

# Microbial Genome Sequencing Program FY 2005

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## Program Solicitation

NSF 05-512

Replaces Document NSF 03-603



### National Science Foundation

Directorate for Biological Sciences

Division of Molecular and Cellular Biosciences

Division of Emerging Frontiers



USDA Cooperative State Research, Education and Extension Service

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

February 04, 2005

## SUMMARY OF PROGRAM REQUIREMENTS

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### General Information

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#### Program Title:

Microbial Genome Sequencing Program FY 2005

#### Synopsis of Program:

As a collaborative, interagency effort, the National Science Foundation, and the Cooperative State Research, Education, and Extension Service (CSREES) of the U.S. Department of Agriculture invite research proposals to support high-throughput sequencing of the genomes of microorganisms (including viruses, bacteria, archaea, fungi, oomycetes, protists and agriculturally important nematodes). The availability of genome sequences provides the foundation for understanding how microorganisms function and live, and how they interact with their environments and with other organisms. The sequences are expected to be available to and used by a community of investigators to address issues of scientific and societal importance including: (i) novel aspects of microbial biochemistry, physiology, metabolism, development and cellular biology, (ii) the diversity and the roles microorganisms play in complex ecosystems and in global geochemical cycles, (iii) the impact that microorganisms have on the productivity and sustainability of agriculture and natural resources (e.g., forestry, soil and water), and on the safety and quality of the nation's food supply, and (iv) the organization and evolution of microbial genomes, and the

mechanisms of transmission, exchange and reshuffling of genetic information.

A Microbial Genomics Workshop is held annually; all current awardees in this interagency program are expected to attend.

### **Cognizant Program Officer(s):**

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- Ann Lichens-Park, National Program Leader, CSREES, U.S. Department of Agriculture, STOP 2241, 1400 Independence Avenue, S.W., CSREES, Washington, DC, 20250-2241, telephone: (202) 401-6466, fax: (202) 401-6488, email: [apark@csrees.usda.gov](mailto:apark@csrees.usda.gov)
- Daniel Jones, National Program Leader, CSREES, U.S. Department of Agriculture, STOP 2220, 1400 Independence Avenue, S.W., CSREES, Washington, DC, 20250-2241, telephone: (202) 401-6854, email: [djones@csrees.usda.gov](mailto:djones@csrees.usda.gov)

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

- 10.206 --- Grants for Agricultural Research-Competitive Research Grants
- 47.074 --- Biological Sciences

### **Eligibility Information**

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#### **• Organization Limit:**

Proposals are invited from U.S. academic institutions, U.S. non-profit research organizations and consortia of organizations with appropriate research and educational facilities. A proposal from a multi-organizational consortium must be submitted by the lead organization as a single proposal. When a consortium of eligible individuals or organizations submits a proposal, a single principal investigator must be designated as the project director and a single organization must accept overall management responsibility, including the management of intellectual property, that may result from the proposed research. Proposals may also be submitted by federal agencies or State Agricultural Experiment Stations; however, these proposals would be eligible for funding only by the USDA (see section III below).

Simultaneous submission of proposals to this program and another federal agency is permissible with prior written approval of the appropriate program officers at each agency involved.

The NSF and the USDA have different eligibility criteria. See section III below for details.

- **PI Eligibility Limit:** None Specified.
- **Limit on Number of Proposals:** None Specified.

### **Award Information**

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- **Anticipated Type of Award:** Standard or Continuing Grant
- **Estimated Number of Awards:** 20 to 30

- **Anticipated Funding Amount:** \$15,000,000 Approximately \$15 million is anticipated (\$10 million of NSF and \$5 million of USDA funds), pending availability of funds, with most awards ranging between \$100,000 - \$2,500,000 total, for periods of up to 3 years.

## Proposal Preparation and Submission Instructions

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### A. Proposal Preparation Instructions

- **Full Proposal Preparation Instructions:** This solicitation contains information that deviates from the standard Grant Proposal Guide (GPG) proposal preparation guidelines. Please see the full text of this solicitation for further information.

### B. Budgetary Information

- **Cost Sharing Requirements:** Cost Sharing is not required.
- **Indirect Cost (F&A) Limitations:**

#### NSF Policy

Standard NSF policy regarding indirect cost rates applies to proposals funded by the NSF. The CSREES policy regarding indirect cost rates is described below.

#### CSREES Policy

The FY 2004 Consolidated Appropriation Act (Public Law 108-199) limited indirect costs to 20 percent of the total Federal funds provided under each award. CSREES anticipates that the FY 2005 Appropriations Act will include a similar limitation. Please note that if the 2005 Appropriations Act contains a different indirect cost limitation, CSREES will contact each successful applicant to apply the correct rate prior to the award of a grant.

To accommodate differences in allowable indirect costs between CSREES and NSF, the proposer may be required at the time of award to submit a separate budget with indirect cost rates appropriate to each agency.

