Metabolomics for a Low Carbon Society (METABOLOMICS)
A Joint NSF-JST Program

PROGRAM SOLICITATION
NSF 11-527

REPLACES DOCUMENT(S):
NSF 10-075

National Science Foundation

Directorate for Biological Sciences
Division of Integrative Organismal Systems
Division of Molecular and Cellular Biosciences

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

May 13, 2011

IMPORTANT INFORMATION AND REVISION NOTES

This solicitation describes a Joint Program between the National Science Foundation and the Japan Science and Technology Agency (JST). Please note that all proposals must include a Japanese co-PI who has submitted a coordinated proposal to JST via the e-RAD system (http://www.e-rad.go.jp/).

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.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Metabolomics for a Low Carbon Society (METABOLOMICS)
A Joint NSF-JST Program

Synopsis of Program:

This is a U.S.-Japan joint program coordinated by the National Science Foundation and the Japan Science and Technology Agency (JST). Proposals submitted in response to this solicitation must represent joint projects involving both US and Japanese research groups. JST and NSF will jointly manage the proposal review and award process.

The "metabolome" is the complete set of metabolites expressed within an organism. Its composition is a reflection of the networks of enzymatic pathways encoded within the genome as well as the interplay of developmental

processes and a changing environment over the lifetime of the organism. Metabolomics has exciting applications in bioenergy, environmental interactions, functional genomics and gene discovery, secondary metabolism, genome-wide association mapping, systems biology and metabolic modeling in plant, algal, and microbial systems. However, the scientific promise of metabolomics currently faces multiple challenges that need to be addressed. These challenges include: how to define the metabolome, metabolite annotation, standardization of spatially and temporally resolved sampling, measurement of metabolite flux, dynamic range and depth-of-coverage, instrumentation and infrastructure, informatics and databases.

The goal of this joint NSF-JST program is to advance novel biological knowledge in metabolomics in the areas of energy and the environment, and to foster greater collaborative interactions between Japanese and U.S. scientists in these priority areas. The focus of METABOLOMICS will be on plants, microbes, and algae and eligible research areas will include but will not be limited to:

- Capture of all major metabolites
- Development of standards and annotation of unknown metabolites
- Identification of specialized metabolites of potential value

In recent years, metabolomics has matured to the point where it is now possible to consider cataloging the complete profiles of small molecules in cells. Such profiling is critically important because these small molecule metabolites are the end products of gene expression and represent the high-resolution biochemical phenotype of the cell, tissue, and organism. Key goals of metabolomics include 1) chemical annotation, i.e. determining the chemical structure of each molecule, 2) biological annotation, i.e. connecting each metabolite to a specific enzyme, biochemical pathway, or biological process, and 3) metabolomic annotation, i.e. the distribution of each metabolite in different cells of an organism which includes spatial and temporal information as well as concentration.

Cognizant Program Officer(s):

- Ellen L. Neidle, telephone: (703) 292-4599, email: biometabolomics@nsf.gov
- Bruce A. McClure, telephone: (703) 292-7265, email: biometabolomics@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: 4 Up to 4 awards will be made in FY 2012, pending availability of funds.

Anticipated Funding Amount: $2,000,000 NSF anticipates that $2 million in US funding will be available in FY2012. It is anticipated that approximately $12 million in total, over 3 years, will be available from NSF and JST to support awards made under this competition. Of this total, $6 million is anticipated to be available from NSF, pending appropriation of funds, to support U.S. researchers recommended for awards, and the remainder will be equivalent JST resources to support the Japanese researchers recommended for funding.

Eligibility Information

Organization Limit:

Proposals may only be submitted by the following:

- U.S. academic institutions, U.S. non-profit research organizations including museums, research laboratories, professional societies and similar organizations in the U.S. that are directly associated with educational or research activities, and consortia of only the eligible organizations listed here, that have a U.S. campus. When a consortium of eligible organizations submits a proposal, it must be submitted as a single proposal with one organization serving as the lead and all other organizations as subawardees. Separately submitted collaborative proposals will not be accepted and will be returned without review. Organizations ineligible to respond to this program solicitation may not receive subawards.

