Collaborative Research in Computational Neuroscience (CRCNS)

Innovative Approaches to Science and Engineering Research on Brain Function

Program Solicitation

08-514

Replaces Document(s):

NSF 04-514

National Science Foundation

Directorate for Computer & Information Science & Engineering
Division of Information & Intelligent Systems

Directorate for Biological Sciences

Directorate for Social, Behavioral & Economic Sciences

Directorate for Mathematical & Physical Sciences

National Institutes of Health

National Institute of Neurological Disorders and Stroke

National Institute of Mental Health

National Institute on Drug Abuse

National Institute on Deafness and Other Communication Disorders

National Institute on Alcohol Abuse and Alcoholism

National Eye Institute

National Institute of Biomedical Imaging and Bioengineering

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

February 26, 2008

October 30, 2008

October 30, 2009

REVISION NOTES

This solicitation extends the NSF/NIH Collaborative Research in Computational Neuroscience program for a period of three years. This new solicitation incorporates the following programmatic and administrative changes:

- Description of scientific areas has been updated;
- Proposals to enable sharing of data and other resources are solicited;
- Letters of intent are no longer required;
- In response to this solicitation, an investigator may participate as PI or Co-PI in no more than one research proposal per review cycle, and in no more than one data sharing proposal per review cycle;
- Proposals submitted in response to this solicitation may not duplicate or be substantially similar to other proposals concurrently under consideration by other NSF or NIH programs or study sections;
- Budget limits are expressed in terms of direct costs and are common across agencies;
- A two-page coordination plan is required for research proposals;
- Human subjects protection and research on vertebrate animals should be addressed in supplementary documents.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Collaborative Research in Computational Neuroscience (CRCNS)
Innovative Approaches to Science and Engineering Research on Brain Function

Synopsis of Program:

Computational neuroscience provides a theoretical foundation and a rich set of technical approaches for understanding the functions of complex neurobiological systems, building on the theory, methods, and findings of computer science, neuroscience, and numerous other disciplines. Through the CRCNS program, participating NSF Directorates and NIH Institutes support innovative interdisciplinary collaborative research to make significant advances in the understanding of nervous system function, mechanisms underlying nervous system disorders, and computational strategies used by the nervous system.

Two classes of proposals will be considered in response to this solicitation:

Research proposals describing new collaborative research projects, and

Data sharing proposals to enable sharing of data and other resources.

As detailed in the solicitation, appropriate scientific areas of investigations may be related to any of the participating funding organizations. ***Questions concerning a particular project's focus, direction and relevance to a participating funding organization should be addressed to the appropriate person in the list of agency contacts found in section VIII of the solicitation.***

Cognizant Program Officer(s):

- Kenneth Whang, CRCNS Program Coordinator - NSF; Program Director, Division of Information and Intelligent Systems, National Science Foundation, 1125 S, telephone: (703) 292-5149, fax: (703) 292-9073, email: kwhang@nsf.gov

- Gloria Strothers, CRCNS Administrative Coordinator - NSF; Integrative Activities Specialist, Division of Information and Intelligent Systems, National Science Foundation, 1125 S, telephone: (703) 292-4718, fax: (703) 292-9073, email: gstrothe@nsf.gov

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

- 47.049 --- Mathematical and Physical Sciences
- 47.070 --- Computer and Information Science and Engineering
- 47.074 --- Biological Sciences
- 47.075 --- Social Behavioral and Economic Sciences
- 93.173 --- National Institute on Deafness and Other Communication Disorders
- 93.242 --- National Institute of Mental Health
- 93.273 --- National Institute on Alcohol Abuse and Alcoholism
- 93.279 --- National Institute on Drug Abuse
- 93.286 --- National Institute of Biomedical Imaging and Bioengineering
- 93.853 --- National Institute of Neurological Disorders and Stroke
- 93.867 --- National Eye Institute

Award Information

Anticipated Type of Award: Standard Grant or Continuing Grant

Estimated Number of Awards: 10 to 15

Anticipated Funding Amount: $5,000,000 per year, subject to availability of funds

Eligibility Information

Organization Limit:

None Specified

PI Limit:

None Specified

Limit on Number of Proposals per Organization:

None Specified

Limit on Number of Proposals per PI:

In response to this solicitation, an investigator may participate as PI or Co-PI in no more than one research proposal per review cycle, and in no more than one data sharing proposal per review cycle. In the event that a PI or Co-PI does appear in any of these roles on more than one research proposal (whether they are lead or collaborative proposals or subawards), all research proposals that include that person as a PI or Co-PI will be returned without review. Likewise, in the event that a PI or Co-PI does appear in any of these roles on more than one data sharing proposal, all data sharing proposals that include that person as a PI or Co-PI will be returned without review.

