

# Physics Frontiers Centers (PFC)

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## Program Solicitation

NSF 07-567

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*Replaces Document(s):*

NSF 01-112

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**National Science Foundation**

Directorate for Mathematical & Physical Sciences  
Division of Physics

**Preliminary Proposal Due Date(s) (required)** (due by 5 p.m. proposer's local time):

August 29, 2007

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

January 30, 2008

By Invitation Only

## REVISION NOTES

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The Program Solicitation contains modifications over that of the previous solicitations.

The designation of Major Research Components has been changed to read Major Activities (MA) in order to include large-scale workshop organization, or comparable community-building efforts, as one of the potential primary thrusts of the PFC unit. Emphasis on interconnectivity between Major Activities centering on research thrusts is enhanced.

## SUMMARY OF PROGRAM REQUIREMENTS

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### General Information

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**Program Title:**

Physics Frontiers Centers (PFC)

**Synopsis of Program:**

The Physics Frontiers Centers (PFC) program supports university-based centers and institutes where the collective efforts of a larger group of individuals can enable transformational advances in the most promising research areas. The program is designed to foster major breakthroughs at the intellectual frontiers of physics by providing needed resources such as combinations of talents, skills, disciplines, and/or specialized infrastructure, not usually available to individual investigators or small groups, in an environment in which the collective efforts of the larger group can be shown to be seminal to promoting significant progress in the science and the education of students. Activities supported through the program are in all

sub-fields of physics within the purview of the Division of Physics: atomic, molecular, optical, plasma, elementary particle, nuclear, astro-, gravitational, and biological physics. Interdisciplinary projects at the interface between these physics areas and other disciplines and physics sub-fields, e.g. biology, quantum information science, mathematical physics, condensed matter physics, and emerging areas of physics are also included. The successful PFC activity will demonstrate: (1) the potential for a profound advance in physics; (2) creative, substantive activities aimed at enhancing education, diversity, and public outreach; (3) potential for broader impacts, e.g., impacts on other field(s) and benefits to society; (4) a synergy or value-added rationale that justifies a center- or institute-like approach.

**Cognizant Program Officer(s):**

- C. D. Caldwell, Program Director, 1015 N, telephone: (703) 292-7371, fax: (703) 292-9078, email: [dcaldwel@nsf.gov](mailto:dcaldwel@nsf.gov)
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- Ramona Winkelbauer, Computer Specialist, FastLane/Technical Problem Solver, 1015 N, telephone: (703) 292-7390, fax: (703) 292-9078, email: [rwinkelb@nsf.gov](mailto:rwinkelb@nsf.gov)

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

- 47.049 --- Mathematical and Physical Sciences

**Award Information**

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**Anticipated Type of Award:** Cooperative Agreement

**Estimated Number of Awards:** 5 to 7

**Anticipated Funding Amount:** \$10,000,000 to \$13,000,000

**Eligibility Information**

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**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.

**PI Limit:**

None Specified

**Limit on Number of Proposals per Organization: 2**

No more than two preliminary proposals may be submitted by any one institution. The same limitation applies to full proposals.

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

Any one individual may be the Principal Investigator (PI) for only one preliminary proposal. The same limitation applies to full proposals.

**Proposal Preparation and Submission Instructions**

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**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: 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](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 under this solicitation.
- **Indirect Cost (F&A) Limitations:** In accordance with Federal Negotiated Rate
- **Other Budgetary Limitations:** Other budgetary limitations apply. Please see the full text of this solicitation for further information.

## C. Due Dates

- **Preliminary Proposal Due Date(s) (required)** (due by 5 p.m. proposer's local time):

August 29, 2007

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

January 30, 2008

By Invitation Only

## Proposal Review Information Criteria

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

## Award Administration Information

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**Award Conditions:** Standard NSF award conditions apply.