PI Limit:

This solicitation is open only to researchers: (1) located at eligible U.S. institutions; and (2) whose Japanese partners have submitted an identical proposal to the Japan Science and Technology Agency by the announced deadline for the program.

Limit on Number of Proposals per Organization:

None Specified

Limit on Number of Proposals per PI:

None Specified

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):

  May 13, 2011

Proposal Review Information Criteria

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

Award Administration Information

Award Conditions: Standard NSF award conditions apply.

Reporting Requirements: Standard NSF reporting requirements apply.

TABLE OF CONTENTS

I. INTRODUCTION

The "metabolome" is the complete set of metabolites expressed within an organism. Its composition is a reflection of the networks of enzymatic pathways encoded within the genome as well as the interplay of developmental processes and a changing environment over the lifetime of the organism. The goal of this joint National Science Foundation and Japan Science and Technology Agency (NSF-JST) program is to advance novel biological knowledge in metabolomics in the areas of energy and the environment, and to foster greater collaborative interactions between Japanese and U.S. scientists in these priority areas. In recent years, metabolomics has matured to the point where it is now possible to consider cataloging the complete profiles of small

molecules in cells. Such profiling is critically important because these small molecule metabolites are the end products of gene expression and represent the high-resolution biochemical phenotype of the cell, tissue, and organism. Key goals of metabolomics research include 1) chemical annotation, i.e. determining the chemical structure of each molecule, 2) biological annotation, i.e. connecting each metabolite to a specific enzyme, biochemical pathway, or biological process, and 3) metabolomic annotation, i.e. the distribution of each metabolite in different cells of an organism which includes spatial and temporal information as well as concentration.

II. PROGRAM DESCRIPTION

Metabolomics has exciting applications in bioenergy, environmental interactions, functional genomics and gene discovery, secondary metabolism, genome-wide association mapping, systems biology and metabolic modeling in plant, algal, and microbial systems. However, the scientific promise of metabolomics currently faces multiple challenges that need to be addressed. These challenges include: how to define the metabolome, metabolite annotation, standardization, spatially and temporally resolved sampling, measurement of metabolite flux, dynamic range and depth-of-coverage, instrumentation and infrastructure, informatics and databases. A recent workshop held at the University of California, Davis, to discuss challenges in metabolomics can be accessed at http://www.noble.org/Research/NFMetabolomics/projects/1038679/index.html. A metabolomic analysis of environmental samples analogous to metagenomic profiling ("meta-metabolomics") was recognized as a grand challenge.

The goal of this joint program is to support collaborative research among U.S. and Japanese scientists focused on fundamental research that contributes to a broader understanding of the metabolic processes in plants, algae or microbes as they relate to bioenergy and the environment. The outcomes of these projects are anticipated to contribute to improved annotation and standardization of metabolites in these organisms. Projects are expected to involve at least one U.S. and one Japanese principal investigator in a single coordinated research project, and each partner should bring specific expertise to the project. Proposals that do not include a Japanese collaboration will be returned without review.

The U.S. components of proposals submitted in response to this Program Solicitation will be supported by the U.S. National Science Foundation. Support for Japanese components will be provided by JST in response to proposals submitted to the e-RAD system.