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Letters of Intent:** Not Applicable
- **Preliminary Proposal Submission:** Not Applicable
- **Full Proposals:** Proposals submitted in response to this Program Solicitation must be submitted to NSF. Proposers may opt to submit proposals via Grants.gov or via the NSF FastLane system.
  - Full Proposals submitted via FastLane: NSF Proposal and Award Policies and Procedures Guide, Part I: Grant Proposal Guide (GPG) Guidelines apply. The complete text of the GPG is available electronically on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg.
  - Full Proposals submitted via Grants.gov: NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov Guidelines apply (Note: The NSF Grants.gov Application Guide is available on the Grants.gov website and on the NSF website at: http://www.nsf.gov/bfa/dias/policy/docs/grantsgovguide.pdf/)

B. Budgetary Information

- **Cost Sharing Requirements:** Cost Sharing is not required by NSF or the NIH.
- **Indirect Cost (F&A) Limitations:** Not Applicable
- **Other Budgetary Limitations:** Other budgetary limitations apply. Please see the full text of this solicitation for further information.

C. Due Dates

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

February 26, 2008

October 30, 2008

October 30, 2009

Proposal Review Information Criteria

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

Award Administration Information

Award Conditions: Additional award conditions apply. Please see the full text of this solicitation for further information.

Reporting Requirements: Standard NSF reporting requirements apply.

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I. INTRODUCTION

The most exciting and difficult challenge facing neuroscience is to understand the functions of complex neurobiological systems, from genetic determinants to cellular processes to the complex interplay of individual neurons, neural circuits and systems in orchestrating behavior and cognition. Disorders of the nervous system are also associated with complex neurobiological changes, leading to profound alterations at all levels of organization.

Computational neuroscience provides a theoretical foundation and a rich set of technical approaches for understanding the principles and dynamics of the nervous system. Building on the theory, methods, and findings of computer science,

neuroscience, biology, psychology, the mathematical and physical sciences, engineering, and other fields, computational neuroscience employs a broad spectrum of analytical and experimental approaches to study function, organization, and computational strategies across all levels of the nervous system. New developments in computational neuroscience are being accelerated by new methods for integrating and analyzing complex data, conceptual frameworks derived from diverse disciplines, new modalities for large-scale data collection and fine experimental manipulation, and increasing opportunities for interdisciplinary collaboration.

Research and research communities supported by the National Science Foundation (NSF) in computer science and engineering, the biological, behavioral, cognitive, physical, and mathematical sciences; and by the National Institutes of Health (NIH) in biological, biomedical, and bioengineering fields make computational neuroscience an area where cooperation between the two agencies is appropriate and essential. Through the Collaborative Research in Computational Neuroscience (CRCNS) program, participating NSF Directorates and NIH Institutes support innovative interdisciplinary research that takes advantage of complementary collaborative expertise to make significant advances in the understanding of nervous system function, mechanisms underlying nervous system disorders, and computational strategies used by the nervous system.

II. PROGRAM DESCRIPTION

Two classes of proposals will be considered in response to this solicitation: **research proposals** describing new collaborative research projects, and **data sharing proposals** to enable sharing of data and other resources.

In general, appropriate scientific areas of investigations may be related to any of the participating funding organizations. Some specific examples are given below. Questions concerning a particular project's focus, direction and relevance to a participating funding organization should be addressed to the appropriate person in the list of agency contacts.

Each of the funding organizations participating in this program has a commitment to developing and supporting computational neuroscience research for the purpose of advancing the understanding of the questions relevant to the missions of the organizations. Proposals selected for funding must be responsive to the mission of a participating funding organization.

Assurance of Innovative Collaborative Research Effort Across Scientific Disciplines

The driving principle behind this program solicitation is the recognition that projects crossing traditional academic disciplinary boundaries often bring about increased productivity and creativity when collaborative efforts include participation by scientists and engineers bringing their experience and training from widely varying backgrounds. Such interdisciplinary collaborations are a requirement for this program and must be demonstrated in the proposal; for example, by naming a co-principal investigator with academic credentials and appointment in an area different from that of the principal investigator, or by other means. A typical research collaboration might include a computer scientist and a neurobiologist. Proposals should describe interdisciplinary work to be done. Another emphasis of this program is to encourage the development and utilization of novel and innovative computational approaches.

Computational research supported under this program must have impact on and relate to biological processes, and should lead to hypotheses that are testable in biological studies. It is expected that: (1) proposals should include collaborations among computational and/or modeling experts, theorists, and experimental neuroscientists; (2) collaboration should involve a dynamic and possibly protracted period of model or theory development and refinement, and intense interactions among scientists and engineers from different disciplines; and (3) the development and testing of new models or theories should provide a framework for the design of experiments and the generation of new hypotheses that can help reveal mechanisms underlying normal or diseased states of the nervous system.

