

# Center for Research at the Interface of the Mathematical and Biological Sciences (CIMBS)

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## Program Solicitation

NSF 07-597

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### National Science Foundation

Directorate for Biological Sciences  
Emerging Frontiers

Directorate for Mathematical & Physical Sciences  
Division of Mathematical Sciences  
Office of Multidisciplinary Activities



### Department of Homeland Security



### U.S. Dept. of Agriculture

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

December 24, 2007

#### Full Proposal Target Date(s):

April 02, 2008

BY INVITATION ONLY

## REVISION NOTES

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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](#) or via the [NSF FastLane](#) system.

## SUMMARY OF PROGRAM REQUIREMENTS

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### General Information

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**Program Title:**

**Synopsis of Program:**

This solicitation requests proposals to establish a Center to stimulate research and education at the interface of the mathematical and biological sciences. The Center will serve the biological and mathematical communities by providing mechanisms to foster synthetic, collaborative, cross-disciplinary studies. It will play a pivotal role by improving understanding and modeling of biological problems that can be gained only by using approaches of mathematical, statistical and computational biology. The Center also will play a critical role in addressing national needs, including the area of plant and animal infectious disease modeling, and provide knowledge that will be useful to policy makers, government agencies, and society.

**Cognizant Program Officer(s):**

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- Gary Sherman, Dept. of Agriculture, telephone: (202) 401-4952, email: [gsherman@csrees.usda.gov](mailto:gsherman@csrees.usda.gov)

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

- 47.049 --- Mathematical and Physical Sciences
- 47.074 --- Biological Sciences

**Award Information**

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**Anticipated Type of Award:** Cooperative Agreement

**Estimated Number of Awards:** 1 , contingent on the quality of proposals received and pending the availability of funds

**Anticipated Funding Amount:** \$16,000,000 The initial term of the award will be 5 years, with the potential for renewal for another 5 years. Pending availability of funds we anticipate a budget of up to \$2,500,000 in year 1, \$3,000,000 in year 2, and \$3,500,000 in years 3, 4 and 5. We strongly encourage creative thinking about the potential range of activities that might occur at a CIMBS and their budgetary needs.

**Eligibility Information**

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**Organization Limit:**

Proposals may only be submitted by the following:

- U.S. academic institutions, U.S. non-profit research organizations that are directly associated with educational or research activities, and consortia of such organizations with appropriate research and educational facilities are eligible to submit proposals in response to this program solicitation. When a consortium of organizations submits a proposal, it must be submitted as a single proposal with one organization serving as the lead and all other organizations as subawardees.

**PI Limit:**

No co-PIs are permitted.

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

None Specified

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

None Specified

**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: 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 by NSF.
- **Indirect Cost (F&A) Limitations:** Not Applicable
- **Other Budgetary Limitations:** Not Applicable

**C. Due Dates**

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

December 24, 2007

- **Full Proposal Target Date(s):**

April 02, 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:** Additional award conditions apply. Please see the full text of this solicitation for further information.

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

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## I. INTRODUCTION

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Mathematical biology is the use of mathematics as a tool for answering biological questions. Today there is unprecedented progress in biology. However, biology will only reach its full maturity and power when it has a foundation of mathematically-based theory. What is frequently missing from biological research is careful, quantifiable mechanism-based theory for studying biological problems. One advantage of using ideas from mathematical biology is that common aspects of these problems emerge. Common mathematical frameworks can be used to understand disparate biological questions, ranging from cellular and neural systems to population and ecosystem dynamics. Some of these problems require the development of novel mathematical approaches, while others can be approached using existing mathematical tools. In all cases, however, mathematics can provide novel insights and further the development of the biological sciences.

In addition to the general needs of the biological and mathematical sciences, there is a need for a center that can respond in a timely manner to specific national needs. One example of such a need is endemic and newly emerging infectious diseases, which are of increasing concern, including diseases of humans (e.g., HIV/AIDS, SARS, and Ebola), other animals (e.g., foot and mouth disease, Rift Valley fever, and avian influenza), and plants (e.g., soybean rust and sudden oak death). Modeling is a critical resource in both the management of disease and in the determination of priorities for critical countermeasures. Few universities, national laboratories, and federal centers have disease modeling expertise. Thus, present resources are insufficient to produce the information needed for national planning efforts. But by working together the agencies involved in this solicitation can support the national need for basic research in this area and focus on models which can address immediate problems and be applied more broadly.