Additional Considerations as Appropriate

- *Synergy of U.S. and Japanese Activities* Applicants are strongly encouraged to develop joint projects that capitalize on the expertise and strengths of the US and Japanese participants. The strongest projects will be those that present a compelling scientific plan that clearly benefits from the US-Japan collaboration.
- *Integration of Research and Education and Broadening Participation* Activities supported by this Program should provide an excellent environment for training young scientists in metabolomics and promoting increased participation by members of under-represented groups. Informatics skills are critical to making the maximum use of genome resources. Accordingly, proposers are expected to integrate this training into their projects at all levels, wherever appropriate. NSF expects proposers to take advantage of the unique opportunities the proposed project provides in terms of education and incorporate these into the plan at a scale that is commensurate with the scale of the proposed activity. Focused activities that fit well with the specific opportunities offered by the project would be viewed favorably. Proposers are encouraged to take advantage of existing programs and networks where appropriate, building in additional opportunities unique to the project's research goals, including opportunities for U.S. students and early career scientists to conduct research in Japan.
- *Data Management Plan* Proposers are strongly encouraged to consider their project outcomes in the context of the whole field of biology and to ensure maximal accessibility and visibility. Outcomes are expected to meet current community standards for metabolomic data and to be deposited into the existing long-lived community databases where appropriate. Projects that produce resources of utility to other researchers, whether part of a large-scale community resource project or not, are expected to release outcomes as soon as appropriate quality standards have been met. 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. Proposers are encouraged to consult the GPG for additional guidance on data management plans (http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg).
- *Societal Impacts* The societal impact of the proposed research, and particularly its relevance to a low carbon society, should be addressed as an integral part of a proposal. These issues could be integrated into research or into an education and/or outreach activity designed to communicate the significance of the outcomes of metabolomics research to development of a low carbon society.
- *Industrial Collaboration* Innovative collaborations with industry are encouraged when they advance the goals of the Program. However, NSF funds may not be used to support the industrial collaborators. Participation of a company as a provider of a service should be managed according to the submitting institution's procurement policy. When private industry is involved, the applicant is responsible for ensuring that any intellectual property issues are handled according to NSF Policy (see section A-1 under Special Information and Supplementary Documentation below).
- *Research Coordination* It is anticipated that one U.S. PI will be asked to serve as the lead in coordination of activities across the funded projects. Please indicate whether you would be willing to serve in this role and if so, how this coordination would be envisioned.
- *Implementation of the Responsible Conduct of Research (RCR):* U.S. applicants are required to certify that the institution has a plan to provide appropriate training and oversight in the responsible and ethical conduct of research to undergraduate students, graduate students, and postdoctoral researchers involved in the proposed research project. Information about NSF's RCR policy is available at http://www.nsf.gov/bfa/dias/policy/rcr.jsp.

III. AWARD INFORMATION

Projects will be supported either as standard or continuing grants. The award size will be determined based on the nature of activities and at a level that would be enabling, as well as the availability of funds. Proposers are strongly encouraged to develop a detailed budget in line with the scope and scale of the project. The role and budget for each investigator (PI, co-PI, collaborator)

should also be commensurate with the activities proposed. Up to 4 awards are anticipated, pending availability of funds. The anticipated award date is December 2011. NSF anticipates that $2 million in US funding will be available in FY2012. It is anticipated that approximately $12 million in total, over 3 years, will be available from NSF and JST to support awards made under this competition. Of this total, $6 million is anticipated to be available from NSF, pending appropriation of funds, to support U.S. researchers recommended for awards, and the remainder will be equivalent JST resources to support the Japanese researchers recommended for funding.

IV. ELIGIBILITY INFORMATION

Organization Limit:

Proposals may only be submitted by the following:

- U.S. academic institutions, U.S. non-profit research organizations including museums, research laboratories, professional societies and similar organizations in the U.S. that are directly associated with educational or research activities, and consortia of only the eligible organizations listed here, that have a U.S. campus. When a consortium of eligible organizations submits a proposal, it must be submitted as a single proposal with one organization serving as the lead and all other organizations as subawardees. Separately submitted collaborative proposals will not be accepted and will be returned without review. Organizations ineligible to respond to this program solicitation may not receive subawards.

PI Limit:

This solicitation is open only to researchers: (1) located at eligible U.S. institutions; and (2) whose Japanese partners have submitted an identical proposal to the Japan Science and Technology Agency by the announced deadline for the program.

Limit on Number of Proposals per Organization:

None Specified

Limit on Number of Proposals per PI:

None Specified

Additional Eligibility Info:

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

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.

