# Division of Molecular and Cellular Biosciences: Investigator-initiated research projects (MCB)

## PROGRAM SOLICITATION
NSF 11-545

## REPLACES DOCUMENT(S):
PD 11-1144, PD 11-1114, PD 11-1112, PD 11-8011

National Science Foundation

Directorate for Biological Sciences
Division of Molecular and Cellular Biosciences

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

September 06, 2011

May 21, 2012

January 28, 2013

## IMPORTANT INFORMATION AND REVISION NOTES

A revised version of the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG), NSF 11-1, was issued on October 1, 2010 and is effective for proposals submitted, or due, on or after January 18, 2011. Please be advised that the guidelines contained in NSF 11-1 apply to proposals submitted in response to this funding opportunity.

Cost Sharing: The PAPPG has been revised to implement the National Science Board's recommendations regarding cost sharing. Inclusion of voluntary committed cost sharing is prohibited. In order to assess the scope of the project, all organizational resources necessary for the project must be described in the Facilities, Equipment and Other Resources section of the proposal. The description should be narrative in nature and must not include any quantifiable financial information. Mandatory cost sharing will only be required when explicitly authorized by the NSF Director. See the PAPP Guide Part I: *Grant Proposal Guide (GPG)* Chapter II.C.2.g(xi) for further information about the implementation of these recommendations.

Data Management Plan: The PAPPG contains a clarification of NSF's long standing data policy. All proposals must describe plans for data management and sharing of the products of research, or assert the absence of the need for such plans. FastLane will not permit submission of a proposal that is missing a Data Management Plan. The Data Management Plan will be reviewed as part of the intellectual merit or broader impacts of the proposal, or both, as appropriate. Links to data management requirements and plans relevant to specific Directorates, Offices, Divisions, Programs, or other NSF units are available on the NSF website at: http://www.nsf.gov/bfa/dias/policy/dmp.jsp. See Chapter II.C.2.j of the GPG for further information about the implementation of this requirement.

Postdoctoral Researcher Mentoring Plan: As a reminder, each proposal that requests funding to support postdoctoral researchers must include, as a supplementary document, a description of the mentoring activities that will be provided for such individuals. Please be advised that if required, FastLane will not permit submission of a proposal that is missing a Postdoctoral Researcher Mentoring Plan. See Chapter II.C.2.j of the GPG for further information about the implementation of this requirement.

Revision Summary

- This solicitation covers the four core clusters in the Division of Molecular and Cellular Biosciences (MCB): Biomolecular Dynamics, Structure and Function; Cellular Processes; Genetic Mechanisms; Networks and Regulation. Historically, these clusters accepted proposals every six months. Because the six-month cycle for proposals does not give the PIs of declined proposals sufficient time for thoughtful revision, the Division is implementing an eight month cycle for proposal submission. The Division will accept investigator-initiated research proposals only in response to this solicitation.
- This solicitation also puts a limit on the number of proposals submitted per cycle by a researcher to one proposal as a PI or co-PI.
- Additional reporting information is provided in this solicitation.
- Proposals for Grants for Rapid Response Research (RAPID), EArly-concept Grants for Exploratory Research (EAGER), and for limited support of special meetings and workshops will still be accepted by the core programs at any time during the year.
- The Division will continue to encourage submissions from junior investigators, investigators at primarily undergraduate institutions (PUIs), investigators in EPSCoR states, and investigators who are underrepresented in molecular and cellular biosciences.

## SUMMARY OF PROGRAM REQUIREMENTS

### General Information

Program Title:

Division of Molecular and Cellular Biosciences: Investigator-initiated research projects (MCB)

Synopsis of Program:

The Division of Molecular and Cellular Biosciences (MCB) supports fundamental research and related activities designed to promote understanding of complex living systems at the molecular, subcellular, and cellular levels. The Division is soliciting proposals for hypothesis-driven and discovery research and related activities in four core clusters:

- Biomolecular dynamics, structure, and function
- Cellular processes
- Genetic mechanisms
- Networks and regulation

The Division supports research using a range of experimental approaches--including *in vivo*, *in vitro* and *in silico* strategies--and a broad spectrum of model and non-model organisms, especially microbes and plants. Typical research in areas supported by MCB integrates theory and experimentation. The Division gives high priority to research projects that use theory, methods, and technologies from physical sciences, mathematics, computational sciences, and engineering to address basic biological questions. Projects that address the emerging areas of single molecule or single cell studies, molecular dynamics, small RNA and chromatin biology, predictive modeling of complexity at molecular and cellular levels, and synthetic biology are particularly welcome. The Division is also interested in projects aimed at understanding and predicting the molecular and cellular underpinnings of phenotypic variation and adaptation to environmental change. Highest funding priority is given to applications that are outstanding in both intellectual merit and broader impacts. The Division supports both hypothesis-driven research and discovery-based, large-scale biology research. Proposals that are motivated by relevance of the proposed research to human health or proposals that address the molecular basis of human diseases and treatment are not appropriate for the Division and will be returned without review.