This program emphasizes innovative research approaches, encouraging the application and development of state-of-the-art computational tools by theoreticians, computational scientists, engineers, mathematicians, and statisticians to tackle dynamic and complex neuroscience problems. Research activities and computational approaches are supported at all levels of organization including molecular, cellular, systems, behavioral, and theory-based development studies. The following list of examples illustrates some areas of research that are appropriate under this solicitation. This list is not intended to be exhaustive or exclusive.

- Develop explanatory, predictive and informative models and simulations of normal and abnormal functions of the nervous system and related disorders.
- Develop and improve mathematical, statistical and other quantitative analyses of research related to molecular, cellular, systems, behavioral and/or cognitive neuroscience.
- Develop theoretical and computational approaches to delineate and understand the functions of neural circuits.
- Develop theoretical and computational approaches that relate nervous system processes to learning algorithms, probabilistic representations, estimation, prediction, and inference.

- Develop and improve algorithms for designing experiments and analyzing data related to structural and functional brain mapping technologies.
- Develop and improve algorithms for designing experiments and analyzing data related to normal biological rhythms and time courses of pathophysiological processes.
- Develop novel theoretical and computational methods that can be applied across multiple areas of neuroscience research.
- Develop multiscale models that span across time, space or state-space to understand and predict processes and behavior in neuroscience.
- Develop methods to integrate across large-scale multi-modal neuroscience data.
- Develop novel theoretical and computational methods that can have realizable clinical applications in neuroscience.

Examples of topics amenable to these approaches include but are not limited to the following:

- Structural and functional relationship of neuronal specific molecules, such as ion channels, neurotransmitter receptors, and neural trophic factors;
- Neurotransmission, neuromodulation, and neural plasticity;
- Mechanisms underlying neuronal cell growth, cell death, and neurodegenerative disorders;
- Neurodevelopment, neurodegeneration and regeneration;
- Normal and abnormal sensory processing (vision, audition, olfaction, taste, balance, proprioception and somatic sensation);
- Pattern recognition and perception;
- Motor control mechanisms and sensorimotor integration;
- Learning, representation, and encoding;
- Neurological disorders;
- Mental health, mental illness and related disorders;
- Alcohol and drug abuse related disorders, including, *e.g.*, their interaction with eating disorders and other psychiatric and neurological disorders;
- Cognitive and decision-making functions and dysfunction, including, *e.g.*, impulse control and disinhibition; and
- Neural interface decoding and analysis, and modeling of processes affecting neural interfaces.

Innovative educational and training opportunities are highly encouraged, to develop research capacity in computational neuroscience, to broaden participation in research and education, and to increase the impact of computational neuroscience research. Activities at all levels of educational and career development are welcome under this solicitation.

Sharing of data and software is highly recommended in all CRCNS projects, to facilitate the translation and dissemination of research results, to accelerate the development of generalizable approaches and tools that can be put to wide use by researchers, and to broaden the scope of collaboration in computational neuroscience and related communities.

Proposals for data sharing and corpora development may address any of the scientific topics that would be appropriate for research proposals under this solicitation. Awards for data sharing will support the preparation and deployment of data, software, code bases, stimuli, models, or other resources in a form that is useful to a broad community of researchers. Proposers of data sharing projects are encouraged to coordinate with other CRCNS data sharing projects or related activities. Information about CRCNS data sharing activities will be posted on the program web site, http://www.nsf.gov/crcns/.

III. AWARD INFORMATION

It is estimated that approximately $5.0 million will be available each year for this competition. Award sizes for research projects are expected to range from approximately $100,000 to $250,000 per year in direct costs, with durations of three to five years. Many awards will be on the smaller end of this range; no awards will exceed $250,000 per year in direct costs. Proposers are strongly discouraged from requesting greater budgets than are necessary for the activities being proposed.

It is estimated that data sharing projects will typically range from $25,000 to $100,000 in cumulative award size for a one- to three-year project.

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

Upon conclusion of the review process, meritorious research proposals may be recommended for funding by either NSF or NIH, at the option of the agencies, not the proposer. Data sharing proposals will be funded only by NSF. Subsequent grant administration procedures will be in accordance with the individual policies of the awarding agency. (See section VI.B. for additional information on NSF and NIH processes.)

IV. ELIGIBILITY INFORMATION

Organization Limit:

None Specified

PI Limit:

None Specified

Limit on Number of Proposals per Organization:

None Specified

Limit on Number of Proposals per PI:

In response to this solicitation, an investigator may participate as PI or Co-PI in no more than one research proposal per review cycle, and in no more than one data sharing proposal per review cycle. In the event that a PI or Co-PI does appear in any of these roles on more than one research proposal (whether they are lead or collaborative proposals or subawards), all research proposals that include that person as a PI or Co-PI will be returned without review. Likewise, in the event that a PI or Co-PI does appear in any of these roles on more than one data sharing proposal, all data sharing proposals that include that person as a PI or Co-PI will be returned without review.