**Reporting Requirements:** Standard NSF reporting requirements apply.

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# I. INTRODUCTION

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Physics addresses an inspiring range of phenomena, from quarks to the cosmos, from the Big Bang to the end of the universe, and all energy, length and time scales in between. The results of physics research touch everyone's life every day and promise solutions to some of our most daunting challenges. In a very real sense, advancing the intellectual frontiers in science, generally, and physics, in particular, is vital to the nation's health, prosperity, and defense. The purpose of the Physics Frontiers Centers (PFC) program is to support timely, aggressive, and forward-looking research that has the potential to lead to a major advance in physics, and, thereby, to advances in other fields and to benefits for society.

Major advances in physics are produced by efforts of all sizes. Over time, individual investigators and the small research group have consistently been among the most important producers of ideas and innovations. However, as projects have become increasingly more complex, large collaborations with hundreds of members are needed to address certain problems involving large-scale tools and facilities. In recent years an increasingly important mode of discovery-class research has developed that engages intermediate-sized collaborations that involve a mix of disciplines and/or talents, infrastructure for shared use, and center-scale activities. It is this mode of research that the PFC program is designed to address.

The PFC program will enable university-based investigators to address research areas that require more resources than are normally available to individual investigators or small groups, such as combinations of talents, skills, and/or disciplines or specialized infrastructure. Centers, groups, or institutes funded through the program are expected to address the most exciting questions at the very edge of current understanding. Such activities frequently take new research directions and always involve considerable technical risk. Organization of such activities will vary widely, depending on the particular needs of the research. It follows that maximum flexibility in the design of units funded through the program is essential, so the specific organization of the unit, whether it be a group, a center, or an institute, is left to the creativity of the principal investigators. Applications to the program will be judged by the two standard NSF criteria of intellectual merit and broader impact. In addition to this, a major deciding factor in determining whether an activity qualifies for PFC funding is the synergy and value added that justifies large-scale support.

Units supported through the PFC program are expected to provide an exceptionally stimulating environment for education so that students will benefit from interactions with a large, often interdisciplinary, group of scientists at all career levels. Awardees should strongly attract the most talented and motivated graduate and undergraduate students and postdocs and provide them with broad educational experiences. They should actively seek to enhance the participation of under-represented groups in the scientific enterprise. And they should reach out to involve younger students and the public in ways that increase science interest and literacy.

Activities supported through the program are in all sub-fields of physics within the purview of the Division of Physics: atomic, molecular, optical, plasma, elementary particle, nuclear, astro-, gravitational, and biological physics. Interdisciplinary projects at the interface between these physics areas and other disciplines and physics sub-fields not within the purview of the Physics Division, e.g. biology, quantum information science, mathematical physics, condensed matter physics, and emerging areas of physics, are also included. Proposals using experimental, theoretical, or computational methods, or any combination will be considered.

## II. PROGRAM DESCRIPTION

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The PFC program is designed to provide support to enable research at the frontiers of physics when the activities are of a scope and complexity that would not be feasible with standard individual investigator or small group support. Through the PFC program university researchers can form centers, institutes, or large group efforts that lead to major new ideas, discoveries, or broad advances in physics or at the boundaries of physics with other disciplines. Proposals for PFC support may address any area normally within the purview of the Division of Physics, including interdisciplinary and emerging areas of research.

Since the PFC program is designed to foster research at the intellectual frontiers, new types of joint efforts may be needed to address the most promising problems. Therefore, preconceived specifications as to the organization of the effort are kept to a minimum. In all cases, however, a unit must demonstrate that the whole is substantially greater than the sum of the parts. The unit must have a Director who takes overall responsibility for the effort. There must be a management and governance plan to indicate how the unit will operate. Such a plan must contain information on the overall management and reporting structure, how research projects are chosen, the existence and makeup of any advisory board(s) to be used, and the principal investigators responsible for different parts of the unit's activities, including education, diversity, and outreach activities, as well as the major research efforts.