Cognizant Program Officer(s):

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

- Kamal Shukla, Biomolecular Dynamics, Structure, and Function, telephone: (703) 292-8440, email: bio-mcb-bdsf@nsf.gov
- Gregory Warr, Cellular Processes, telephone: (703) 292-8440, email: bio-mcb-cp@nsf.gov
- Karen C. Cone, Genetic Mechanisms, telephone: (703) 292-8440, email: bio-mcb-gm@nsf.gov
- Susanne von Bodman, Networks and Regulation, telephone: (703) 292-8440, email: bio-mcb-nr@nsf.gov

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

- 47.074 --- Biological Sciences

## Award Information

Anticipated Type of Award: Standard Grant or Continuing Grant

Estimated Number of Awards: 100

Anticipated Funding Amount: $65,000,000 Approximately $65M funds will be used for total budget of new awards in each cycle, pending availability of funds.

## Eligibility Information

Organization Limit:

Proposals may only be submitted by the following:

- Universities and Colleges - Universities and two- and four-year colleges (including community colleges) accredited in, and having a campus located in the US, acting on behalf of their faculty members. Such organizations also are referred to as academic institutions.
- Non-profit, non-academic organizations: Independent museums, observatories, research labs, professional societies and similar organizations in the U.S. associated with educational or research activities.
- Organizations ineligible to submit a proposal in response to this solicitation cannot receive funds as subawardees. If a consortium of eligible organizations submit a collaborative proposal, it should be submitted as separate, linked collaborative proposals.

PI Limit:

None Specified

Limit on Number of Proposals per Organization:

None Specified

Limit on Number of Proposals per PI: 1

An investigator can serve as a PI or co-PI on only one regular investigator-initiated research proposal per cycle. This limitation applies only to proposals submitted to this solicitation. PIs receiving current funding for other grants may apply. See "Other Funding Opportunities" in Section II. Program Description.

## Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- Letters of Intent: Not Applicable
- Preliminary Proposal Submission: Not Applicable
- Full Proposals:
  - Full Proposals submitted via FastLane: NSF Proposal and Award Policies and Procedures Guide, Part I: Grant Proposal Guide (GPG) Guidelines apply. The complete text of the GPG is available electronically on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg.
  - Full Proposals submitted via Grants.gov: NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov Guidelines apply (Note: The NSF Grants.gov Application Guide is available on the Grants.gov website and on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide)

B. Budgetary Information

- Cost Sharing Requirements: Inclusion of voluntary committed cost sharing is prohibited.
- Indirect Cost (F&A) Limitations: Not Applicable
- Other Budgetary Limitations: Not Applicable

C. Due Dates

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

  September 06, 2011

  May 21, 2012

  January 28, 2013

## Proposal Review Information Criteria

Merit Review Criteria: National Science Board approved criteria apply.

## Award Administration Information

Award Conditions: Standard NSF award conditions apply.

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

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## I. INTRODUCTION

The Division of Molecular and Cellular Biosciences (MCB) supports fundamental research and related activities designed to decipher molecular underpinnings of complex living systems. The Division supports research across a broad spectrum of experimental systems, ranging from organisms, such as plants and microbes, to the use of *in silico* approaches. Typical research in areas supported by MCB integrates theory and experimentation.

Although the Division considers projects in all areas of molecular and cellular biology, the following types of projects are given high priority.

- Projects that address the emerging areas of single molecule or single cell studies, small RNA and chromatin biology, predictive modeling at molecular and cellular levels, real-time biology examining dynamics of molecules, cells, populations and synthetic biology.
- Projects related to bio-inspired solutions to clean energy and to environmental changes, especially when the research uses modeling or synthetic biology to address questions relating to the capture and use of energy by biological catalysts or to the analysis and prediction of molecular mechanisms underlying phenotypic variation and adaptation to environmental change.
- Development of new methods and tools that will be applicable to a wide range of molecular and cellular research.
- Research at the interface of molecular and cellular biosciences and physical, mathematical, computational and engineering sciences. Additional information about the research at the interface can be found in the Dear Colleague Letter about this topic (http://www.nsf.gov/pubs/2011/nsf11010/nsf11010.jsp?WT.mc_id=USNSF_25&WT.mc_ev=click). The PIs are encouraged to use MPS-BIO at the beginning of the title if appropriate.