- **Other Budgetary Limitations:** Other budgetary limitations apply. Please see the full text of this solicitation for further information.

### C. Due Dates

- **Full Proposal Deadline Date(s)** (due by 5 p.m. proposer's local time):  
February 04, 2005

## Proposal Review Information

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

## Award Administration Information

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- **Award Conditions:** Additional award conditions apply. Please see the full text of this solicitation for further information.
- **Reporting Requirements:** Standard NSF reporting requirements apply.

### Summary of Program Requirements

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## I. INTRODUCTION

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Microorganisms dominate the planet in terms of total biomass. They represent a vast array of species with enormous genetic, metabolic, structural, physiological and behavioral diversity. Despite their ubiquity, beyond human pathogens, a few model organisms, and a few broad surveys, little is known about their fundamental properties, the range in their diversity, how they interact with each other, with more complex life forms and with their environment, and the roles they play in global biogeochemical cycles. Future progress toward filling these knowledge gaps can be advanced significantly by the availability of whole genome sequences. The **Microbial Genome Sequencing Program** is a collaborative interagency activity of the National Science Foundation and the Cooperative State Research, Education, and Extension Service (CSREES) of the U.S. Department of Agriculture. The program supports high-throughput sequencing of the genomes of a broad range of microorganisms (including viruses, bacteria, archaea, fungi, oomycetes, protists and agriculturally important nematodes). The sequences are expected to be made available and used by a community of investigators to address issues of scientific and societal importance including: (i) novel aspects of microbial biochemistry, physiology, metabolism, development and cellular biology, (ii) the diversity and the roles microorganisms play in complex ecosystems and in global geochemical cycles, (iii) the impact that microorganisms have on the productivity and sustainability of agriculture and natural resources (e.g., forestry, soil and water), and on the safety and quality of the nation's food supply, and (iv) the organization and evolution of microbial genomes, and the mechanisms of transmission, exchange and reshuffling of genetic information. This program is part of **The**

**Microbe Project**, a coordinated effort of multiple federal agencies to promote genome-enabled microbial science. (See <http://www.ostp.gov/html/microbial/2000microbial/start.htm>.)

## II. PROGRAM DESCRIPTION

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This program supports high-throughput sequencing of the genomes from a wide range of microorganisms (including viruses, bacteria, archaea, fungi, oomycetes, protists and agriculturally important nematodes) that are either of fundamental biological interest, are important to the national interest, to the productivity and sustainability of agriculture and forestry, or to the safety and quality of the nation's food supply. The results will be partial or whole genome sequence data, annotation and mapping information. Proposals are encouraged to incorporate teaching, training, or outreach components within the scope of the project to facilitate the dissemination of knowledge and the education of students and the public. Research aimed at determining the functions of sequenced genes (Functional Genomics) is not within the scope of this Microbial Genome Sequencing Program. Such studies are supported by other Programs offered by NSF and the CSREES; e.g., activities within the NSF Division of Molecular and Cellular Biosciences (<http://www.nsf.gov/bio/mcb/start.htm>) and the CSREES National Research Initiative's Functional Genomics of Agriculturally Important Organisms Program, Biology of Plant-Microbe Associations Program, and the Animal Health and Well-being Program ([http://www.csrees.usda.gov/funding/rfas/nri\\_rfa.html](http://www.csrees.usda.gov/funding/rfas/nri_rfa.html)).

All microorganisms, except strict human pathogens that are not related to food safety, are candidates for genome sequencing under this program. Proposers should justify organism selection on the basis of biological interest or agricultural importance, as well as community involvement, education and training, and societal impact. Factors to consider include metabolic potential, novel biochemical, structural or developmental features, phylogenetic affiliation, ecological or evolutionary significance, economic importance, and relevance to national security. Proposals to sequence the genomes of agriculturally important nematodes will be accepted in the competition; such proposals will be eligible for funding by CSREES but not by NSF.

Some organisms of profound biological or agricultural importance are not easily cultured or subjected to genetic analysis. Such organisms, with sufficient justification and a clear experimental strategy, may be strong candidates for whole genome sequencing. Other projects including, for example, the sequencing of (i) eukaryotic expressed sequence tag (EST) libraries, (ii) clones from mixed environmental microbial populations, or (iii) homologous genes (orthologs and paralogs), islands, plasmids or regions from the genomes of multiple organisms will also be considered.