Thus, there is a need for a center where researchers can come together to work on important problems in mathematical biology as soon as they arise, in a setting that fosters productive collaboration, especially for stimulating basic research in

disease modeling and developing next generation models. The National Science Foundation broadly supports fundamental research in the biological and mathematical sciences. The Department of Homeland Security and the Department of Agriculture have mission-specific goals directed towards concerns about animal disease epidemics. This center is designed to meet both those broad and more narrowly-focused goals.

The National Science Foundation recently funded a workshop to consider the scientific and national needs for a center for mathematical biology research [see report at: [www.nsf.gov/pubsys/ods/getpub.cfm?ods\\_key=biort701](http://www.nsf.gov/pubsys/ods/getpub.cfm?ods_key=biort701)]. This center will serve the broad needs of the mathematics and biology communities by providing mechanisms to foster synthetic, collaborative, cross-disciplinary studies. It will play a pivotal role by improving understanding and modeling of biological problems that can be gained only by using the approaches of mathematical biology. Finally, the center will play a critical role in addressing national needs, such as infectious disease modeling, especially with regard to animal diseases, and provide knowledge that will be useful to policy makers, government agencies, and society.

## II. PROGRAM DESCRIPTION

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### General Characteristics

A Center for Research at the Interface of the Mathematical and Biological Sciences (CIMBS) is expected to play a vital and important role in answering fundamental questions about biology that require the tools, approaches and development of mathematics and statistics. This broad support of fundamental research at the interface of the biological and mathematical sciences is a goal of the National Science Foundation. A major role of the Center will be the formulation and analysis of models describing biological phenomena, which may require new mathematical and computational approaches. Such a center is expected to overcome many current challenges to progress at the interface of the biological and mathematical sciences. Important goals include:

- shortening the timescale for addressing pressing biological questions,
- focusing on cross-disciplinary questions,
- integrating mathematics and biology,
- transferring methods between different sub-fields of biology, and
- fostering education at the interface of biology and mathematics.

The Center is expected to integrate experts and expertise for the analysis, modeling, prediction, and control of biological phenomena. By bringing together researchers from distant locations, the Center can increase the productivity of its participants. Integration is essential because it brings together a wide range of disciplines, and brings together the individuals that can contribute to problem definition and solution. Many times complex problems can be better attacked if correctly formulated in a multidisciplinary approach with an interdisciplinary methodology.

The Center can accomplish these goals by a variety of mechanisms. One blueprint is provided by the workshop report [[www.nsf.gov/pubsys/ods/getpub.cfm?ods\\_key=biort701](http://www.nsf.gov/pubsys/ods/getpub.cfm?ods_key=biort701)]. We stress, however, that other formats and ranges of activities are possible. We urge broad and creative thinking about the form, structure, and activities of the Center. However, the Center must be national and international in scope and disseminate both specific results and a culture of research to a broad community.

### Response to National Needs

Common mathematical frameworks can be used to understand disparate biological phenomena, ranging from cellular and neural systems to population and ecosystem dynamics. Common mathematical themes include: stochastic dynamical systems, effects of network architecture on dynamics, multiple temporal and spatial scales, methods for model reduction, methods for fitting models to data. These approaches can be used to understand issues in

- evolution
- growth and development
- dynamics of cells
- transport in tissues
- structure of and dynamics in random media
- structure and dynamics of biological networks

Advances in understanding of fundamental biological questions, such as the dynamics of networks, would naturally increase

understanding of, and ability to answer, applied questions such as optimal ways of dealing with emerging diseases and basic questions such as how cells use signaling networks to control cell growth.