MCB will continue to encourage projects that provide unique educational and training opportunities for the next generation of researchers, scientific educators, and scientifically literate citizens. Broadening participation of underrepresented groups is a high priority to the Division. Proposals to the Division can contain development of innovative educational, broadening participation, and outreach activities or participation in the existing institutional infrastructure for education, training and outreach. Priority will placed on those activities deemed important in the Vision and Change report for transforming biology education (http://visionandchange.org/files/2010/03/VC_report.pdf).

Highest funding priority is given to applications that are outstanding in both intellectual merit and broader impacts. Successful proposals often demonstrate close integration of scientific and educational aims, and the Division encourages creative activities that broaden participation and stimulate an appreciation and curiosity for molecular and cell biology among the widest possible audiences. Priority for funding is given to research areas in which MCB plays a unique or special role among NSF programs and within the scope of total Federal funding.

MCB supports research projects that address fundamental biological questions. If your proposed research is motivated by interest in a human disease or uses model systems (including mammalian cell lines) that are used to address molecular and cellular systems involved in human disease, you are strongly advised to contact the appropriate program director prior to submission of a proposal. Please note that research motivated by relevance to human health and disease is not supported by MCB. Proposals that include reference to the etiology, diagnosis or treatment of human disease, or that are relevant to or motivated by the medical importance of the research topic will be returned without review.

In addition to the regular research proposals sought under this solicitation, the Division supports a variety of Foundation-wide and Directorate-wide activities designed to promote integration of research and education such as the Faculty Early Career Development Program (CAREER), Research Coordination Networks (RCN), and Research at Undergraduate Institutions (RUI). RCN and RUI proposals are reviewed along with regular research proposals using ad hoc and panel reviews and should be submitted by the deadlines in this solicitation. Proposals for the CAREER solicitation should be submitted by the deadlines listed in the CAREER solicitation.

The Division also considers proposals for Grants for Rapid Response Research (RAPID), for EArly-concept Grants for Exploratory Research (EAGER), and for limited support of special meetings and workshops. See Chapter II.D (Special Guidelines) of the Grant Proposal Guide for more complete information about these types of proposals. Typically, these proposals are reviewed internally. Before submitting EAGER, RAPID, and conference proposals, please contact the program director in the area of the proposal. Conference proposals should be submitted in response to Grant Proposal Guide at least 6 months before start of the project.

## II. PROGRAM DESCRIPTION

This solicitation invites research proposals for the following clusters:

### Biomolecular dynamics, structure, and function

This cluster supports fundamental research in the areas of molecular biophysics and biochemistry. The cluster gives high priority to creative projects that address the relationships between structure, function, and dynamics in studies of individual biomolecules and their complexes by an integrated approach of theory, computation, and experimental methods such as NMR, X-ray crystallography, EPR, and optical spectroscopy including single molecule methods. The cluster encourages research projects that are designed to discover and define general principles of macromolecular structure, dynamics, and mechanisms, as well as projects that will develop cutting-edge technologies in the context of biological questions relevant to the cluster. The cluster also encourages multi-disciplinary research at the interface of biology with physics, chemistry, mathematics, computer science, and engineering. Funding priority is given to proposals that identify critical gaps in our understanding, propose imaginative experiments to fill the gaps, and promise high-impact breakthroughs. The cluster receives proposals in the following areas of research.

- Structure, dynamics, and function of biomolecules

- Biomolecular interactions and mechanisms
- Energy transduction: photosynthesis and biological electron transfer

### Cellular processes

The Cellular Processes Cluster encourages the use of innovative approaches and technologies that address new concepts or resolve long-standing questions in cell biology. The cluster seeks to support imaginative projects that integrate research on processes at the supramolecular and cellular scales. The cluster recognizes the need for rigorous, quantitative approaches for cell biology and welcomes multidisciplinary research that includes physical, mathematical, and computational approaches. Areas of particular interest include evolutionary and comparative cell biology, live-cell imaging, single-particle analysis of macromolecular assemblies, architectural organization and dynamics of structures over broad dimensional scales. This cluster entertains proposals in the following areas of cell biology:

- Membrane organization and function, extracellular matrices
- Organelle biogenesis, maintenance, and trafficking
- Cytoskeletal dynamics, cell division and motility