Complete coverage is generally the most desirable end-point for whole genome sequencing. However, the choice and justification of complete versus draft coverage is dependent on the nature and scope of the proposed project. For example, the genomes of some protozoa and fungi are relatively large and their sequencing may not easily be completed under the support of a single grant. Similarly, sequencing of prokaryotic genomes for comparative purposes or from environmental samples may not require or generate complete coverage. The outcome of all draft sequencing projects is expected to include generation of high quality sequence data, organization of the sequence reads into contiguous sequences (contigs), correlation with physical maps when appropriate, annotation of open reading frames, and deposition of all information into a publicly accessible, preexisting data base. Investigators who choose to create their own database must ensure accessibility and justify why preexisting databases are not suitable. Investigators should indicate how accessibility to the scientific community will be maintained for the microbial strains or isolates, for high quality genomic DNA, and for an appropriate set of verified clones developed during the course of the sequencing project. When the future goal is complete coverage, plans for completing the sequence should be outlined.

For large genome projects, investigators are encouraged to seek partners, either in the form of consortia or support from other sources, so that the complete sequence, if appropriate, can be obtained in a reasonable time frame. If parallel support from another agency is under consideration or being planned, investigators should inform the cognizant NSF program officer in advance and indicate in the application how the NSF or CSREES funded activity will be organized and coordinated within the larger project.

An important activity of this interagency program is an annual Microbial Genomics Workshop for current awardees. This

workshop is intended to highlight the breadth of the program and to facilitate exchange of scientific and technical information between awardees and projects.

Organism strains that are being targeted in other, already funded, sequencing projects should be avoided, unless the sequence information from these other projects is incomplete or will not be in the public domain. If one strain of a species has been or is being sequenced, the proposer should provide strong justification as to why the sequencing of other strains should be undertaken. Lists of on-going microbial genome sequencing projects are available at the following sites:

<http://www.tigr.org/tdb/mdb/mdb.html>

[http://www.science.doe.gov/ober/EPR/mig\\_cont.html](http://www.science.doe.gov/ober/EPR/mig_cont.html)

<http://www.niaid.nih.gov/dmid/genomes/default.htm>

<http://www.sanger.ac.uk/Projects/>

<http://www.genome.wisc.edu>

<http://www.genome.wustl.edu/>

<http://hgsc.bcm.tmc.edu/>

**The NSF and CSREES will determine which agency will support each award.** These decisions will be based on the mission of the agency (NSF, fundamental scientific and national interest; CSREES, food and agricultural relevance) and the availability of funds. Proposers may request funding for up to three years. The requested duration should be consistent with the goals of the project. **Detailed information on (i) the organisms chosen, (ii) the coordination, management and organizational plan, (iii) the method of library preparation and all other pertinent methodological information, and (iv) the method for disseminating data and interfacing with the broader scientific community and the public, should be provided.** All cloning and sequencing technologies and strategies, particularly ones that are novel, and the mechanisms to assess validity and accuracy of the data must be described in the proposal. Current industry standards employing ABI 3730, or equivalent sequencing technology, result in costs below one dollar per lane and read lengths of 800 nucleotides or more. A reasonable cost per megabase of finished, non-problematic sequence is now about \$80,000; this includes library preparation, template production, sequencing, closure, assembly, automated annotation, personnel, and indirect costs. When sequencing costs exceed this benchmark, an explanation and justification should be provided. Additional activities such as manual annotation, and integral education and outreach are appropriate for inclusion in the project; when included, full justification and a description of the appropriateness within the context of the project is required. Factors resulting in additional costs (e.g., resulting from methodological complexity, non sequencing personnel, education and outreach, community integration, resource storage and management, etc.) should be clearly identified and rationalized. It is unlikely that awards will be made in excess of \$2,500,000. In judging the merits of a proposal, the speed, level of accuracy, and cost effectiveness of the proposed work will be among the evaluation criteria.

Awards will be made in the form of grants to be determined at the time of the award. Each participating agency will obligate funds separately and any particular award may be funded by one or both of the participating agencies. The exact amount of an award will depend on the advice of the reviewers, agency priorities and the availability of funds. In FY 2004 the award sizes ranged from \$50,000 to \$2,500,000. Further information on awards made in this program during FY 2004 is available at the following sites:

<http://www.nsf.gov/bio/pubs/awards/microbgen03.htm>

<http://www.csrees.usda.gov/fo/fundview.cfm?fonum=1108>

### III. ELIGIBILITY INFORMATION

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**NSF Eligibility Criteria:** Proposals are invited from U.S. academic institutions, U.S. non-profit research organizations, and consortia of such organizations with appropriate research and educational facilities. NSF does not normally support research or education activities by scientists, engineers or educators employed by federal agencies or Federally Funded Research and Development Centers (FFRDCs). Proposers are encouraged to establish international collaborations where appropriate. It is anticipated that foreign agencies will support the offshore activities of these programs. Under most circumstances, the NSF component of this program will not make awards or allow subcontracts to non-U.S. institutions.