Additional Eligibility Info:

- **Proposal Limit:** Proposals submitted in response to this solicitation may not duplicate or be substantially similar to other proposals concurrently under consideration by other NSF or NIH programs or study sections. Duplicate or substantially similar proposals will be returned without review.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Full Proposal Preparation Instructions: Proposals submitted in response to this Program Solicitation must be submitted to NSF. Proposers may opt to submit proposals via Grants.gov or via the NSF FastLane system.

- Full proposals submitted via FastLane: Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the NSF Grant Proposal Guide (GPG). The complete text of the GPG is available electronically on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg. Paper copies of the GPG may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from pubs@nsf.gov. Proposers are reminded to identify this program solicitation number in the program solicitation block on the NSF Cover Sheet For Proposal to the National Science Foundation. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.

- Full proposals submitted via Grants.gov: Proposals submitted in response to this program solicitation via Grants.gov should be prepared and submitted in accordance with the NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov. The complete text of the NSF Grants.gov Application Guide is available on the Grants.gov website and on the NSF website at: (http://www.nsf.gov/bfa/dias/policy/docs/grantsgovguide.pdf). To obtain copies of the Application Guide and Application Forms Package, click on the Apply tab on the Grants.gov site, then click on the Apply Step 1: Download a Grant Application Package and Application Instructions link and enter the funding opportunity number, (the program solicitation number without the NSF prefix) and press the Download Package button. Paper copies of the Grants.gov Application Guide also may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from pubs@nsf.gov.

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.

The following information supplements the Grant Proposal Guide and the NSF Grants.gov Application Guide.

Research Proposals

1. Project Summary: For projects with medical relevance, the statement on broader impacts within the one-page project summary should include a summary of the project's potential contributions to understanding and controlling disease, and enhancing public health.

2. Project Description: Proposals for research projects must include a Coordination Plan. Up to two additional pages are permitted in the Project Description for this purpose only, allowing a maximum of 17 pages. The Coordination Plan must include: 1) the specific roles of the PI, Co-PIs, other Senior Personnel and paid consultants at all organizations involved; 2) how the project will be managed across institutions and disciplines; 3) identification of the specific coordination mechanisms that will enable cross-institution and/or cross-discipline scientific integration (e.g., workshops, graduate student exchange, project meetings at conferences, use of videoconferencing and other communication tools, software repositories, etc.), and 4) specific references to the budget line items that support these coordination mechanisms.

3. Supplementary Documents: Supplementary documents are limited to the specific types of documentation listed in the GPG, with the following two exceptions:

Human Subjects Protection. Proposals involving human subjects should include a supplementary document no more than two pages in length summarizing potential risks to human subjects, plans for recruitment and informed consent, and planned procedures to protect against or minimize potential risks.

Vertebrate Animals. Proposals involving vertebrate animals should include a supplementary document no more than two pages in length that addresses the following points:

- Justify the use of animals, the choice of species, and the numbers to be used. If animals are in short supply, costly, or to be used in large numbers, provide an additional rationale for their selection and numbers.
- Provide information on the veterinary care of the animals involved.
- Describe the procedures for ensuring that discomfort, distress, pain, and injury will be limited to that which is unavoidable in the conduct of scientifically sound research. Describe the use of analgesic, anesthetic, and tranquilizing drugs and/or comfortable restraining devices, where appropriate, to minimize discomfort, distress, pain, and injury.
- Describe any method of euthanasia to be used and the reasons for its selection. State whether this method is consistent with the recommendations of the Panel on Euthanasia of the American Veterinary Medical Association. If not, present a justification for not following the recommendations.

Proposals containing special information or supplementary documentation that has not been explicitly allowed in the GPG or this solicitation, such as article reprints or preprints, or appendices, will be returned without review.

Data Sharing Proposals

1. **Title:** Titles for data sharing proposals should begin with the phrase, "CRCNS data sharing: ."

2. **Project Description:** Project descriptions for data sharing proposals are limited to 10 pages and should address the following points:

- Quality and scientific importance of the data, software, stimuli, models, or other resources;
- Structure and format of data or other resources;
- Relationship to similar data or other resources, and relevant standards, if applicable;
- Anticipated uses for research and education in computational neuroscience or other fields;
- Plan for preparation and deployment.

3. Supplementary Documents: Proposals may include a supplementary document on Human Subjects Protection, as described above, if issues related to the sharing of data (e.g., confidentiality) require human subjects review. Up to 2 reprints of published articles, or articles in press pertaining to the data or other resources to be shared, may be included as supplementary documents. Do not include any manuscripts that have not been accepted for publication.