In addition to the goal of broad support of fundamental research at the interface of the biological and mathematical sciences, the Center will also address more narrowly-focused problems. Mathematical modeling and analysis can provide predictive understanding. With predictive understanding comes the ability to plan for and respond to specific problems. For example, epidemiological and economic models are frequently used to inform policy decisions, compare and simulate effects of control measures under different disease outbreak scenarios, train response personnel, and educate industry professionals. The Center is expected to bring together scientists from academia, the federal government, and private industry to form new types of partnerships and expand the modeling community in these areas.

The Center will be expected to devote a portion of its capacity to addressing national needs, such as: understanding complex biological systems; predicting effects of global climate change; managing invasive species; and modeling infectious diseases, especially diseases of livestock and wildlife [<http://ostp.gov/nstc/html/FADT%20R&D%2016%20Feb%202007.pdf>] and of plants. These efforts will focus on improving operational models used to guide infectious disease monitoring, prediction, simulation, and response. To facilitate the transition of these models from basic research to operational capability, efforts will include coordination with other centers and national initiatives. This additional, more specific mission of the center meets the goals of the Departments of Homeland Security and Agriculture. We urge broad and creative thinking about how the Center can meet national needs through the promotion of fundamental research at the interface of the biological and mathematical sciences.

## **Education**

Progress at the interface between mathematics and biology has been hindered by the lack of appropriately trained scientists. Few individuals are able to do research in both mathematics and biology. Thus, the Center is expected to address needs in education at this interface. Educational activities may be targeted at all levels: elementary, secondary, undergraduate, graduate, and post-doctoral. Such activities should emphasize active guidance and exposure to both the mathematical and biological sciences.

## **Computational Aspects**

Computation is central to progress in mathematical biology. The Center is expected to include computer support staff that would actively participate in and support research activities. These individuals should have expertise in biological systems, numerical analysis, mathematical and statistical analysis, and programming. The role of this staff would be to help develop and maintain computer code and ensure the stability, quality and coherence of computer programs. The Center is expected to foster the development of open source software and maintain a software database (i.e., act as archivist of software) so as to serve as a source of knowledge transfer among Center researchers and the larger scientific community. Of particular importance is coordination with federal and other agencies in the development and maintenance of software to address national needs. Because some models require high performance computing, provision should be made for access to the necessary computing capabilities.

## **Center Director**

Because the Center Director is essential to the successful operation of the CIMBS, the qualifications of the Director are crucial. The 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 CIMBS. The principal investigator of the proposal should be the anticipated Center Director or the Interim Director. In the latter case, the proposal must clearly describe the process to be used to identify candidates and to make the final selection for the Center Director. Note that no co-PIs are permitted.

## **Proposal Content**

All proposals should address the following areas:

- **Rationale for the Center:** Clearly indicate what unique opportunities will be addressed by the proposed center.
- **Description of Research Activities:** Describe the range and modes of research activities that the center will support in sufficient detail to allow assessment of their merit. These activities are expected to meet the goals of all of the agencies. 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.
- **National Needs:** Indicate how the Center will work with government agencies to respond to national needs.
- **Education and Outreach:** Provide a detailed description of the educational and outreach activities the center will undertake. Outline plans for involving students at all educational levels (elementary, secondary, undergraduate,

graduate and post-doctoral) at the interface of mathematics and biology, especially with regard to increasing participation of members of underrepresented groups.

- Communication, knowledge transfer, and informatics: Describe plans for linking with appropriate communities and institutions beyond the sponsoring institution, e.g., other colleges, universities, disciplinary subfields, other disciplines, nonprofit research organizations, government laboratories, or industry, to enhance involvement and knowledge transfer.
- Management Plan: Provide a description of the organizational structure of the Center. Outline mechanisms for selecting projects, allocating funds and equipment, and managing the participating scientific groups. Describe plans for external oversight and accountability mechanisms. Do NOT list individual names of the external advisory committee, but list the number of members and describe the range of expertise needed to constitute an efficient and functional committee. If there is to be an Interim Director, describe the process to be used to select the Center Director.
- Intellectual Property Rights: Provide a clear statement of management of intellectual property rights and how the Center plans to share information, data, tools, and 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.
- Institutional Capabilities: Provide a description of how the current capabilities and resources of the host institution will facilitate the proposed activities. Include information on organizational leadership, technical expertise, general support, and maintenance as well as space, infrastructure and technologies that will support the activities of the Center. Describe how the probable location of the Center will affect its success, including any unique characteristics of the institution or location, including ease of travel to and accommodations at or near the Center for visitors.