**CSREES Eligibility Criteria:** The source of CSREES funds for the FY 2005 Microbial Genome Sequencing Program is the National Research Initiative Competitive Grants Program (NRI). Except where otherwise prohibited by law, State agricultural experiment stations, all colleges and universities, other research institutions and organizations, federal agencies, national laboratories, private organizations or corporations, and individuals are eligible to apply for and to receive a competitive grant. Faculty at small and mid-sized academic institutions with limited institutional success and faculty at institutions in USDA Experimental Program for Stimulating Competitive Research (EPSCoR) entities are encouraged to apply (for definitions of small and mid-sized institutions and for EPSCoR eligibility see Part II, C., 2.(c) of the FY 2005 NRI Request for Applications at [http://www.csrees.usda.gov/funding/rfas/nri\\_rfa.html](http://www.csrees.usda.gov/funding/rfas/nri_rfa.html)). Applications from scientists at non-U.S. organizations will not be accepted. Award recipients may subcontract to organizations not eligible to apply, provided such organizations are necessary for the conduct of the project.

**PI Eligibility Limit:** None Specified.

**Limit on Number of Proposals:** None Specified.

### IV. AWARD INFORMATION

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Estimated program budget, number of awards and average award size/duration are subject to the availability of funds. Between 20 and 30 awards are anticipated in this program in FY 2005, and will be made as standard or continuing grants, with most budgets ranging from \$100,000 - \$2,500,000 for durations up to three years.

### V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

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#### A. Proposal Preparation Instructions

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##### Full Proposal Instructions:

Proposals submitted in response to this program announcement/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/cgi-bin/getpub?gpg>. Paper copies of the GPG may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from [pubs@nsf.gov](mailto:pubs@nsf.gov).



This program solicitation supplements the standard GPG proposal preparation guidelines.

Proposers or applicants who have had prior support from the Microbial Genome Sequencing Program (from NSF and/or USDA/CSREES) should indicate the results of that prior support in the Project Description section of the application.

Applicants selected for funding by CSREES will be requested to submit paper copies of their proposals with all associated CSREES forms. These Application Forms may be downloaded from the CSREES website at <http://www.csrees.usda.gov/funding/forms.html>. Successful applicants will be notified at the time of award to prepare and submit applicable forms along with a paper copy of their proposal.

Proposers are reminded to identify the program announcement/solicitation number (05-512) in the program announcement/solicitation block on the proposal Cover Sheet. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.

## **B. Budgetary Information**

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### **Cost Sharing:**

Cost sharing is not required in proposals submitted under this Program Solicitation.

### **Indirect Cost (F&A) Limitations:**

#### **NSF Policy**

Standard NSF policy regarding indirect cost rates applies to proposals funded by the NSF. The CSREES policy regarding indirect cost rates is described below.

#### **CSREES Policy**

The FY 2004 Consolidated Appropriation Act (Public Law 108-199) limited indirect costs to 20 percent of the total Federal funds provided under each award. CSREES anticipates that the FY 2005 Appropriations Act will include a similar limitation. Please note that if the 2005 Appropriations Act contains a different indirect cost limitation, CSREES will contact each successful applicant to apply the correct rate prior to the award of a grant.

To accommodate differences in allowable indirect costs between CSREES and NSF, the proposer may be required at the time of award to submit a separate budget with indirect cost rates appropriate to each agency.

### **Other Budgetary Limitations:**

With the introduction of new technology, the cost of high-throughput genome sequencing has decreased dramatically in the last two years. Current industry standards employing ABI 3730, or equivalent sequencing technology, result in costs below one dollar per lane and read lengths of 800 nucleotides or more. A reasonable cost per megabase of finished, non-problematic sequence is now about \$80,000; this includes library preparation, template production, sequencing, closure, assembly, automated annotation, personnel, and indirect costs. When sequencing costs exceed this benchmark, an explanation and justification should be provided. Additional activities such as manual annotation, and integral education and outreach are appropriate for inclusion in the project; when included, full justification and a description of appropriateness within the context of the project is required.

### **Budget Preparation Instructions:**



A budget is required for each year of requested support. In addition, a cumulative budget is required detailing the requested total support for the overall project period. Funds may be requested under any of the categories listed on the budget, provided that the item or service for which support is requested is allowable under the authorizing legislation, the applicable statutes, regulations, and Federal cost principles, and these program guidelines, and can be justified as necessary for the successful conduct of the proposed project. In the budget justification, all budget categories for which support is requested, with the exception of Indirect Costs, must be individually listed (with costs) in the same order as in the budget and justified on a separate page according to the instructions in the Grant Proposal Guide.

Proposers are reminded to include in the submitted budget the cost of the principle investigator or designee to attend the annual Microbial Genomics Awardee Workshop that is organized by NSF and CSREES. This meeting is often held as a satellite to a larger national genomics meeting.