The main characteristics of a PFC-supported unit are tailored by the principal investigators to most effectively address the chosen physics goals. Therefore, every unit will be different. Some may be centers; others may be institutes. Some may be stand-alone efforts; others may be intellectually-connected parts of a larger unit. Whatever the type of organization, it is expected that the PFC-supported unit will have some or all of the following characteristics of successful units of similar size and complexity in physics and other fields. In no particular order, these are: (1) combining talent, skills, or facilities required for a major advance in physics; (2) combining groups, departments, institutions, etc. required to make a major advance in physics; (3) providing critical mass or specialized infrastructure needed for an advance by the unit, and often the broader field; (4) providing the context and/or organization to bring together leaders and students to initiate work in a promising new area, a new interdisciplinary field, an important application, or a new facility of strategic importance to physics; (5) fostering field-wide exploration of frontier research within the community at large; (6) making available specialized infrastructure to others; and (7) creating innovative projects to promote education, diversity, and public outreach using the center as a focal point.

Investigators making up the unit requesting PFC funding may already have, or choose to apply for, funding outside the context of the PFC funds. (This applies to typical individual principal investigator grants and not to large group grants that are already on the PFC scale.) The combination of PFC support with other support for the major investigators will be handled in the following way: If the existing individual support is for work not related to the PFC, it must be listed in the proposal to indicate the context of the proposed work. If an existing grant is related to the objectives of the proposed PFC, that support could be considered to be a base for the incremental PFC support that would then contribute to the additional benefits expected from the PFC. If no related support exists, or if the PIs so choose, the PFC budget can include all support for the activity. Examples of both approaches exist, and the PIs are encouraged to discuss such matters with the cognizant Program Director prior to submitting the preliminary proposal. Whatever the choice made, however, it is critical to demonstrate that the research for which PFC funds are requested is connected to the overall PFC-supported activity in such a way as to foster progress that would not be realized in the absence of the synergy provided by the PFC effort.

## III. AWARD INFORMATION

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Estimated program budget, number of awards and average award size/duration are subject to the availability of funds. Individual PFC awards are expected to range in size between \$1.0 million/year and \$4.5 million/year, with an average award size of approximately \$2M/year. The number of awards in FY 2008 is expected to be in the range 5-7, depending upon the availability of funds and the quality of proposals received. Awards will be made for five years, with an option for a one-year extension, contingent on satisfactory review, during which the PFC is eligible to apply for renewal. Proposals from existing (re-competing) PFCs will be evaluated in open competition with new proposals. If a proposal from an existing Center is not successful, phase-out support may be provided at a reduced level for up to two years under the current award. If a proposal from an existing PFC is successful, a new cooperative agreement will be awarded. Anticipated date of awards: On or about August 1, 2008.

## IV. ELIGIBILITY INFORMATION

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### 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.

**PI Limit:**

None Specified

**Limit on Number of Proposals per Organization: 2**

No more than two preliminary proposals may be submitted by any one institution. The same limitation applies to full proposals.

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

Any one individual may be the Principal Investigator (PI) for only one preliminary proposal. The same limitation applies to full proposals.

**Additional Eligibility Info:**

Academic institutions in the United States with research and education programs in the areas of physics outlined in the Introduction in Section I must submit preliminary proposals. In order to reduce the burden of proposal writing for the physics research community and the burden of subsequent proposal review and evaluation for reviewers and NSF staff, the NSF will accept full proposals for PFC funding by invitation only, based on the results of the preliminary proposal evaluation. No more than two preliminary proposals may be submitted by any one institution. While more than one institution may participate in a single proposal or preliminary proposal, a single institution must accept overall management responsibility for the PFC. Any one individual may be the Principal Investigator (PI) for only one preliminary proposal. The same limitations apply to full proposals.

## V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

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### A. Proposal Preparation Instructions

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**Preliminary Proposals (required):** Preliminary proposals are required and must be submitted via the NSF FastLane system, even if full proposals will be submitted via Grants.gov.