B. Budgetary Information

Cost Sharing: Cost sharing is not required.

Other Budgetary Limitations:

Budgets should include travel funds for the PI to attend an annual CRCNS Principal Investigators' meeting.

C. Due Dates

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

  February 26, 2008

  October 30, 2008

  October 30, 2009

D. FastLane / Grants.gov Requirements

- **For Proposals Submitted Via FastLane:**

  Detailed technical instructions regarding the technical aspects of preparation and submission via FastLane are available at: https://www.fastlane.nsf.gov/a1/newstan.htm. For FastLane user support, call the FastLane Help Desk at 1-800-673-6188 or e-mail fastlane@nsf.gov. The FastLane Help Desk answers general technical questions related to the use of the FastLane system. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this funding opportunity.

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

  For Proposals Submitted Via Grants.gov:

  Before using Grants.gov for the first time, each organization must register to create an institutional profile. Once registered, the applicant's organization can then apply for any federal grant on the Grants.gov website. The Grants.gov's Grant Community User Guide is a comprehensive reference document that provides technical information about Grants.gov. Proposers can download the User Guide as a Microsoft Word document or as a PDF document. The Grants.gov User Guide is available at: http://www.grants.gov/CustomerSupport. In addition, the NSF Grants.gov Application Guide provides additional technical guidance regarding preparation of proposals via Grants.gov. For Grants.gov user support, contact the Grants.gov Contact Center at 1-800-518-4726 or by email: support@grants.gov. The Grants.gov Contact Center answers general technical questions related to the use of Grants.gov. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this solicitation.

  Submitting the Proposal: Once all documents have been completed, the Authorized Organizational Representative (AOR) must submit the application to Grants.gov and verify the desired funding opportunity and agency to which the application is submitted. The AOR must then sign and submit the application to Grants.gov. The completed application will be transferred to the NSF FastLane system for further processing.

VI. NSF PROPOSAL PROCESSING AND REVIEW PROCEDURES

Proposals received by NSF are assigned to the appropriate NSF program where they will be reviewed if they meet NSF proposal preparation requirements. All proposals are carefully reviewed by a scientist, engineer, or educator serving as an NSF Program Officer, and usually by three to ten other persons outside NSF who are experts in the particular fields represented by the proposal. These reviewers are selected by Program Officers charged with the oversight of the review process. Proposers are invited to suggest names of persons they believe are especially well qualified to review the proposal and/or persons they would prefer not review the proposal. These suggestions may serve as one source in the reviewer selection process at the Program Officer's discretion. Submission of such names, however, is optional. Care is taken to ensure that reviewers have no conflicts of interest with the proposal.

A. NSF Merit Review Criteria

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

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

What is the intellectual merit of the proposed activity?
How important is the proposed activity to advancing knowledge and understanding within its own field or across different fields? How well qualified is the proposer (individual or team) to conduct the project? (If appropriate, the reviewer will comment on the quality of the prior work.) To what extent does the proposed activity suggest and explore creative, original, or potentially transformative concepts? How well conceived and organized is the proposed activity? Is there sufficient access to resources?
What are the broader impacts of the proposed activity?
How well does the activity advance discovery and understanding while promoting teaching, training, and learning? How well does the proposed activity broaden the participation of underrepresented groups (e.g., gender, ethnicity, disability, geographic, etc.)? To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships? Will the results be disseminated broadly to enhance scientific and technological understanding? What may be the benefits of the proposed activity to society?

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

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:

A central goal of this solicitation is to enable high-quality collaborative research. Following are suggested considerations pertaining to the quality of collaboration, not all of which will necessarily apply to any given proposal:

Quality of collaboration
Is the expertise of the proposers complementary and well-suited to the problems being addressed? Does the collaboration productively bring together new combinations of investigators, approaches, or resources? Are the specific contributions of each collaborating investigator clear? Is the collaborative activity coordinated efficiently and effectively? To what extent will it contribute to the advancement of multiple collaborating disciplines? To what extent will it lead to the development of high-quality resources that will be useful to many other researchers?

The goals of NIH-supported research are to advance our understanding of biological systems, improve the control of

disease, and enhance health. In their evaluations of intellectual merit, reviewers will be asked to consider the following criteria that are used by NIH:

Significance
Does this study address an important problem? If the aims of the proposal are achieved, how will scientific knowledge or clinical practice be advanced? What will be the effect of these studies on the concepts, methods, technologies, treatments, services, or preventative interventions that drive this field?