### C. Due Dates

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Proposals must be submitted by the following date(s):

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

February 04, 2005

### D. FastLane Requirements

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Proposers are required to prepare and submit all proposals for this announcement/solicitation through the FastLane system. Detailed instructions for proposal preparation and submission via FastLane are available at: <https://www.fastlane.nsf.gov/a1/newstan.htm>. For FastLane user support, call the FastLane Help Desk at 1-800-673-6188 or e-mail [fastlane@nsf.gov](mailto:fastlane@nsf.gov). The FastLane Help Desk answers general technical questions related to the use of the FastLane system. Specific questions related to this program announcement/solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this announcement/solicitation.

*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. Proposers are no longer required to provide a paper copy of the signed Proposal Cover Sheet to NSF. Further instructions regarding this process are available on the FastLane Website at: <http://www.fastlane.nsf.gov>

## VI. PROPOSAL REVIEW INFORMATION

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### A. NSF Proposal Review Process

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Reviews of proposals submitted to NSF are solicited from peers with expertise in the substantive area of the proposed research or education project. These reviewers are selected by Program Officers charged with the oversight of the review process. NSF invites the proposer to suggest, at the time of submission, the names of appropriate or inappropriate reviewers. Care is taken to ensure that reviewers have no conflicts with the proposer. Special efforts are made to recruit reviewers from non-academic institutions, minority-serving institutions, or adjacent disciplines to that principally addressed in the proposal.

The National Science Board approved revised criteria for evaluating proposals at its meeting on March 28, 1997 ([NSB 97-72](#)). All NSF proposals are evaluated through use of the two merit review criteria. In some instances, however, NSF will

employ additional criteria as required to highlight the specific objectives of certain programs and activities.

On July 8, 2002, the NSF Director issued [Important Notice 127](#), Implementation of new Grant Proposal Guide Requirements Related to the Broader Impacts Criterion. This Important Notice reinforces the importance of addressing both criteria in the preparation and review of all proposals submitted to NSF. NSF continues to strengthen its internal processes to ensure that both of the merit review criteria are addressed when making funding decisions.

In an effort to increase compliance with these requirements, the January 2002 issuance of the GPG incorporated revised proposal preparation guidelines relating to the development of the Project Summary and Project Description. Chapter II of the GPG specifies that Principal Investigators (PIs) must address both merit review criteria in separate statements within the one-page Project Summary. This chapter also reiterates that broader impacts resulting from the proposed project must be addressed in the Project Description and described as an integral part of the narrative.

Effective October 1, 2002, NSF will return without review proposals that do not separately address both merit review criteria within the Project Summary. It is believed that these changes to NSF proposal preparation and processing guidelines will more clearly articulate the importance of broader impacts to NSF-funded projects.

The two National Science Board approved merit review criteria are listed below (see the [Grant Proposal Guide](#) Chapter III.A for further information). 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 he/she 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 and original concepts? How well conceived and organized is the proposed activity? Is there sufficient access to resources?

**What are the broader impacts of the proposed activity?**

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

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

***Integration of Research and Education***

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

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

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

## **Additional Review Criteria:**

Each proposal will be evaluated in a two-part process. First, proposals will be screened to ensure that they meet the administrative requirements as set forth in this program solicitation. Second, proposals that meet these requirements will be technically evaluated by *ad hoc* reviewers and by a review panel. *Ad hoc* and panel reviewers will be selected based on training, expertise and experience and as a group will cover all aspects of microbial genomics. The panel makeup will reflect a balance (i) of individuals from various types of organizations (e.g., colleges, universities, industry, private non profit organizations, state and federal agencies), (ii) age and geographic distribution, and (iii) diversity with respect to gender and ethnicity.

## **Additional Evaluation Factors:**

The following additional evaluation factors will be considered in reviewing all proposals:

**1. Relevance of the microorganism(s) to be sequenced and the scientific merit of the project.** This criterion addresses the scientific and/or practical importance of the microorganism chosen for sequencing, the novelty, uniqueness and originality of the proposal, and the conceptual adequacy of the sequencing approach including suitability of methodology, clarity and delineation of objectives, and demonstration of feasibility through preliminary data (e.g., known or estimated genome size and techniques for isolation of nucleic acid).

**2. The broader impact of the activity on the biological sciences or agriculture, community involvement, education, training, and outreach.** This criterion addresses the potential of the proposed activity to contribute to better understanding or improvement in the quality and effectiveness of the Nation's scientific research, education, and human resources capabilities. Important issues are the widespread use and appropriate dissemination of results, strengthening the biological sciences and agriculture, and contributing to the security and social stability of the nation. Priority also will be given to projects that integrate research with education and outreach, and those that exhibit close collaboration among multiple investigators, institutions, and end users.

**3. Performance competence.** This criterion addresses the technical merit of the proposed approach, the capabilities of the proposed personnel, including those of the Principal Investigator and other senior staff, the adequacy of the resources available or proposed, and the likelihood that this project will lead to successful, timely, and cost-effective completion of the microbial genome sequence(s).