The Center may be multi-institutional. If so, the proposal must come from a single institution with other institutional partners as subawardees. The proposal should indicate what synergies and advantages are accrued by such a multi-institutional arrangement and how activities will be coordinated if spread across multiple locations.

The proposal should **NOT** specify the membership of any oversight or executive board, but it should indicate how such a board will be recruited and constituted.

The proposal should clearly and concisely justify Center support. Especially important general considerations are: focus, breadth of vision, education and outreach including international dimensions; communication and knowledge transfer; rationale for a Center-mode of activities; and management plan. We emphasize that this proposal is NOT a research plan; rather it is a plan for how research activities will be fostered.

#### **Additional Information**

The Biological Sciences Directorate currently supports two synthesis centers: the National Center for Ecological Analysis and Synthesis (NCEAS; see <http://www.nceas.org>) and the National Evolutionary Synthesis Center (NESCent; see <http://www.nescent.org>). Additionally, the Division of Mathematical Sciences supports the Mathematical Biosciences Institute (MBI; see <http://www.mbi.osu.edu>). While the goals and focus of the CIMBS differ, proposers should take advantage of lessons learned from these organizations in developing a concept for the CIMBS.

### **III. AWARD INFORMATION**

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**Anticipated Type of Award:** Cooperative Agreement

**Estimated Number of Awards:** 1, contingent on the quality of proposals received and pending the availability of funds

**Anticipated Funding Amount:** \$16,000,000 The initial term of the award will be 5 years, with the potential for renewal for another 5 years. Pending availability of funds we anticipate a budget of up to \$2,500,000 in year 1, \$3,000,000 in year 2, and \$3,500,000 in years 3, 4 and 5. We strongly encourage creative thinking about the potential range of activities that might occur at a CIMBS and their budgetary needs.

Estimated program budget, number of awards and average award size/duration are subject to the availability of funds.

### **IV. ELIGIBILITY INFORMATION**

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**Organization Limit:**

Proposals may only be submitted by the following:

- U.S. academic institutions, U.S. non-profit research organizations that are directly associated with educational or research activities, and consortia of such organizations with appropriate research and educational facilities are eligible to submit proposals in response to this program solicitation. When a consortium of organizations submits a proposal, it must be submitted as a single proposal with one organization serving as the lead and all other organizations as subawardees.

**PI Limit:**

No co-PIs are permitted.

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

None Specified

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

None Specified

**Additional Eligibility Info:**

## V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

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### A. Proposal Preparation Instructions

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**Preliminary Proposals(required):**

Submission of a preliminary proposal is required for eligibility to submit a full proposal. The preliminary proposal must be submitted via FastLane and must contain the following:

- Fastlane Cover Sheet: Select this program solicitation number from the pull down list. Check the box for preliminary proposal. Entries on the Fastlane cover sheet are limited to the principal investigator.
- Title - The title of the proposal must begin with "CIMBS Preliminary Proposal:".
- Project Summary (1 page) - The summary must consist of 2 parts: (1) A succinct summary of the intellectual merit including the vision and rationale for the center capabilities and mechanisms for achieving that vision. (2) A description of the broader impacts of the proposed work, including approaches to achieve goals for innovation and leadership in outreach and education.
- Project Description - The project description is limited to a total of 7 pages and must address the following:
  1. Description of the range and modes of activities that the center will support (up to 3 pages)
  2. Brief description of the organizational structure of the Center (up to 2 pages)
  3. List of primary individuals and major institutions that would be involved in the establishment of the Center (up to 1 page)
  4. Capabilities of the institution to host and manage the Center (up to 1 page)
- Note: The Results of Prior Support section is not required.
- References Cited – Not to exceed 5 pages.
- Biographical Sketches - Provide a biographical sketch for the PI.
- Current and Pending Support – (not required – do not complete this section)
- 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).



Following review of the preliminary proposals, proposers with promising programs will be invited to submit a full proposal. Comments of the preliminary proposal reviewers will be considered during review of the full proposals.