Approach
Are the conceptual or clinical framework, design, methods, and analyses adequately developed, well integrated, well reasoned, and appropriate to the aims of the project? Does the proposer acknowledge potential problem areas and consider alternative tactics? For proposals designating multiple Principal Investigators, is the leadership approach, including the designated roles and responsibilities, governance and organizational structure consistent with and justified by the aims of the project and the expertise of each of the PIs?

Innovation
Is the project original and innovative? For example: Does the project challenge existing paradigms or clinical practice; address an innovative hypothesis or critical barrier to progress in the field? Does the project develop or employ novel concepts, approaches, methodologies, tools, or technologies for this area?

Investigator
Are the PI(s) and other key personnel appropriately trained and well suited to carry out this work? Is the work proposed appropriate to the experience level of the PI(s) and other researchers? Do the PI (s) and the investigative team bring complementary and integrated expertise to the project (if applicable)?

Environment
Do(es) the scientific environment(s) in which the work will be done contribute to the probability of success? Do the proposed studies benefit from unique features of the scientific environment(s), or subject populations, or employ useful collaborative arrangements? Is there evidence of institutional support? (NOTE: Cost sharing is not required under this program solicitation. Any information in the proposal related to this criterion is not auditable.)

Where applicable, the following items will also be considered:

Protection of human subjects from research risk
Research involving human subjects will be evaluated with reference to the following criteria: risk to subjects, adequacy of protection against risks, potential benefit to the subjects and to others, and importance of the knowledge to be gained.

Inclusion of women, minorities and children in research
The adequacy of plans to include subjects from both genders, all racial and ethnic groups (and subgroups), and children as appropriate for the scientific goals of the research will be assessed. Plans for the recruitment and retention of subjects will also be evaluated.

Vertebrate Animals
Research involving vertebrate animals will be evaluated with reference to the following criteria: justification the use of animals, the choice of species, and the numbers to be used; veterinary care of the animals involved; procedures for ensuring that discomfort, distress, pain, and injury will be limited to that which is unavoidable in the conduct of scientifically sound research; and any method of euthanasia to be used and the reasons for its selection.

Budget
The reasonableness of the proposed budget and the requested period of support in relation to the proposed research.

B. Review and Selection Process

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

Reviewers will be asked to formulate a recommendation to either support or decline each proposal. Program officers from

participating funding units will meet as soon as possible after proposals have been reviewed to formulate a set of funding recommendations consistent with the goals of the program. In doing so, the program officers will consider panel recommendations and other appropriate concerns such as program relevance and breadth of impact.

NSF Process: Those proposals selected for funding by NSF will be handled in accordance with standard NSF procedures. 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.

NIH Process: For those proposals that are selected for potential funding by participating NIH Institutes, the PI will be required to resubmit the proposal in an NIH-approved format directly to the Center for Scientific Review (http://www.csr.nih.gov/) of the NIH. PIs invited to resubmit to NIH will receive further information on resubmission procedures from NIH. An applicant will not be allowed to increase the proposed budget or change the scientific content of the application in the resubmission to the NIH. For applications where the principal investigators are at different institutions, the applicants will be expected to utilize the Multiple Principal Investigator mechanism at the NIH (http://grants.nih.gov/grants/multi_pi/). These NIH applications will be entered into the NIH IMPAC II system. The results of the review will be presented to the involved Institutes' National Advisory Councils for the second level of review. Subsequent to the Council reviews, NIH Institutes will make their funding determinations and selected awards will be made. Subsequent grant administration procedures for NIH awardees will be in accordance with the policies of NIH.

Proposals that are funded by the NIH are expected to be renewed as competing continuing applications. Principal Investigators should contact their NIH Program Officer for additional information. For informational purposes, NIH Principal Investigators may wish to consult the NIAID web site, “All About Grants,” which provides excellent generic information about all aspects of NIH grantsmanship, including competitive renewals (http://www.niaid.nih.gov/ncn/grants/).

VII. NSF AWARD ADMINISTRATION INFORMATION

A. Notification of the Award

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

B. Award Conditions

An NSF award consists of: (1) the award letter, which includes any special provisions applicable to the award and any numbered amendments thereto; (2) the budget, which indicates the amounts, by categories of expense, on which NSF has based its support (or otherwise communicates any specific approvals or disapprovals of proposed expenditures); (3) the proposal referenced in the award letter; (4) the applicable award conditions, such as Grant General Conditions (GC-1); * or Research Terms and Conditions * and (5) any announcement or other NSF issuance that may be incorporated by reference in the award letter. Cooperative agreements also are administered in accordance with NSF Cooperative Agreement Financial and Administrative Terms and Conditions (CA-FATC) and the applicable Programmatic Terms and Conditions. NSF awards are electronically signed by an NSF Grants and Agreements Officer and transmitted electronically to the organization via e-mail.