**4. Project management.** This criterion addresses the overall quality of the technical and managerial aspects of the proposal, including management oversight, long-range planning, release of the data, and sharing of the information and resources resulting from the project within the broader scientific community.

**5. Scientific collaboration and information sharing.** Sequencing of the genome of an organism is a community activity. As such, a close collaboration among the scientists and organizations involved in sequencing activities and effective dissemination to the potential users of the information are important components of this criterion.

**6. Appropriateness of the proposed budget.** Budget requests should be proportional to the size of the genome(s) to be sequenced or the amount of sequencing to be done. With the introduction of new technology, the cost of high-throughput sequencing has decreased dramatically in the last two years. Current industry standards employing ABI 3730, or equivalent sequencing technology, result in costs below one dollar per lane and read lengths of 800 nucleotides or more. A reasonable cost per megabase of finished, non-problematic, sequence is now about \$80,000; this includes library preparation, template production, sequencing, closure, assembly, automated annotation, personnel, and indirect costs. When sequencing costs exceed this benchmark, an explanation and justification need to be provided. Additional activities, such as manual annotation, and integral education and outreach are appropriate for inclusion in the project; when included, full justification and a description of appropriateness within the context of the project is required. Factors resulting in additional costs (e.g., resulting from methodological complexity, non sequence related personnel, education and outreach, community integration, resource storage and management) should be clearly identified and rationalized. It is unlikely that awards will be made in excess of

\$2,500,000.

## **B. Review Protocol and Associated Customer Service Standard**

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All proposals are carefully reviewed by at least three other persons outside NSF who are experts in the particular field represented by the proposal.

Proposals submitted under this program solicitation will be carefully reviewed by a combination of at least three ad hoc (mail) or panel reviewers from outside of the Foundation who have expertise in some aspect of the proposal. Reviewers are selected by the responsible Program Director and are asked to provide a written critique of the proposal that addresses the two National Science Board review criteria and the special program criteria described above. The written reviews will also include an overall rating of the proposal. An individual reviewer may not have expertise in all aspects of a complex proposal and therefore may choose to focus on areas that are closest to their areas of expertise. In all cases reviews are treated as confidential documents.

Each proposal, along with the associated written reviews, will be discussed by a review panel. The panel will rate each proposal relative to all other proposals under consideration. A summary of the panel deliberations will be written by one of the panelists. The summary will describe substantive issues raised by the panel that are not covered in the written reviews, and in addition, will provide a general impression of the enthusiasm of the panel for the project and their overall panel rating of the proposal. The panel rating is not intended to be an average of the ratings of the written reviews.

The Program Directors assigned to manage the review of the proposals will consider all available information, including the written ad hoc and panel reviews, the panel discussion and rating, the panel summary and all other available information and formulate a recommendation to award or decline the proposal. After programmatic approval has been obtained, the proposals recommended for funding will be forwarded to either the Division of Grants and Agreements or the USDA/CSREES Office of Extramural Programs (OEP) for review of business, financial, and policy implications and the processing and issuance of a grant or other agreement. Proposers are cautioned that only an NSF Grants and Agreements Officer or an OEP Authorized Departmental Officer may make commitments, obligations, awards or authorize the expenditure of funds on behalf of either NSF or USDA. No commitment on the part of either NSF or USDA should be inferred from technical or budgetary discussions with a NSF or USDA Program Director. 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 or the USDA Authorized Departmental Officer, does so at their own risk.

For both awarded and declined proposals, verbatim copies of all written reviews and the panel summary, excluding the names of the reviewers, are sent to the Principal Investigator/Project Director by the Program Director. In addition, the proposer will receive an explanation of the decision to award or decline funding. NSF and USDA are striving to be able to tell applicants whether their proposals have been declined or recommended for funding within six months. The time interval begins on the date of receipt. The interval ends when the Division Director accepts the Program Officer's recommendation.

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.

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 Director. In addition, the proposer will receive an explanation of the decision to award or decline funding.

NSF is striving to be able to tell proposers whether their proposals have been declined or recommended for funding within six months. The time interval begins on the closing date of an announcement/solicitation, or the date of proposal receipt, whichever is later. The interval ends when the Division Director accepts the Program Officer's recommendation.

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

## VII. AWARD ADMINISTRATION INFORMATION

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### A. Notification of the Award

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Notification of the award is made to *the submitting organization* by a Grants Officer in the Division of Grants and Agreements. Organizations whose proposals are declined will be advised as promptly as possible by the cognizant NSF Program Division 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.A. for additional information on the review process.)