**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).

**Full proposals will be accepted only from PIs who have submitted Preliminary proposals in the current review cycle.**

Eligible proposals must originate from principal investigators whose projects are successful in the preceding preliminary proposal competition described above and must be based on those preliminary proposals. All proposals not meeting these requirements will be returned without review. Submission of full proposals by PIs whose preliminary proposals received a review recommendation of “not invited” will be returned without review.

- Cover Sheet:
  - Fastlane Users - Select this program solicitation number from the pull down list. Entries on the Fastlane cover sheet are limited to the principal investigator/project director. All other senior project participants should be listed on the project summary page and entered into Fastlane as Senior Personnel (this latter provision allows their biographical sketches to be included in the Fastlane proposal).
  - Grants.gov Users - The program solicitation number will be pre-populated by Grants.gov on the NSF Grant Application Cover Page. NSF allows one principal investigator/project director. Instructions for entering additional senior project participants are included in Section V.5. of the NSF Grants.gov Application Guide.
- Title - The title of the proposal must begin with "CIMBS Full Proposal:".
- Project Summary (1 page) - The summary must consist of 2 parts: (1) A succinct summary of the intellectual merit including the vision and rationale for the center capabilities and mechanisms for achieving that vision. (2) A description of the broader impacts of the proposed work, including approaches to achieve goals for innovation and leadership in outreach and education.
- Project Description – The project description is limited to 15 pages and must contain the following sections:
  1. Rationale for the Center: Clearly indicate what unique opportunities will be met by the proposed center.
  2. Research Activities: Describe the range and modes of research activities that the center will support in sufficient detail to allow assessment of their merit. These activities are expected to meet the goals of all of the agencies. 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.
  3. National Needs: Indicate how the Center will work with federal agencies to respond to national needs.
  4. Education and Outreach: Provide a detailed description of the educational and outreach activities the center will undertake. Outline plans for involving students at all educational levels (elementary, secondary, undergraduate, graduate and post-doctoral) at the interface of mathematics and biology, especially with regard to increasing participation of members of underrepresented groups.
  5. Communication, knowledge transfer, and informatics: Describe plans for linking with appropriate communities and institutions beyond the sponsoring institution, e.g., other colleges, universities,

disciplinary subfields, other disciplines, nonprofit research organizations, government laboratories, or industry, to enhance involvement and knowledge transfer.

- Note: The Results of Prior Support section is not required.
- References Cited – Not to exceed 5 pages.
- Biographical Sketches - Provide biographical sketches for the PI and all key personnel.
- Current and Pending Support – (not required – do not complete this section)
- Special Information and Supplementary Documentation – The following additional information is required in addition to that allowed by the provisions of the GPG or the NSF Grants.gov Application Guide:
  - Appendix A1, Senior Personnel: Provide a list of senior personnel (maximum 3 pages), with a brief description of what each person brings to the center.
  - Appendix A2, Management Plan (maximum 3 pages): Provide a description of the organizational structure of the Center. Outline mechanisms for selecting projects, allocating funds and equipment, and managing the participating scientific groups. Describe plans for external oversight and accountability mechanisms. Do **NOT** list individual names of the external advisory committee, but list the number of members and describe the range of expertise needed to constitute an efficient and functional committee. If there is to be an Interim Director, describe the process to be used to select the Center Director.
  - Appendix A3, Intellectual Property Rights (maximum 2 pages): Provide a clear statement of management of intellectual property rights and how the Center plans to share information, data, tools, and 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.
  - Appendix A4, Institutional Capabilities (maximum 2 pages): Provide a description of how the current capabilities and resources of the host institution will facilitate the proposed activities. Include information on organizational leadership, technical expertise, general support, and maintenance as well as space, infrastructure and technologies that will support the activities of the Center. Describe how the probable location of the Center will affect its success, including any unique characteristics of the institution or location, including ease of travel to and accommodations at or near the Center for visitors.
- Single Copy Documents: The following additional information is required in addition to that included within the provisions of the GPG or the NSF Grants.gov Application Guide:
  - 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 post-doctoral scholars, for the past 48 months; and (3) any other individuals or institutions with which the PI or Senior Personnel have financial ties.