*These documents may be accessed electronically on NSF's Website at http://www.nsf.gov/awards/managing/

award_conditions.jsp?org=NSF. Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from 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.

Special Award Conditions: Attribution of support in publications must acknowledge the joint program, as well as the agency and award number, by including the phrase, "as part of the NSF/NIH CRCNS Program."

C. Reporting Requirements

For all multi-year grants awarded by NSF (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

General inquiries regarding this program should be made to:

- Kenneth Whang, CRCNS Program Coordinator - NSF; Program Director, Division of Information and Intelligent Systems, National Science Foundation, 1125 S, telephone: (703) 292-5149, fax: (703) 292-9073, email: kwhang@nsf.gov

- Gloria Strothers, CRCNS Administrative Coordinator - NSF; Integrative Activities Specialist, Division of Information and Intelligent Systems, National Science Foundation, 1125 S, telephone: (703) 292-4718, fax: (703) 292-9073, email: gstrothe@nsf.gov

For questions related to the use of FastLane, contact:

- FastLane Help Desk, telephone: 1-800-673-6188; e-mail: fastlane@nsf.gov.

For questions relating to Grants.gov contact:

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

Questions concerning a particular project's focus, direction and relevance to a participating funding organization should be addressed to:

- Martha Flanders, Program Director, Division of Integrative and Organismal Systems, National Science Foundation, 685 S, telephone: (703) 292-7862, email: mflander@nsf.gov

- Stacia Friedman-Hill, Program Director, Division of Behavioral and Cognitive Sciences, National Science Foundation, 907 N telephone: (703) 292-8121, email: sfriedma@nsf.gov

- Mary Ann Horn, Program Director, Division of Mathematical Sciences, National Science Foundation, 1025 N, telephone: (703) 292-4879, email: mhorn@nsf.gov

- Douglas Whalen, Program Director, Division of Behavioral and Cognitive Sciences, National Science Foundation, 995 N, telephone: (703) 292-7321, email: dwhalen@nsf.gov

- Yuan Liu, Director, Computational Neuroscience and Neuroinformatics Program, National Institute of Neurological Disorders and Stroke, telephone: (301) 496-0012, email: liuyuan@ninds.nih.gov

- Dennis Glanzman, Chief, Theoretical and Computational Neuroscience Research, National Institute of Mental Health, telephone: (301) 443-1576, email: dglanzma@mail.nih.gov

- David Shurtleff, Director, Division of Neuroscience and Behavioral Research, National Institute on Drug Abuse, telephone: (301) 443-1887, email: david_shurtleff@nih.gov

- Barry J. Davis, Director, Taste and Smell Program, National Institute on Deafness and Other Communication Disorders, telephone: (301) 402-3464, fax: (301) 402-6251, email: davisb1@nidcd.nih.gov

- John A. Matochik, Program Director, Division of Neuroscience and Behavior, National Institute on Alcoholism and Alcohol Abuse, telephone: (301) 451-7319, email: jmatochi@mail.nih.gov

- Michael Oberdorfer, Program Director, Visual Neuroscience Program, National Eye Institute, telephone: (301) 451-2020, email: oberdorfer@nei.nih.gov

- Grace C. Y. Peng, Program Director, Discovery Science and Technology, National Institute of Biomedical Imaging and Bioengineering, telephone: (301) 451-4778, email: penggr@mail.nih.gov

IX. OTHER INFORMATION

The NSF Website provides the most comprehensive source of information on NSF Directorates (including contact information), programs and funding opportunities. Use of this Website by potential proposers is strongly encouraged. In addition, MyNSF (formerly the Custom News Service) is an information-delivery system designed to keep potential proposers and other interested parties apprised of new NSF funding opportunities and publications, important changes in proposal and award policies and procedures, and upcoming NSF Regional Grants Conferences. Subscribers are informed through e-mail or the user's Web browser each time new publications are issued that match their identified interests. MyNSF also is available on NSF's Website at http://www.nsf.gov/mynsf/.

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

Coordination of Data Sharing

An activity supported by the NSF for the U.S. government is the International Neuroinformatics Coordinating Facility (INCF) located at the Karolinska Intitute in Stockholm, Sweden. Initiated as an activity of the OECD Global Science Forum, INCF will develop a neuroinformatics portal service in cooperation with member countries. More information is available at http://www.incf.org/.

Related Funding Opportunities

The following NSF activities support computational neuroscience research, including single-investigator projects:

- **Cognitive Neuroscience** (http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5316&org=BCS)
- **Mathematical Biology** (http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5690&org=DMS)
- **Neural Systems** (http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=501089&org=IOS)
- **Robust Intelligence** (http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=500053&org=IIS)

ABOUT THE NATIONAL SCIENCE FOUNDATION

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

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

NSF receives approximately 40,000 proposals each year for research, education and training projects, of which approximately 11,000 are funded. In addition, the Foundation receives several thousand applications for graduate and postdoctoral fellowships. The agency operates no laboratories itself but does support National Research Centers, user facilities, certain oceanographic vessels and Antarctic research stations. The Foundation also supports cooperative research between universities and industry, US participation in international scientific and engineering efforts, and educational activities at every academic level.