Important Information The METABOLOMICS proposal is to be a coordinated submission of essentially a single proposal to both NSF and JST. The U.S. institution will submit its proposal to NSF via FastLane or Grants.gov, while the Japanese institution will submit its proposal to JST using the e-RAD system. The core sections of the proposal—Project Summary, Project Description, and Management Plan—will be the same for each submission. Certain minor differences may appear in other sections as required by formatting or other requirements of each system.

1. The core sections of the coordinated proposal (Project Summary, Project Description, Management Plan) must be in English.
2. Several elements of JST's standard proposal preparation have been incorporated into the NSF proposal requirement. As a result, the Project Summary now includes two parts and together, the parts exceed the standard NSF one-page limit.

Proposals submitted in response to this solicitation will not be accepted as separately submitted collaborative proposals.

Proposal Cover Sheet: The Project Title must start with "METABOLOMICS:". When completing the Cover Sheet, click on the GO button at "Program Announcement/Solicitation/ Program Description No." Highlight METABOLOMICS and click on the Select button. Your proposal will automatically be assigned to the IOS-MCB METABOLOMICS Program. Be sure to complete the remainder of the cover sheet information. The Japanese co-PIs should not be listed on the cover page and instead included in the personnel list in the Project Summary . Please note that FastLane allows a maximum of four Co-PIs to be listed on the cover page. Additional Co-PIs and other Senior Personnel are allowable and should be included in the complete list provided in the Project Summary.

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.

Project Summary: The project summary should consist of two separate parts in the following order:

PART 1 (Equivalent to JST Form 1)

U.S. Research Team Leader

Name (Last/First)

Organization

Division/Department

Title

Address

Telephone

Fax

Email

Japanese Research Team Leader

Name (Last/First)

Organization

Division/Department

Title

Address

Telephone

Fax

Email

Other Senior Personnel

Name (Last/First)

Organization

Proposed Project Duration: day/month/year - day/month/year (Total years and months)

PART 2 (maximum 1 page)

1. The intellectual merit of the proposed research, including a summary of the scientific objectives and approaches; and
2. Expected broader impacts of the proposed research.

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 (equivalent to JST Form 5; maximum 10 pages, including figures and tables): In addition to the standard description in the GPG, the guidelines below, which are an exception to the GPG should be followed, noting that the page allowances listed are part of the overall 10-page maximum:

- Relevance and justification: Briefly, but explicitly, explain the relevance of the proposed research to the stated goals of the Program.
- Research plan: Describe the goals of the project, scientific and technical approaches, including informatics where appropriate, with expected outcomes. Descriptions must be sufficiently detailed to allow adequate review.
- Plan to integrate research and education: It is expected that all proposals will include activities that integrate research and education. NSF expects that each proposal will include training and/or educational component that takes advantage of unique and specific opportunities the proposed project would provide, including opportunities for U.S. students and early career scientists to conduct research in Japan. The scale of the training and educational activities should be commensurate with the scale and scope of the proposed research and integrated well into the overall project plan.

Broadening participation of members of under-represented groups and small colleges and universities is especially encouraged.

References Cited: Indicate with an asterisk any cited publications that resulted from prior research funded by NSF for the PI, or Co-PI(s) when following the GPG guidelines for all references cited.

Biographical Sketches (equivalent to JST Form 2; 2 pages each): Biographical sketches following the GPG guidelines must be included for the PI, Co-PIs and each of the Senior Personnel listed on the Project Summary page.

Proposal Budget: Provide a summary budget and a yearly budget for the duration of the proposed project. When subawards are involved, summary and yearly budgets are required for each subaward. A Budget Justification should be provided (maximum 3 pages per budget and subaward budget). A careful and realistic budget that is consistent with the proposed activities will add to the overall strength of a proposal. Funds for facility construction or renovation may not be requested. Travel funds should be requested in the NSF and JST budgets respectively for the US and Japanese PI to attend an annual awardee meeting for each year of the award, which is anticipated to be held in conjunction with a relevant international scientific conference.

Current and Pending Support: Current and Pending Support following the GPG guidelines must be listed for the U.S. PI, Co-PIs and each of the Senior Personnel listed on the Project Summary page.