#### Checklist for Proposal Preparation

- Proposal submitted as a single proposal with one organization as the lead and all other participating organizations as subawardees. No linked, collaborative proposal submissions will be accepted.
- Title begins with "CIMBS Preliminary Proposal: ..." or "CIMBS Full Proposal: ..."
- Project Summary contains all requested information, including the broader impacts of the proposed work
- Project Description is 7 (preliminary) or 15 (full) pages or less in length, including figures and tables
- References Cited
- Biographical Sketches (2 pages each) included for PI (preliminary or full proposal) and Senior Personnel (full proposal)
- For full proposal, appendices A1, A2, A3, and A4 uploaded in Supplementary Documents
- Single, alphabetized table listing conflicts of interests uploaded into Single Copy Documents. Proposers are reminded to identify the program announcement/solicitation number in the program announcement/solicitation block on the proposal Cover Sheet. (Note: Solicitation number is found on the coversheet of this document.) Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.

## B. Budgetary Information

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

## C. Due Dates

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

December 24, 2007

- **Full Proposal Target Date(s):**

April 02, 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 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

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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 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:**

- Effect of the Center on the infrastructure of the mathematical and biological sciences: The potential of the proposed Center and its activities to increase the level of collaborative research and to contribute to fundamental knowledge.
- Ability of the Center to respond to national needs, especially in the area of the modeling of the dynamics of infectious animal diseases.
- Institutional capabilities and management plan: The ability of the institution to effectively host the Center. The likely effectiveness of the management plan. Qualifications of the Center Director, if known, or the selection process for that director. Additional issues include reasonableness and appropriateness of the budget.

Following panel review, site reviews will be done for one or more finalists. The analysis by the site review teams will be critical in making the final award recommendation.

**B. Review and Selection Process**

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

Proposals submitted in response to this program solicitation will be reviewed by a three-stage review process.

First, all proposers must submit a preliminary proposal that provides the information described in Section V of the Program

Solicitation. Following review of preliminary proposals, selected proposers will be invited to proceed to the next stage of review with submission of a full proposal. Those who did not submit preliminary proposals are ineligible to submit a full proposal. Full proposals submitted without a corresponding preliminary proposal in the current review cycle will not be accepted. Eligible full proposals will be evaluated by panel reviews. The outcomes of this evaluation will then be used to select proposals for the third stage of review consisting of a site visit 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.

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## VII. AWARD ADMINISTRATION INFORMATION

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### 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.)

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### 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](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).

**Special Award Conditions:** NSF has responsibility for providing general oversight and monitoring of the Center to help assure effective performance and administration. Because the award resulting from this funding opportunity will require

substantial NSF oversight, it will be made in the form of a Cooperative Agreement. The Cooperative Agreement will contain two types of terms and conditions, the Programmatic Terms and Conditions (PTC) which relate to the actual science research and education projects, and the Financial and Administrative Terms and Conditions (FATC) which relate to management of funds that support the project.

## 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.

The PI of this center will submit annual or other special reports of progress and plans with the contents of the reports to be determined by the terms of the cooperative agreement. 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

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General inquiries regarding this program should be made to:

- Samuel Scheiner, NSF, Dir. of Biological Sciences, telephone: (703) 292-7175, email: [sscheine@nsf.gov](mailto:sscheine@nsf.gov)
- Mary Ann Horn, NSF, Div. of Mathematical Sciences, telephone: (703) 292-4879, email: [mhorn@nsf.gov](mailto:mhorn@nsf.gov)
- Peter McCartney, NSF, Dir. of Biological Sciences, telephone: (703) 292-8470, email: [pmccartn@nsf.gov](mailto:pmccartn@nsf.gov)
- Tam Garland, Dept. of Homeland Security, telephone: (202) 254-6885, email: [Tam.Garland@dhs.gov](mailto:Tam.Garland@dhs.gov)
- Gary Sherman, Dept. of Agriculture, telephone: (202) 401-4952, email: [gsherman@csrees.usda.gov](mailto:gsherman@csrees.usda.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

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