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

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

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

ABOUT THE NATIONAL INSTITUTES OF HEALTH

The National Institutes of Health (NIH) mission is to uncover new knowledge that will lead to better health for everyone. NIH works toward that mission by conducting research in its own laboratories; supporting the research of non-Federal scientists in universities, medical schools, hospitals, and research institutions throughout the country and abroad; helping in the training of research investigators; and fostering communication of medical information. The NIH institutes participating in this program contribute to NIH s mission through research efforts aimed at understanding, treating, and preventing disease states that involve or are related to the nervous system.

The NINDS is interested in supporting collaborative research in innovative computational analysis, simulation and modeling of physiological and pathological functions of the nervous system, and mechanisms underlying neurological and neuromuscular disorders and stroke.

NIMH supports an integrated program of basic and clinical research in biology, neuroscience, epidemiology, behavioral sciences as well as services research aimed at developing and assessing new approaches to diagnose, prevent and treat mental illness.

NIDA supported research is aimed at increasing the understanding of the causes and consequences of drug abuse and addiction. NIDA supports a broad research program in basic and clinical research, neuroscience, molecular biology, genetics, epidemiology, behavioral sciences and services research.

NIDCD supports biomedical and behavioral research related to normal and disordered processes of hearing, balance, smell, taste, voice, speech and language. Basic and clinical studies of genetic, molecular, cellular, physiological, biochemical,

and behavioral aspects of function in health and disease are encouraged.

NIAAA supports basic, clinical and behavioral research to increase the understanding of normal and abnormal biological functions and behavior relating to alcohol use, to improve the diagnosis, prevention, and treatment of alcohol use disorders, and to enhance quality health care to reduce the burden of alcohol abuse and addiction.

NEI supports basic and clinical research aimed at increasing our understanding of the eye and the visual system in normal health and disease.

NIBIB supports research and development of new and novel computational methods for modeling, simulation and analysis for the purpose of detecting, treating and preventing disease. For projects developing computational methods for image analysis and post-processing, where the computation is not linked to the direct testing or generation of a neuroscience hypothesis, please refer to the NIBIB program for image processing: http://www.nibib.nih.gov/Research/ProgramAreas/ImageProcessing.

For the latest information about NIH programs, visit the NIH website at http://www.nih.gov/.

The National Science Foundation promotes and advances scientific progress in the United States by competitively awarding grants and cooperative agreements for research and education in the sciences, mathematics, and engineering.

To get the latest information about program deadlines, to download copies of NSF publications, and to access abstracts of awards, visit the NSF Website at http://www.nsf.gov

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

  Send an e-mail to: pubs@nsf.gov

  or telephone: (703) 292-7827
- **To Locate NSF Employees:** (703) 292-5111

PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

The information requested on proposal forms and project reports is solicited under the authority of the National Science Foundation Act of 1950, as amended. The information on proposal forms will be used in connection with the selection of qualified proposals; and project reports submitted by awardees will be used for program evaluation and reporting within the Executive Branch and to Congress. The information requested may be disclosed to qualified reviewers and staff assistants as part of the proposal review process; to proposer institutions/grantees to provide or obtain data regarding the proposal review process, award decisions, or the administration of awards; to government contractors, experts, volunteers and researchers and educators as necessary to complete assigned work; to other government agencies or other entities needing information regarding applicants or nominees as part of a joint application review process, or in order to coordinate programs or policy; and to another Federal agency, court, or party in a court or Federal administrative proceeding if the government is a party. Information about Principal Investigators may be added to the Reviewer file and used to select potential candidates to serve as peer reviewers or advisory committee members. See Systems of Records, NSF-50, "Principal Investigator/Proposal File and Associated Records," 69 Federal Register 26410 (May 12, 2004), and NSF-51, "Reviewer/Proposal File and Associated Records, " 69 Federal Register 26410 (May 12, 2004). Submission of the information is voluntary. Failure to provide full and complete information, however, may reduce the possibility of receiving an award.

An agency may not conduct or sponsor, and a person is not required to respond to, an information collection unless it displays a valid Office of Management and Budget (OMB) control number. The OMB control number for this collection is

3145-0058. Public reporting burden for this collection of information is estimated to average 120 hours per response, including the time for reviewing instructions. Send comments regarding the burden estimate and any other aspect of this collection of information, including suggestions for reducing this burden, to:

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