Facilities, Equipment and Other Resources: Provide a description of available facilities and priorities for its use. For projects requiring additional equipment, justify the need for these resources in the context of the innovative work proposed.

Special Information and Supplementary Documentation:

Include the following materials in addition to Project Description. These materials should be labeled clearly and included in the Supplementary Documents section of FastLane. Provide only the allowable and applicable items as noted in the GPG and this section. Include the materials in the FastLane submission by transferring them as .pdf files through the "Supplementary Docs" module of the FastLane system.

(A-1) Sharing of Results and Management of Intellectual Property (maximum 3 pages): Describe the management of intellectual property rights related to the proposed project, including plans for sharing data, information, and materials resulting from the award. This plan must be specific about the nature of the results to be shared, the timing and means of release, and any constraints on release. The PI of a proposal involving multiple institutions should formulate a coherent plan for the project prior to submission of the proposal. The U.S. and Japanese lead institutions are responsible for coordinating and managing the intellectual property resulting from the METABOLOMICS award. It is expected that an agreement will be developed between grantee institutions and signed prior to the start of a funded project.

(A-2) Participants and Roles ***(equivalent to JST Form 4)*** : The following information should be provided:

I. Researchers in the U.S. Research Team

Name	Organization/Division	Title	Degree	Specialty
(PI)				
(Senior Personnel)				

II. Researchers in the Japanese Research Team

Name	Organization/Division	Title	Degree	Specialty
(Leader)				
(Researchers)				

III. Summary of the roles of each participating group (equivalent to JST Form 3)

- Team: Collection of Japanese or U.S. researchers which may be composed of several separate research groups
- Team leader: researcher who will act as the leader (principal investigator or P.I.) of the Japanese or U.S. research team

Group	Role(s)

(A-3) Management Plan (maximum 2 pages): Projects should provide a description of the management plan for coordinating the activities of the joint project across all participating U.S. and Japanese groups.

The proposed joint research plan should include significant collaborative activities, such as researcher exchanges, joint meetings or joint workshops, to ensure the greatest synergy.

(A-4) Joint Budget Summary (equivalent to JST Form 6)

U.S. Budget Plan (U.S. $)

Year 1 (FY 2011, Total)

Year 2 (FY 2012, Total)

Year 3 (FY 2013, Total)

Cumulative

Japanese Budget plan (JP Yen)

Year 1 (FY 2011, Total)

Year 2 (FY 2012, Total)

Year 3 (FY 2013, Total)

Cumulative Total

(A-5) Postdoctoral Mentoring Plan (maximum 1 page): The NSF Proposal & Award Policies & Procedures Guide (PAPPG) includes guidance regarding complying with the mentoring requirement of the America COMPETES Act (ACA) (Pub. L. No. 110-69, Aug. 9, 2007). As specified in the ACA, 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. Proposals that do not comply with this requirement will be returned without review (see the PAPP Guide Part I: Grant Proposal Guide Chapter II for further information about the implementation of this requirement).

(A-6) Data Management Plan (2 pages maximum) 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 may include:

1. the types of data, samples, physical collections, software, curriculum materials, and other materials to be produced in the course of the project;
2. the standards to be used for data and metadata format and content (where existing standards are absent or deemed inadequate, this should be documented along with any proposed solutions or remedies);
3. policies for access and sharing including provisions for appropriate protection of privacy, confidentiality, security, intellectual property, or other rights or requirements;
4. policies and provisions for re-use, re-distribution, and the production of derivatives; and
5. plans for archiving data, samples, and other research products, and for preservation of access to them.

Any material not specifically requested or in excess of the page allowances will be discarded prior to review. It is the submitting institution's responsibility to ensure that the proposal is compliant with the guidelines. Non-compliant proposals may be returned without review.

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. 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. GPG Exhibit II-2 contains information on conflicts of interest that may be useful in preparation of this list.