### Genetic mechanisms

The Genetic Mechanisms Cluster supports inventive studies seeking to address the following fundamental questions: How do genes work? How are genes maintained and inherited? How do genes and genomes change? The Cluster encourages research projects that capitalize on the growing abundance of genomic data to understand the relationship of genotype to phenotype. The Cluster also welcomes the development and use of innovative *in vivo* and *in vitro* approaches, including biochemical, biophysical, computational, genetic, genomic, and metagenomic methods. Research at the interfaces between biology and other disciplines such as physics, chemistry, mathematics, computer science, and engineering is encouraged. Funding priority is given to proposals that promise high-impact contributions and significant forward movement in the following areas:

- Gene expression and epigenetics
- Chromosome dynamics, DNA replication, repair, recombination and inheritance
- Evolution of genes and genomes

### Networks and regulation

The Networks and Regulation Cluster seeks to support creative proposals that offer a comprehensive understanding of the emergent properties of cells, organisms, and microbial communities. The cluster promotes fundamental research addressing the manner in which cells integrate environmental signals with their internal genetic and metabolic programs to regulate physiology, development or behavior. The Cluster is interested in supporting research in areas that include the nature and behavior of cellular networks; the elucidation of novel or important metabolic pathways (especially in plants and microbes); synthetic biology and the origin of living systems. Research projects are given high priority if they are likely to lead to quantitative, predictive models of cellular function through iterative cycles of theory and experiment. The proposals in the areas listed below are particularly encouraged.

- Signaling, metabolic and gene regulatory networks
- The minimal cell, synthetic biology and the origins of life
- Environmental interactions, metabolic pathways and microbial communities

### Other Funding Opportunities

Additional funding opportunities may be found at http://www.nsf.gov/funding/pgm_list.jsp?org=BIO&ord=rcnt. Investigators are encouraged to contact the cognizant Program Directors directly regarding the fit of the proposed research into a particular program.

***Conferences, Workshops and Symposia:*** MCB supports a small number of conferences, symposia and workshops in molecular and cellular biosciences that bring experts together to discuss current research, to expose other researchers or students to new research methods, and to discuss future directions of major research activities relevant to the Division. Conferences will be supported only if equivalent results cannot be obtained at regular meetings of professional societies or the established conference series. Conferences that include sessions directly relevant to human diseases are given low priority. More information about submission of these proposals can be found at http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg. Proposers are encouraged to contact a Program Director about the suitability of the proposed activity for MCB support prior to submission. These proposals are submitted any time during the year, but should be received by NSF at least 6 months before the meeting.

***Early-concept Grants for Exploratory Research (EAGER):*** The EAGER funding mechanism may be used to support exploratory work in its early stages on untested, but potentially transformative, research ideas or approaches. This work may be considered especially "high risk-high payoff" in the sense that it, for example, involves radically different approaches, applies new expertise, or engages novel disciplinary or interdisciplinary perspectives. These exploratory proposals may also be submitted directly to an NSF program, but the EAGER mechanism should not be used for projects that are appropriate for submission as "regular" (i.e., non-EAGER) NSF proposals. PI(s) must contact the NSF program officer(s) whose expertise is most germane to the proposal topic prior to submission of an EAGER proposal. This will aid in determining the appropriateness of the work for consideration under the EAGER mechanism; this suitability must be assessed early in the process. For guidelines, see the most recent version of the NSF Grant Proposal Guide (http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg). These proposals can be submitted any time during the year.

***Grants for Rapid Response Research (RAPID):*** The RAPID funding mechanism is used for proposals having a severe urgency with regard to availability of, or access to data, facilities or specialized equipment, including quick-response research on natural or anthropogenic disasters and similar unanticipated events. PI(s) must contact the NSF program officer(s) whose expertise is most germane to the proposal topic before submitting a RAPID proposal. This will facilitate determining whether the proposed work is appropriate for RAPID funding. For guidelines, see the most recent version of the NSF Grant Proposal Guide (http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg). These proposals can be submitted any time during the year.

***Research Coordination Networks (RCN):*** The goal of the RCN Program is to advance a field or create new directions in research or education. Innovative ideas for implementing novel networking strategies are especially encouraged. Groups of investigators will be supported to communicate and coordinate their research, training and educational activities across disciplinary, organizational, geographic and international boundaries. The objectives are to facilitate open communication and exchange of information and resources, to integrate research and/or education activities of scientists and engineers working independently on topics of common interest, to nurture a sense of community among young scientists and engineers, and to minimize isolation and maximize cooperation so as to eliminate unnecessary duplication of efforts. The Program Solicitation is accessible through http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=11691. These proposals must be received by the deadlines listed in this MCB solicitation.

