers with expertise in the substantive area of the proposed research or education project. These reviewers are selected by Program Officers charged with the oversight of the review process. NSF invites the proposer to suggest, at the time of submission, the names of appropriate or inappropriate reviewers by entering that information into the FastLane "List of Suggested Reviewers" form. Special efforts are made to recruit reviewers from non-academic institutions, minority-serving institutions, or adjacent disciplines to that principally addressed in the proposal. Care is taken to ensure that reviewers have no conflicts with the proposer.
11. **Single Copy Document: Integrated Conflicts of Interests List for Applicants:** Provide a list, in a single alphabetized table or spreadsheet of the full names and institutional affiliations of all people with **conflicts of interest** for the PI, any senior personnel, and any named personnel whose salary is requested in the project budget. The table should specify the nature of the conflict including: (1) PhD thesis advisors or advisees; (2) collaborator or co-authors, including postdocs, for the past 48 months; and (3) any other individuals or institutions with which the PI or Co-PIs have financial ties.

B. Budgetary Information

Cost Sharing: Cost sharing is not required by NSF in proposals submitted to the National Science Foundation.

C. Due Dates

- **Preliminary Proposal Due Date(s) (required):**

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

March 17, 2008

Full proposals may ONLY be submitted by invitation from NSF

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 and, if they meet NSF proposal preparation 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 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 with the proposer.

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 and original 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?

NSF staff 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:

Reviewers will be asked to comment on the following criteria in addition to the standard NSF review criteria. Preliminary proposals will be evaluated in terms of their potential to meet the criteria for full proposals:

- Intrinsic merit of the proposed research program and the likelihood that the Center will lead to fundamental advances, new discoveries and/or technological advances;
- The level of interdisciplinary integration and synergy of research and education for the Center as a whole, and its potential to make significant contributions to advancing understanding of the impact of nanotechnology on environmental health and safety;
- Potential effect on the infrastructure of science and engineering by fostering a climate of interaction and effective knowledge transfer between the Center and its partners in industry and other sectors, and by fostering increased participation by members of underrepresented groups.
- Effectiveness of the proposed management plan for research and education, including mechanisms for setting priorities and allocating resources, plans for self-evaluation, and plans for ensuring a flexible and innovative program;
- Appropriateness of the requested budget.

The evaluation may also include the following criteria as appropriate:

- Effectiveness of the proposed collaboration with other U.S. and/or international centers, laboratories or groups;
- Appropriateness and level of integration among the shared facilities and research partners.

B. Review and Selection Process

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

Proposals will be evaluated using a three-stage review process. First, all proposers must submit a preliminary proposal. Preliminary proposals will be reviewed by an outside panel of experts. Proposers selected as a result of this preliminary review process will be invited to submit a full proposal. Those not invited will be ineligible to submit a full proposal. Full proposals submitted without a corresponding preliminary proposal will not be accepted. Eligible full proposals will be evaluated by both external mail-in and panel review. The outcomes of this evaluation will then be used to select 2-3 proposals for the third stage of review consisting of site/reverse site visits by a panel of outside experts.

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 date of receipt. 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 Federal Demonstration Partnership (FDP) 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/general_conditions.jsp?org=NSF. Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from pubs@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.

Failure to provide the required annual or final project reports 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 Awardee will provide an annual progress report at least three months prior to the end of each budget period, and additional ad hoc and regular reports as designated by the cognizant NSF Program Official with subject matter, format, and submission time line established by the NSF cognizant Program Official. The Awardee will submit all required reports via FastLane using the appropriate reporting category; for any type of report not specifically mentioned in FastLane, the Awardee will use the "Interim Reporting" function to submit reports. This system permits electronic submission and updating of project reports, including information on project participants (individual and organizational), activities and findings, 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.

External review in the form of a site/reverse site visit will be conducted by NSF approximately 12 months after the start of the award, and as often as necessary thereafter. The results of such review(s), the contents of annual reports, and the response of the Center to the reports it receives from its advisory group(s) will be among the factors used to determine the continuation of support.

VIII. AGENCY CONTACTS

General inquiries regarding this program should be made to:

- Alan J. Tessier, Lead Program Officer, BIO/Division of Environmental Biology, 635, telephone: (703) 292-7198, email: nsfcein@nsf.gov
- Nora Savage, Lead Program Officer, EPA/Office of Research & Development, National Center for Environmental Research, 3319L, telephone: (202) 343-9858, email: nsfcein@nsf.gov
- Judy Raper, ENG/Division of Chemical, Bioengineering, Environmental & Transport Systems, 565, telephone: (703) 292-5382, email: nsfcein@nsf.gov
- Enriqueta Barrera, GEO/Division of Earth Sciences, 785, telephone: (703) 292-8551, email: nsfcein@nsf.gov
- Ulrich Strom, MPS/Division of Materials Research, 1065, telephone: (703) 292-4938, email: nsfcein@nsf.gov
- Rita Teutonico, SBE/Office of the Assistant Director, 907, telephone: (730) 292-7118, email: nsfcein@nsf.gov
- Alphonse DeSena, EHR/Division of Research on Learning in Formal & Informal Settings, 885, telephone: (703) 292-5106, email: nsfcein@nsf.gov
- Helen G. Hansma, BIO/Division of Biological Infrastructure, 615, telephone: (703) 292-8470, email: nsfcein@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, MyNSF (formerly the Custom News Service) 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 Regional 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. MyNSF also is available on NSF's Website at <http://www.nsf.gov/mynsf/>.

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.

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.

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 <http://www.nsf.gov>

- **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:**
 - Send an e-mail to: pubs@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
Division of Administrative Services
National Science Foundation
Arlington, VA 22230

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