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 sent as Single Copy Documents. Please note that key project personnel may be required, prior to an award decision, to submit copies of any intellectual property agreements or material transfer agreements they have signed, or are planning to sign, that would impact the unrestricted and timely distribution of the outcomes of the NSF funded research. Submission of a Single Copy Document will allow these documents to be reviewed by the NSF officials only, and they will remain confidential.

Checklist for Proposal Preparation

- Title begins "METABOLOMICS:...."
- Project Summary contains all requested information, including broader impacts of the proposed work and any potentially transformative concepts
- Project Description is 10 pages or less in length, including figures and tables
- References Cited
- Biographical Sketches (2 pages each) included for PI, Co-PIs and Senior Personnel listed in the Project Summary
- Current and Pending Support Statements included for PI, Co-PIs and Senior Personnel listed in the Project Summary
- Appendices (A-1), (A-2), (A-3), (A-4), (A-5) uploaded in Supplementary Documents
- The Data Management Plan (A-6) has been uploaded
- Conflict of Interest list uploaded as a single integrated table or spreadsheet into Single Copy Documents

This checklist is not intended to be an all-inclusive repetition of the required proposal contents and associated proposal preparation guidelines. It is, however, meant to highlight certain critical items so they will not be overlooked when the proposal is prepared.

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):

  May 13, 2011

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://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 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.

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.

Additional Review Criteria:

- *Synergy of U.S. and Japanese Activities* Applicants should develop joint projects that capitalize on the expertise and strengths of the U.S. and Japanese participants. The strongest projects will be those that present a compelling scientific plan that clearly benefits from the U.S.-Japan collaboration.
- *Integration of Research and Education and Broadening Participation* Projects should take advantage of opportunities for training young scientists in metabolomics and promoting increased participation by members of under-represented groups. Proposers are expected to integrate informatics training into their projects at all levels, wherever appropriate. Focused activities that fit well with the specific opportunities offered by the project would be viewed as a strength. Proposers should take advantage of existing programs and networks where appropriate, building in additional opportunities unique to the project's research goals.
- *Data Management Plan* Proposers should consider their project outcomes in the context of the whole field of biology and ensure maximal accessibility and visibility. Outcomes are expected to meet current community standards for metabolomic data and be deposited into the existing long-lived community databases where appropriate. Projects that produce resources of utility to other researchers, whether part of a large-scale community resource project or not, are expected to release outcomes as soon as appropriate quality standards have been met. The Data Management Plan will be reviewed as part of the intellectual merit or broader impacts of the proposal, or both.

B. Review and Selection Process

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

The review process for proposals submitted under this Agreement will consist of two stages. NSF will organize the first stage of the review, review by panel and/or ad hoc, in coordination with JST. At the conclusion of the first stage of the review, NSF and JST will jointly select up to 8 proposals for a secondary review. JST will organize the secondary review in coordination with NSF, and it is anticipated that the secondary review will be held in Japan. The Japanese and U.S. PIs of each proposal selected for the second stage will be invited to participate in the second stage of the review. NSF and JST will share reviews to facilitate the selection process.

At each stage, reviewers will be asked to formulate a recommendation to either support or decline each proposal. At the conclusion of both review steps, the NSF Program Officers assigned to manage the review will consider the advice of reviewers and will formulate a recommendation in consultation with the JST Program Officers. The NSF Program Officer will recommend to the cognizant Division Director whether each 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.

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.

VIII. AGENCY CONTACTS

General inquiries regarding this program should be made to:

- Ellen L. Neidle, telephone: (703) 292-4599, email: biometabolomics@nsf.gov
- Bruce A. McClure, telephone: (703) 292-7265, email: biometabolomics@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 40,000 proposals each year for research, education and training projects, of which approximately 11,000 are funded. In addition, the Foundation receives several thousand applications for graduate and postdoctoral fellowships. The agency operates no laboratories itself but does support National Research Centers, user facilities, certain oceanographic vessels and Antarctic research stations. The Foundation also supports cooperative research between universities and industry, US participation in international scientific and engineering efforts, and educational activities at every academic level.

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

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

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

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

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

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

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