### B. Award Conditions

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An NSF award consists of: (1) the award letter, which includes any special provisions applicable to the award and any numbered amendments thereto; (2) the budget, which indicates the amounts, by categories of expense, on which NSF has based its support (or otherwise communicates any specific approvals or disapprovals of proposed expenditures); (3) the proposal referenced in the award letter; (4) the applicable award conditions, such as Grant General Conditions (NSF-GC-1); \* or Federal Demonstration Partnership (FDP) Terms and Conditions \* and (5) any announcement or other NSF issuance that may be incorporated by reference in the award letter. Cooperative agreement awards also are administered in accordance with NSF Cooperative Agreement Terms and Conditions (CA-1). Electronic mail notification is the preferred way to transmit NSF awards to organizations that have electronic mail capabilities and have requested such notification from the Division of Grants and Agreements.

\*These documents may be accessed electronically on NSF's Website at [http://www.nsf.gov/home/grants/grants\\_gac.htm](http://www.nsf.gov/home/grants/grants_gac.htm). Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from [pubs@nsf.gov](mailto:pubs@nsf.gov).

More comprehensive information on NSF Award Conditions is contained in the NSF *Grant Policy Manual* (GPM) Chapter II, available electronically on the NSF Website at <http://www.nsf.gov/cgi-bin/getpub?gpm>. The GPM is also for sale through the Superintendent of Documents, Government Printing Office (GPO), Washington, DC 20402. The telephone number at GPO for subscription information is (202) 512-1800. The GPM may be ordered through the GPO Website at <http://www.gpo.gov>.

### **Special Award Conditions:**

#### **CSREES Awards**

Within the limit of funds available for such purpose, the awarding CSREES official shall make grants to those responsible, eligible applicants whose applications are judged most meritorious under the procedures set forth in this program solicitation. All funds granted by CSREES under this solicitation shall be expended solely for the purpose for which the funds are granted in accordance with the approved application and budget, the regulations, the terms and conditions of the award, the applicable Federal cost principles, and the assistance regulations of the USDA (parts 3015 and 3019 of 7 CFR).

Specific management information relating to an applicant shall be submitted on a one-time basis as part of the responsibility

determination prior to the award of a grant identified under this solicitation, if such information has not been provided previously under this or another CSREES program. CSREES will provide copies of forms recommended for use in fulfilling these requirements as part of the preaward process. Although an applicant may be eligible based on its status as one of these entities, there are factors which may exclude an applicant from receiving Federal financial and nonfinancial assistance and benefits under this program (e.g., debarment or suspension of an individual involved or a determination that an applicant is not responsible based on submitted organizational management information).

A CSREES award document shall include at a minimum the following:

- (1) Legal name and address of performing organization or institution to whom the CSREES Administrator has awarded a grant under the terms of this solicitation;
- (2) Title of project;
- (3) Name(s) and institution(s) of Principal Investigators chosen to direct and control approved activities;
- (4) Identifying grant number assigned by CSREES;
- (5) Project period, specifying the amount of time CSREES intends to support the project without requiring recompetition for funds;
- (6) Total amount of CSREES financial assistance approved by the CSREES Administrator during the project period;
- (7) Legal authority(ies) under which the grant is awarded;
- (8) Appropriate Catalog of Federal Domestic Assistance (CFDA) number;
- (9) Applicable award terms and conditions (see <http://www.csrees.usda.gov/business/awards/awardterms.html>. for CSREES award terms and conditions);
- (10) Approved budget plan for categorizing allocable project funds to accomplish the stated purpose of the grant award; and
- (11) Other information or provisions deemed necessary by CSREES to carry out its respective granting activities or to accomplish the purpose of a particular grant.

### C. Reporting Requirements

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For all multi-year grants (including both standard and continuing grants), the PI must submit an annual project report to the cognizant Program Officer at least 90 days before the end of the current budget period.

Within 90 days after the expiration of an award, the PI also is required to submit a final project report. Failure to provide final technical reports delays NSF review and processing of pending proposals for the PI and all Co-PIs. PIs should examine the formats of the required reports in advance to assure availability of required data.

For NSF awards, PIs are required to use NSF's electronic project reporting system, available through FastLane, for preparation and submission of annual and final project reports. This system permits electronic submission and updating of project reports, including information on project participants (individual and organizational), activities and findings, 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.



CSREES grantees are required to submit annual and summary evaluation reports via the CSREES Current Research Information System (CRIS). CRIS is an electronic, Web-based inventory system that facilitates both grantee submissions of project outcomes and public access to information on Federally-funded projects. Specific technical reporting requirements will be provided to CSREES grantees at the time of award.