***The Faculty Early Career Development (CAREER) Program:*** This is a Foundation-wide activity that offers the National Science

Foundation's most prestigious awards in support of junior faculty who exemplify the role of teacher-scholars through outstanding research, excellent education and the integration of education and research within the context of the mission of their organizations. Such activities should build a firm foundation for a lifetime of leadership in integrating education and research. MCB encourages CAREER proposals which should be submitted by the deadlines listed in the CAREER solicitation (available at http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503214).

***Research in Undergraduate Institutions (RUI):*** This activity supports research by faculty members of predominantly undergraduate institutions through the funding of (1) individual and collaborative research projects, (2) the purchase of shared-use research instrumentation, and (3) Research Opportunity Awards for work with NSF-supported investigators at other institutions. All NSF directorates participate in the RUI activity. Eligible "predominantly undergraduate" institutions include U.S. two-year, four-year, masters-level, and small doctoral colleges and universities that (1) grant baccalaureate degrees in NSF-supported fields, or provide programs of instruction for students pursuing such degrees with institutional transfers (e.g., two-year schools), (2) have undergraduate enrollment exceeding graduate enrollment, and (3) award an average of no more than 10 Ph.D. or D.Sc. degrees per year in all NSF-supportable disciplines. Additional guidance is available in the solicition that is posted on http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5518&from=fund. These proposals must be received by the deadlines listed in this MCB solicitation.

***Supplemental funding requests***

Supplemental funding requests for existing awards can be requested for different activities such as Research Opportunity Awards, Research Experience for Teachers, and Research Experience for Undergraduates. PIs should include the funding for anticipated REU requests in the proposal budget instead of requesting a supplement after the award is made. If included, the funds are requested under participant support costs. Supplemental funding requests must be received by February 15 of each year to receive funding consideration during that fiscal year.

## III. AWARD INFORMATION

Approximately $65M funds will be used for total budget of new awards in each cycle, pending availability of funds. Requested budget and duration should be in proportion to the proposed scope of the project. The Division funds research projects of varying durations (typically 3 to 5 years) and size.

## IV. ELIGIBILITY INFORMATION

Organization Limit:

Proposals may only be submitted by the following:

- Universities and Colleges - Universities and two- and four-year colleges (including community colleges) accredited in, and having a campus located in the US, acting on behalf of their faculty members. Such organizations also are referred to as academic institutions.
- Non-profit, non-academic organizations: Independent museums, observatories, research labs, professional societies and similar organizations in the U.S. associated with educational or research activities.
- Organizations ineligible to submit a proposal in response to this solicitation cannot receive funds as subawardees. If a consortium of eligible organizations submit a collaborative proposal, it should be submitted as separate, linked collaborative proposals.

PI Limit:

None Specified

Limit on Number of Proposals per Organization:

None Specified

Limit on Number of Proposals per PI: 1

An investigator can serve as a PI or co-PI on only one regular investigator-initiated research proposal per cycle. This limitation applies only to proposals submitted to this solicitation. PIs receiving current funding for other grants may apply. See "Other Funding Opportunities" in Section II. Program Description.

## V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

### A. Proposal Preparation Instructions

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

- Full proposals submitted via FastLane: Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the NSF Grant Proposal Guide (GPG). The complete text

of the GPG is available electronically on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg. Paper copies of the GPG may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from nsfpubs@nsf.gov. Proposers are reminded to identify this program solicitation number in the program solicitation block on the NSF Cover Sheet For Proposal to the National Science Foundation. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.

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

In determining which method to utilize in the electronic preparation and submission of the proposal, please note the following:

Collaborative Proposals. All collaborative proposals submitted as separate submissions from multiple organizations must be submitted via the NSF FastLane system. Chapter II, Section D.4 of the Grant Proposal Guide provides additional information on collaborative proposals.

Use the instructions in the Grant Proposal Guide for formatting proposals, however, this solicitation has a few additional instructions, as follows:

***Proposal Cover Sheet:*** Fastlane Users: When completing the Cover Sheet, click on the GO button at "Program Announcement/Solicitation/ Program Description No." Select this solicitation. The cluster closest to the area of research should be selected as the NSF Unit of Consideration. Grants.gov Users: The program solicitation number will be pre-populated by Grants.gov on the NSF Grant Application Cover Page. Grants.gov users should refer to Section VI.1.2. of the NSF Grants.gov Application Guide for specific instructions on how to designate the NSF Unit of Consideration.