The following instructions for the submission of preliminary proposals supplement the NSF Grant Proposal Guide:

The preliminary proposal must be submitted via NSF FastLane. The preliminary proposal must be single-spaced in 12-point type, and consist of:

1. the NSF coversheet showing the name of the proposed PFC director (principal investigator or PI) and the preliminary proposal title. The block indicating that a preliminary proposal is being submitted should be checked. Identify the program solicitation number in the program announcement/solicitation block.
2. a summary of the project, including scientific thrusts, educational, outreach and diversity activities, broader impacts, and other information necessary to provide a concise overview of the proposed PFC activities; enter in the Project Summary.
3. a narrative (described at the end of this section); enter in the Project Description.
4. a list of participating senior investigators (faculty level and equivalent) by name, institutional affiliation, and departmental affiliation (additional biographical information is not required in the preliminary proposal); include this at the end of the narrative along with a title that clearly identifies the section and enter in the Project Description.
5. a one-page synopsis of institutional and other commitments to the proposed PFC; include this at the end of the narrative along with a title that clearly identifies the section and enter in the Project Description.
6. budget pages (see Budgetary Information, section V.B.), and a one-page budget justification;

7. a summary table of requested NSF support (see Budgetary Information, section V.B.); include this at the end of the narrative along with a title that clearly identifies the section and enter in the Project Description.

In the narrative (item 3 above), provide the following:

- a brief overview of the PFC project as a whole, including a concise rationale for establishing the PFC, and an outline of the existing and planned capabilities of the participating institutions in physics research and education (**Limit: 1 page**);
- a description of pertinent achievements under prior NSF support, where applicable (**Limit: 2 pages**);
- a description of each Major Activity (MA) (A Major Activity is usually a primary research thrust, but may also be a large-scale effort in workshop organization or comparable community-building effort.) For research thrusts include names of faculty-level participants and numbers of undergraduate and graduate students and postdoctoral associates in each group (**Limit: 2 pages for each Major Activity**);
- a description of proposed activities in education and human resource development, including the promotion of diversity and outreach; proposed collaborations with industry and/or other sectors; shared experimental facilities; international collaboration (**Limit: 2 pages**);and
- an outline of the proposed arrangements for administration and management of the PFC(**Limit: 2 pages**).

**Limit the narrative section as a whole to no more than thirteen pages total, including tables, and illustrations, regardless of the number of Major Activities.**

**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](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](mailto: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](mailto:pubs@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.3 of the Grant Proposal Guide provides additional information on collaborative proposals.

A full proposal may be submitted by invitation only, based on the evaluation of the preliminary proposal. The instructions below supplement the guidelines in the NSF Grant Proposal Guide or NSF Grants.gov Application Guide.

The proposal must be single spaced in 12-point type and must contain the following items in the order indicated. Proposals that exceed the page limitations will be ineligible for consideration and will be returned without review. Items 3 through 15 described below should be entered in the "Project Description" section, with the exception of Item 5, which should be entered on the "Add/Modify Non CO-PI Senior Personnel" section. **The Project Description is limited to no more than 70 pages, regardless of the number of Major Activities.**

1. NSF Cover Sheet. Indicate the total amount requested for the five years of NSF support in the box entitled "requested amount." For Grants.gov users, enter the amount in block 16a of the SF424 R&R form.
2. a summary of the project, including scientific thrusts, educational, outreach and diversity activities, broader impacts, and other information necessary to provide a concise overview of the PFC activities; enter in the "Project Summary"

section. For Grants.gov users, attach the Project Summary in field 6 of the SF424 R&R form.