## VIII. CONTACTS FOR ADDITIONAL INFORMATION

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General inquiries regarding this program should be made to:

- Christina K. Kennedy, Program Director, Directorate for Biological Sciences, Division of Molecular & Cellular Biosciences, 655 S, telephone: (703) 292-7582, fax: (703) 292-9061, email: [ckennedy@nsf.gov](mailto:ckennedy@nsf.gov)
- Robert S. Coyne, Program Director, Directorate for Biological Sciences, Division of Molecular & Cellular Biosciences, 655 S, telephone: (703) 292-8171, fax: (703) 292-9061, email: [rcoyne@nsf.gov](mailto:rcoyne@nsf.gov)
- Patrick P. Dennis, Program Director, Directorate for Biological Sciences, Division of Molecular & Cellular Biosciences, 655 S, telephone: (703) 292-7145, fax: (703) 292-9061, email: [pdennis@nsf.gov](mailto:pdennis@nsf.gov)
- Matthew D. Kane, Program Director, Directorate for Biological Sciences, Division of Molecular & Cellular Biosciences, 655 S, telephone: (703) 292-7186, fax: (703) 292-9061, email: [mkane@nsf.gov](mailto:mkane@nsf.gov)
- Ann Lichens-Park, National Program Leader, CSREES, U.S. Department of Agriculture, STOP 2241, 1400 Independence Avenue, S.W., CSREES, Washington, DC, 20250-2241, telephone: (202) 401-6466, fax: (202) 401-6488, email: [apark@csrees.usda.gov](mailto:apark@csrees.usda.gov)
- Daniel Jones, National Program Leader, CSREES, U.S. Department of Agriculture, STOP 2220, 1400 Independence Avenue, S.W., CSREES, Washington, DC, 20250-2241, telephone: (202) 401-6854, email: [djones@csrees.usda.gov](mailto:djones@csrees.usda.gov)

For programmatic questions dealing with relevance of the proposed sequencing activity to the program, contact any of the six individuals above. Questions dealing with proposal preparation should be directed to Drs. Kennedy, Coyne, Dennis or Kane.

For questions related to the use of FastLane, contact:

- Una Alford-Solomon, Program Technology Analyst, Division of Molecular & Cellular Biosciences, NSF, telephone: (703) 292-8440, email: [biofl@nsf.gov](mailto:biofl@nsf.gov)

## IX. OTHER PROGRAMS OF INTEREST

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The NSF *Guide to Programs* is a compilation of funding for research and education in science, mathematics, and engineering. The NSF *Guide to Programs* is available electronically at <http://www.nsf.gov/cgi-bin/getpub?gp>. General descriptions of NSF programs, research areas, and eligibility information for proposal submission are provided in each chapter.

Many NSF programs offer announcements or solicitations concerning specific proposal requirements. To obtain additional information about these requirements, contact the appropriate NSF program offices. Any changes in NSF's fiscal year programs occurring after press time for the *Guide to Programs* will be announced in the NSF *E-Bulletin*, which is updated daily on the NSF Website at <http://www.nsf.gov/home/ebulletin>, and in individual program announcements/solicitations. Subscribers can also sign up for NSF's *Custom News Service* (<http://www.nsf.gov/home/cns/start.htm>) to be notified of new funding opportunities that become available.

CSREES supports a wide variety of agricultural research and educational programs. Further information concerning funding



opportunities may be obtained on the CSREES web site at <http://www.csrees.usda.gov/fo/funding.cfm>.

## ABOUT THE NATIONAL SCIENCE FOUNDATION

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The National Science Foundation (NSF) funds research and education in most fields of science and engineering. Awardees are wholly responsible for conducting their project activities and preparing the results for publication. Thus, the Foundation does not assume responsibility for such findings or their interpretation.

NSF welcomes proposals from all qualified scientists, engineers and educators. The Foundation strongly encourages women, minorities and persons with disabilities to compete fully in its programs. In accordance with Federal statutes, regulations and NSF policies, no person on grounds of race, color, age, sex, national origin or disability shall be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving financial assistance from NSF, although some programs may have special requirements that limit eligibility.

*Facilitation Awards for Scientists and Engineers with Disabilities* (FASSED) provide funding for special assistance or equipment to enable persons with disabilities (investigators and other staff, including student research assistants) to work on NSF-supported projects. See the GPG Chapter II, Section D.2 for instructions regarding preparation of these types of proposals.

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

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

- **Location:** 4201 Wilson Blvd. Arlington, VA 22230
  
- **For General Information** (NSF Information Center): (703) 292-5111
  
- **TDD (for the hearing-impaired):** (703) 292-5090
  
- **To Order Publications or Forms:**  
  
Send an e-mail to: [pubs@nsf.gov](mailto:pubs@nsf.gov)  
  
or telephone: (703) 292-7827
  
- **To Locate NSF Employees:** (703) 292-5111

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; 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 applicant 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 needing information as part of the review process or in order to coordinate programs; 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," 63 Federal Register 267 (January 5, 1998), and NSF-51, "Reviewer/Proposal File and Associated Records," 63 Federal Register 268 (January 5, 1998). 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 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 this burden estimate and any other aspect of this collection of information, including suggestions for reducing this burden, to: Suzanne Plimpton, Reports Clearance Officer, Division of Administrative Services, National Science Foundation, Arlington, VA 22230.

OMB control number: 3145-0058.

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