Be sure to complete the remainder of the cover sheet information. Please note that a maximum of 4 Co-PIs can be listed on the cover page. Additional Co-PIs and other Senior Personnel should be included in the complete list provided in the Project Summary. Duplicate proposals that are pending at other federal agencies can only be submitted if all PIs and coPIs are beginning investigators.

***BIO Proposal Classification Form (PCF)****:* Complete the BIO PCF, an on-line coding system that allows the Principal Investigator to characterize his/her project when submitting proposals to the Directorate for Biological Sciences. Once a PI begins preparation of his/her proposal in the NSF FastLane system, selects any program within the Directorate for Biological Sciences as the first or only organizational unit to review the proposal, and saves the cover sheet, the PCF will be generated and available through the Form Preparation screen. Additional information about the BIO PCF is available in FastLane at http://www.fastlane.nsf.gov/a1/BioInstr.htm. Grants.gov Users: Refer to Section VI.5. of the NSF Grants.gov Application Guide for specific instructions on how to submit the BIO Proposal Classification Form.

***Project Summary (maximum 1 page):*** The project summary should consist of five separate parts in the following order:

1. Title
2. A list of senior personnel (PI, Co-PIs, key-collaborators) along with their home institutions;
3. Intellectual merit of the proposed activity, including the major question being addressed in the proposal, the specific scientific objectives, approaches and potential impact on a broad scientific area. Subheading "Intellectual Merit" must be used.
4. Broader impacts of the proposed research. Subheading 'Broader Impacts" must be used.
5. Keywords: 5-10 keywords or phrases should be included. You can use keywords from the program descriptions that are appropriate for the proposed research. The keywords will be used at various steps in the review process, such as assignment of proposals to appropriate panels in the Division and assignment of appropriate reviewers/panelists to the proposals.

Both the intellectual merit and the anticipated broader impacts must be addressed or the proposal will be returned without review. See Section VI. of this solicitation for additional information. The potentially transformative aspects of the proposed research should be addressed, as appropriate (http://www.nsf.gov/pubs/2007/in130/in130.jsp). Please consult http://www.nsf.gov/pubs/gpg/broaderimpacts.pdf for additional information about broader impacts.

***Project Description (maximum 15 pages):*** If results from prior NSF support are included in the project description, the PIs should include the accomplishments from the educational, outreach, and training impacts of the project. The PIs are encouraged to provide information about training of personnel in the previous project along with their current position and institution. The publications resulting from previous support can be listed in references cited and referred in the results from prior support.

***References Cited:*** This section can includes publications resulting from prior research funded by NSF (marked*). All authors and titles must be listed.

All authors and titles of the references should be included.

***Proposal Budget:*** The Division reviews and funds proposals with a wide range of budgets and duration. Provide a summary budget and a yearly budget for the duration of the proposed project. A careful and realistic budget that is consistent with the proposed activities will add to the overall strength of a proposal. If a PI anticipates requesting REU support, the budget should include the funds for undergraduate research internships as the participant support costs.

Special Information and Supplementary Documentation:

Include the following materials in addition to the Project Description. These materials should be labeled clearly and included in the Supplementary Documents section of FastLane or Grants.gov. Provide only the allowable and applicable items as noted in the GPG or NSF Grants.gov Application Guide and this section. Include the materials in the proposal by transferring them as .PDF files through the "Supplementary Docs" module of FastLane or Grants.gov.

A1. Data Management Plan

A2. Postdoctoral Researcher Mentoring Plan (if the proposal requests funding to support postdoctoral researchers)

A3. Letters of Collaboration, if applicable: Multiple letters may be submitted, however each letter of collaboration must not exceed

one page. If a proposal contains a letter that is more than one page, the proposal will be returned without review. Please note that the letters of collaboration must be limited to the nature of collaboration and commitments by the collaborator. If a proposal contains a letter of recommendation or a letter that includes results, it will be returned without review.

A4. RUI Impact statement, if applicable

No other supplementary documents will be allowed.

Single Copy Documents:

***Conflict of Interest Document-*** A single integrated document (in table or spreadsheet form only) should be uploaded into the Single Copy Documents (not Supplementary Documents) section of FastLane at the time of proposal submission. (If submitting via Grants.gov, complete the information and attach as a PDF file in Field 5, Additional Single Copy Documents, on the NSF Grant Application Cover Page.)