3. Table of Contents. Will be generated automatically.
4. Executive Summary. Provide a clear rationale for and description of the proposed PFC and its potential impact. Briefly describe the institutional setting of the PFC unit, its proposed scope and organization, activities in research and education and their integration, efforts to promote diversity, outreach activities, any shared experimental facilities, any collaborative activities with industry or other sectors, links with related major research centers on or off campus, and management plan. **Limit: 3 pages.**
5. List of Participants. List each senior investigator (faculty level or equivalent), by full name, and his or her institutional and departmental affiliation. Enter in "Add/Modify Non CO-PI Senior Personnel".
6. Achievements Under Prior NSF Support. Describe achievements under prior NSF support that pertain to the present proposal. **Limit: 5 pages.**
7. Major Activities (MAs). The PFC activity may encompass one or more MAs. A Major Activity will most frequently be a major research thrust of the unit, but may also be a large-scale effort in workshop organization, or comparable community-building activity, that advances the frontiers of physics. For an MA that involves the latter, the need for the activity should be clearly established, including justification for the approach, arguments for why the proposed PFC is the appropriate vehicle to carry out the organization, the proposed organizational mechanism, the number of faculty and students potentially impacted by the activity, and the expected impacts on the community. For each proposed MA that involves a research thrust, provide a concise description of the long-term research goals and intellectual focus, and describe the planned research activities in sufficient detail to enable their scientific merit and significance to be assessed. In all cases, describe the role and intellectual contribution of each senior participant in the MA, and briefly outline the resources available or planned to accomplish the stated goals. The need for a center- or institute-like approach involving several investigators and the means of achieving this should be clearly established. The role of the MA in the context of the PFC as a whole should be outlined, and connections between MAs making up the unit should be sufficiently drawn to justify their inclusion within the PFC. Interactions with other groups and institutions should be described. At the beginning of each MA section in the proposal, name the senior personnel who will participate, and state the proposed number of postdoctoral and undergraduate and graduate student participants. **Limit for each MA: 10 pages.**
8. Education, Human Resources, Diversity, and Outreach. Describe the proposed activities of the PFC in education and human resource development, including plans for participation by undergraduates, pre-college students and teachers, as appropriate. Specifically address how these efforts will impact the participation of under-represented groups, which is a high-priority goal of the Physics Division and of NSF. 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. Finally, describe means that will be used to measure and/or document the impact of these activities. **Limit: 3 pages.**
9. Shared Facilities. Describe the shared facilities and infrastructure to be established, including specific major instrumentation, and plans for the development of instrumentation. Describe plans for maintaining and operating the facilities, including staffing, and plans for ensuring access to outside participants. Distinguish clearly between existing facilities and those still to be acquired or developed. **Limit: 3 pages.**
10. Collaboration with Other Sectors. Describe any proposed interactions and collaborations with industry, and, where appropriate, with other institutions and sectors, including national laboratories. Define the goals of the collaboration, and describe the planned activities. 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.**
11. International Collaboration. Describe the nature of any planned international collaboration and the expected international and scientific or engineering benefits to the research and education programs. 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.**
12. Seed Funding and Emerging Areas. Through this mechanism, NSF intends to provide flexibility for the PFC to respond quickly and effectively to new opportunities. Briefly describe emerging research plans and related activities, showing clearly how they are related to the mission of the PFC. These may include (but are not limited to): seed support for junior faculty and for investigators changing fields; high-risk research projects; emerging areas of interdisciplinary research; programs to link the university effort in physics with industry and other sectors; the development of tools for remote access to instrumentation; and innovative educational ventures. Seed funding through the PFC is not intended to provide a substitute for NSF individual investigator funding: the criteria and mechanisms for selecting and evaluating projects must be clearly addressed in the management plan. Include the names of key personnel for the first year. **Limit: 3 pages.**



13. Management. Describe the plans for administration of the PFC, including the functions of key personnel and the role of any advisory committee, executive committee, program committee, or their equivalent. Describe the procedures and criteria used to select, administer, and evaluate the Major Activities of the PFC, including seed funding and collaborative programs with other groups and institutions. Plans for administering shared facilities should be described under item 9. Describe plans for administering the educational programs and outreach activities of the PFC, as appropriate. **Limit: 4 pages.**
  
14. Institutional and Other Sector Support. Outline institutional and other commitments to the PFC, including space, faculty and staff positions, capital equipment, access to existing facilities, commitments for collaboration and outreach programs, and other commitments. **Limit: 1 page.**
  
15. Letters of Commitment. Include only official letters of commitment verifying specific commitments of resources from participating institutions. PDF versions should be included in the Supplementary Documents section of a FastLane proposal. For Grants.gov proposals they should be attached in Field 11 of the SF424 R&R Other Project Information Form.

**Additional Information**

- Biographical Information. Include a biographical sketch for each senior participant, listing up to ten publications most pertinent to this proposal. Limit, 1 page for each senior investigator. Enter in the "Biographical Sketch" section. For Grants.gov proposals, the biographical sketch should be attached to the R&R form.
  