Hard copies or e-mail copies will not be accepted. The document should consist of a list in the form of a single alphabetized table, with the full names (Last name, first name, middle initial) of all people having a conflict of interest with any senior personnel and any named personnel member whose salary is requested in the project budget. Conflicts to be identified are (1) Ph.D. thesis advisors or advisees, (2) collaborators or co-authors for the past 48 months, including postdoctoral advisors and advisees and (3) any other individuals or institutions with which the investigator has financial ties (please specify type). Members of current Advisory Committees who receive reimbursement for travel or honoraria should be included in this last category.

***Other single copy documents-*** In addition to the Conflict of Interest Document, other correspondence to the program not intended to be sent to reviewers such as a list of potential reviewers can be uploaded as Single Copy Documents. Submission of a Single Copy Document will allow these documents to be reviewed by the NSF officials only, and they will remain confidential.

A proposal preparation checklist can be found in Grant Proposal Guide (http://www.nsf.gov/pubs/policydocs/pappguide/nsf11001/gpg_2.jsp#IIex1 ) and should be used to ensure that the proposal is compliant with the formatting guidelines in addition to the information provided in this solicitation.

## B. Budgetary Information

Cost Sharing: Inclusion of voluntary committed cost sharing is prohibited

## C. Due Dates

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

  September 06, 2011

  May 21, 2012

  January 28, 2013

## D. FastLane / Grants.gov Requirements

- For Proposals Submitted Via FastLane:

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

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

- For Proposals Submitted Via Grants.gov:

  Before using Grants.gov for the first time, each organization must register to create an institutional profile. Once registered, the applicant's organization can then apply for any federal grant on the Grants.gov website. Comprehensive information about using Grants.gov is available on the Grants.gov Applicant Resources webpage: http://www07.grants.gov/applicants/app_help_reso.jsp. In addition, the NSF Grants.gov Application Guide provides additional technical guidance regarding preparation of proposals via Grants.gov. For Grants.gov user support, contact the Grants.gov Contact Center at 1-800-518-4726 or by email: support@grants.gov. The Grants.gov Contact Center answers general technical questions related to the use of Grants.gov. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this solicitation.

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

## VI. NSF PROPOSAL PROCESSING AND REVIEW PROCEDURES

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

### A. NSF Merit Review Criteria

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

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

What is the intellectual merit of the proposed activity?
How important is the proposed activity to advancing knowledge and understanding within its own field or across different fields? How well qualified is the proposer (individual or team) to conduct the project? (If appropriate, the reviewer will comment on the quality of the prior work.) To what extent does the proposed activity suggest and explore creative, original, or potentially transformative concepts? How well conceived and organized is the proposed activity? Is there sufficient access to resources?

What are the broader impacts of the proposed activity?
How well does the activity advance discovery and understanding while promoting teaching, training, and learning? How well does the proposed activity broaden the participation of underrepresented groups (e.g., gender, ethnicity, disability, geographic, etc.)? To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships? Will the results be disseminated broadly to enhance scientific and technological understanding? What may be the benefits of the proposed activity to society?

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

Mentoring activities provided to postdoctoral researchers supported on the project, as described in a one-page supplementary document, will be evaluated under the Broader Impacts criterion.

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

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

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

### B. Review and Selection Process

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

Reviewers will be asked to formulate a recommendation to either support or decline each proposal. The Program Officer assigned to manage the proposal's review will consider the advice of reviewers and will formulate a recommendation.

After scientific, technical and programmatic review and consideration of appropriate factors, the NSF Program Officer recommends to the cognizant Division Director whether the proposal should be declined or recommended for award. NSF is striving to be able to tell applicants whether their proposals have been declined or recommended for funding within six months. The time interval begins on the deadline or target date, or receipt date, whichever is later. The interval ends when the Division Director accepts the Program Officer's recommendation.

A summary rating and accompanying narrative will be completed and submitted by each reviewer. In all cases, reviews are treated as confidential documents. Verbatim copies of reviews, excluding the names of the reviewers, are sent to the Principal Investigator/Project Director by the Program Officer. In addition, the proposer will receive an explanation of the decision to award or decline funding.

In all cases, after programmatic approval has been obtained, the proposals recommended for funding will be forwarded to the Division of Grants and Agreements for review of business, financial, and policy implications and the processing and issuance of a grant or other agreement. Proposers are cautioned that only a Grants and Agreements Officer may make commitments, obligations or awards on behalf of NSF or authorize the expenditure of funds. No commitment on the part of NSF should be inferred from technical or budgetary discussions with a NSF Program Officer. A Principal Investigator or organization that makes financial or personnel commitments in the absence of a grant or cooperative agreement signed by the NSF Grants and Agreements Officer does

so at their own risk.

## VII. AWARD ADMINISTRATION INFORMATION

### A. Notification of the Award

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

### B. Award Conditions

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

*These documents may be accessed electronically on NSF's Website at http://www.nsf.gov/awards/managing/award_conditions.jsp?org=NSF. Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from nsfpubs@nsf.gov.

More comprehensive information on NSF Award Conditions and other important information on the administration of NSF awards is contained in the NSF *Award & Administration Guide* (AAG) Chapter II, available electronically on the NSF Website at http://www.nsf.gov/publications/pub_summ.jsp?ods_key=aag.

### C. Reporting Requirements

For all multi-year grants (including both standard and continuing grants), the Principal Investigator must submit an annual project report to the cognizant Program Officer at least 90 days before the end of the current budget period. (Some programs or awards require more frequent project reports). Within 90 days after expiration of a grant, the PI also is required to submit a final project report, and a project outcomes report for the general public.

Failure to provide the required annual or final project reports, or the project outcomes report will delay NSF review and processing of any future funding increments as well as any pending proposals for that PI. PIs should examine the formats of the required reports in advance to assure availability of required data.

PIs are required to use NSF's electronic project-reporting system, available through FastLane, for preparation and submission of annual and final project reports. Such reports provide information on activities and findings, project participants (individual and organizational), publications, and other specific products and contributions. PIs will not be required to re-enter information previously provided, either with a proposal or in earlier updates using the electronic system. Submission of the report via FastLane constitutes certification by the PI that the contents of the report are accurate and complete. The project outcomes report must be prepared and submitted using Research.gov. This report serves as a brief summary, prepared specifically for the public, of the nature and outcomes of the project. This report will be posted on the NSF website exactly as it is submitted by the PI.

While submitting an annual or final report, the PIs are required to include the information.

- Information about the project participants. It is essential that the PI reports names, roles on the project and current position (if the person has left the institution) of each person involved in the project. This includes information about the postdoctoral fellows, graduate students, undergraduate students, teachers, faculty from undergraduate institutions, and other personnel that were supported by the original grant or by a supplement to the grant. This information should be uploaded as a table.
- List of all publications must be reported through the Project Report System and not uploaded as a separate file.
- Broader impacts of the project, including educational and outreach activities must be included.

A project report will be returned to the PI if it does not contain information about human resources supported and their tracking or about the educational and outreach activity if included in the original grant or in a supplemental funding request.

## VIII. AGENCY CONTACTS

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

General inquiries regarding this program should be made to:

- Kamal Shukla, Biomolecular Dynamics, Structure, and Function, telephone: (703) 292-8440, email: bio-mcb-bdsf@nsf.gov
- Gregory Warr, Cellular Processes, telephone: (703) 292-8440, email: bio-mcb-cp@nsf.gov

- Karen C. Cone, Genetic Mechanisms, telephone: (703) 292-8440, email: bio-mcb-gm@nsf.gov
- Susanne von Bodman, Networks and Regulation, telephone: (703) 292-8440, email: bio-mcb-nr@nsf.gov

For questions related to the use of FastLane, contact:

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

For questions relating to Grants.gov contact:

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

## IX. OTHER INFORMATION

The NSF Website provides the most comprehensive source of information on NSF Directorates (including contact information), programs and funding opportunities. Use of this Website by potential proposers is strongly encouraged. In addition, National Science Foundation Update is a free e-mail subscription service designed to keep potential proposers and other interested parties apprised of new NSF funding opportunities and publications, important changes in proposal and award policies and procedures, and upcoming NSF Regional Grants Conferences. Subscribers are informed through e-mail when new publications are issued that match their identified interests. Users can subscribe to this service by clicking the "Get NSF Updates by Email" link on the NSF web site.

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

## ABOUT THE NATIONAL SCIENCE FOUNDATION

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

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

NSF receives approximately 55,000 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 Arctic 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: nsfpubs@nsf.gov

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

## PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

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

An agency may not conduct or sponsor, and a person is not required to respond to, an information collection unless it displays a valid Office of Management and Budget (OMB) control number. The OMB control number for this collection is 3145-0058. Public reporting burden for this collection of information is estimated to average 120 hours per response, including the time for reviewing instructions. Send comments regarding the burden estimate and any other aspect of this collection of information, including suggestions for reducing this burden, to:

Suzanne H. Plimpton
Reports Clearance Officer
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