- Current and Pending Support. List current and pending support for each senior investigator. Enter in the "Current and Pending Support" section. For Grants.gov proposals, current and pending support should be attached to the R&R form.
  
- Reviewer Information. Enter the following information into the "List of Suggested Reviewers" section: (1) a list of individuals (and their affiliations) outside the participating institutions whose participation in the review of the full proposal might constitute a conflict-of-interest through association with the participants, and (2) a list of individuals who are suitable to serve as impartial reviewers. For Grants.gov proposals, this information should be included on the NSF specific form, "List of Suggested Reviewers or Reviewers Not to Include."

**B. Budgetary Information**

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**Cost Sharing:** Cost sharing is not required under this solicitation.

**Indirect Cost (F&A) Limitations:** In accordance with Federal Negotiated Rate

**Other Budgetary Limitations:** Five-year awards are expected to range in size between \$1.0 million/year and \$4.5 million/year, with an average award size of approximately \$2M/year. The budget for the full proposal may not be larger than the preliminary proposal budget.

**Budgets** Complete budget pages for each year of support (1-5) and a five-year summary budget justification. A five-year budget summary will be automatically generated by FastLane. Provide separate budget pages for the PFC as a whole and for each participating institution. Also, in tabular form as follows, summarize the overall support levels planned for each of the Major Activities of the PFC as a whole. (Note: The table below should be entered in the "Project Description").

Summary Table of Requested NSF Support		
Activity	Year One	Five Year Total
Major Activity (MA) 1 (Title)		
MA 2 (title) (repeat for each MA)		
Shared Facilities		

Seed Funding and Emerging Areas	
Education and Human Resources	
Outreach	
Administration	
<b>Total</b>	

For each entry in the Table, include indirect costs. Column totals must equal the total budget requested from NSF for the period shown. Include major capital equipment under shared facilities. Support for graduate students should normally be included under research, not under education and human resources.

### C. Due Dates

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- **Preliminary Proposal Due Date(s) (required)** (due by 5 p.m. proposer's local time):

August 29, 2007

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

January 30, 2008

By Invitation Only

### D. FastLane/Grants.gov Requirements

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- **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](mailto:fastlane@nsf.gov). The FastLane Help Desk answers general technical questions related to the use of the FastLane system. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this funding opportunity.

**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](mailto:support@grants.gov). The Grants.gov Contact Center answers general technical questions related to the use of Grants.gov. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this solicitation.

**Submitting the Proposal:** Once all documents have been completed, the Authorized Organizational Representative (AOR) must submit the application to Grants.gov and verify the desired funding opportunity and agency to which the

application is submitted. The AOR must then sign and submit the application to Grants.gov. The completed application will be transferred to the NSF FastLane system for further processing.

## **VI. NSF PROPOSAL PROCESSING AND REVIEW PROCEDURES**

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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**

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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>.

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

#### ***Integration of Research and Education***

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

#### ***Integrating Diversity into NSF Programs, Projects, and Activities***

Broadening opportunities and enabling the participation of all citizens -- women and men, underrepresented minorities, and persons with disabilities -- is essential to the health and vitality of science and engineering. NSF is committed to this principle of diversity and deems it central to the programs, projects, and activities it considers and supports.

#### **Additional Review Criteria:**

**In addition to these generic review criteria, reviewers of PFC proposals will be asked to use the following**

**criteria. Preliminary proposals will be evaluated in terms of their potential to meet the criteria for full proposals.**

The PFC proposal must exhibit synergy or value-adding features that justify center- or institute-type support, rather than an equivalent level of support for individual investigators or small groups. Proposals must address these points for each Major Activity of the PFC, and the roles and responsibilities of each senior investigator must be described. Reviewers will be asked to assess each Major Activity and each investigator in their review, along with the potential synergy among the different Major Activities.

#### **Separate Major Activity and PI Evaluation:**

- Intrinsic Merit of each MA: Reviewers will be asked to evaluate the overall quality of the proposed MAs, and likelihood that the research or organizational efforts will lead to significant fundamental advances, new discoveries, and/or technological developments.
- Competence of each senior investigator: Reviewers will be asked to evaluate the merits of each senior investigator and their importance to the PFC goals.

#### **The Center as a Whole:**

- Synergy and interconnections within the PFC's Major Activities: Benefits of a multi-investigator, center- or institute-level approach; the synergy among the investigators; and the potential for cross fertilization among Major Activities
- Institutional setting and rationale for the PFC: Relationship to existing and planned institutional programs and capabilities in physics research and education; intellectual breadth of the proposed program; potential for stimulating creative interaction and collaboration. Potential for institutional, national, and international impact.
- Achievements under prior NSF support, where applicable.
- Plans and potential to develop and maintain active collaboration with industry and/or other sectors, where applicable; to stimulate and facilitate knowledge transfer among the institutional participants and between the PFC and other institutions; and to strengthen the links between university-based physics research and its broader impacts. Outreach to other institutions and scientists in the field, including international collaboration and cooperation.
- Plans to establish, operate, and maintain shared facilities and infrastructure and to provide appropriate access to participants from the home institution and from other institutions.
- Potential effect on the infrastructure of science and engineering, particularly in fostering a broadly interactive approach to cutting-edge research and education, developing effective educational outreach programs, fostering a climate of interaction and effective knowledge transfer between the university and its partners, effective use of seed funding, and fostering increased participation in research and education on the part of women and members of underrepresented groups.
- Management plan, and budget. Likely effectiveness of the proposed management plan, including mechanisms for selection of topics and internal allocation of resources, plans for self-evaluation, and plans and potential for maintaining a flexible and innovative program. Appropriateness of the requested budget.

A summary rating and accompanying narrative will be completed and signed by each reviewer. In all cases, reviews are treated as confidential documents. Verbatim copies of reviews, excluding the names of the reviewers, are mailed to the Principal Investigator(s) by the Program Director.

## **B. Review and Selection Process**

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

Preliminary proposals will be reviewed by panel only. The panel will recommend that the applicant either be invited to submit a full proposal or not invited to submit a full proposal.

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

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### A. Notification of the Award

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

### B. Award Conditions

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An NSF award consists of: (1) the award 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](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](mailto: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](http://www.nsf.gov/publications/pub_summ.jsp?ods_key=aag).

### C. Reporting Requirements

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For all multi-year grants (including both standard and continuing grants), the Principal Investigator must submit an annual project report to the cognizant Program Officer 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.

## VIII. AGENCY CONTACTS

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General inquiries regarding this program should be made to:

- C.D. Caldwell, Program Director, 1015 N, telephone: (703) 292-7371, fax: (703) 292-9078, email: [dcaldwel@nsf.gov](mailto:dcaldwel@nsf.gov)
- Kathleen McCloud, Program Director, 1015 N, telephone: (703) 292-8236, fax: (703) 292-9078, email: [kmcccloud@nsf.gov](mailto:kmcccloud@nsf.gov)
- Ramona Winkelbauer, Computer Specialist, FastLane/Technical Problem Solver, 1015 N, telephone: (703) 292-7390, fax: (703) 292-9078, email: [rwinkelb@nsf.gov](mailto:rwinkelb@nsf.gov)

For questions related to the use of FastLane, contact:

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

For questions relating to Grants.gov contact:

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

## IX. OTHER INFORMATION

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The NSF Website provides the most comprehensive source of information on NSF Directorates (including contact information), programs and funding opportunities. Use of this Website by potential proposers is strongly encouraged. In addition, 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

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

NSF funds research and education in most fields of science and engineering. It does this through grants and cooperative agreements to more than 2,000 colleges, universities, K-12 school systems, businesses, informal science organizations and other research organizations throughout the US. The Foundation accounts for about one-fourth of Federal support to academic institutions for basic research.

NSF receives approximately 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](mailto:pubs@nsf.gov)
  - or telephone: (703) 292-7827
- **To Locate NSF Employees:** (703) 292-5111

## PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

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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



The National Science Foundation, 4201 Wilson Boulevard, Arlington, Virginia 22230, USA  
Tel: (703) 292-5111, FIRS: (800) 877-8339 | TDD: (800) 281-8749

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