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Interagency Announcement of Opportunities in Metabolic Engineering

NSF-02-037

DIRECTORATE FOR BIOLOGICAL SCIENCES
DIVISION OF INTEGRATIVE BIOLOGY AND NEUROSCIENCES
DIVISION OF MOLECULAR AND CELLULAR BIOSCIENCES
DIRECTORATE FOR ENGINEERING
DIVISION OF BIOENGINEERING AND ENVIRONMENTAL SYSTEMS

FULL PROPOSAL DEADLINE: March 20, 2002

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SUMMARY OF PROGRAM REQUIREMENTS

GENERAL INFORMATION

Program Title: Interagency Announcement of Opportunities in Metabolic Engineering

Synopsis of Program: This Announcement describes a collaborative effort among the Department of Agriculture, Department of Commerce, Department of Defense, Department of Energy, Environmental Protection Agency, National Aeronautics and Space Administration, National Institute of General Medical Sciences (National Institutes of Health), and the National Science Foundation. The intent of this Inter-Agency Announcement is to provide an opportunity for an Inter-Agency research activity in the area of Metabolic Engineering (ME). The eight participating Agencies or Departments are to make available up to $6M from current research funding (including agency in-kind support ie, equipment, laboratory space, personnel time, materials, etc.) in support of this Announcement. This is the fourth competition in an anticipated total of five competitions.

Cognizant Program Officer(s):

- Fred Heineken, Program Director, Biochemical Engineering/Biotechnology, Bioengineering and Environmental Systems Division, Room 565, telephone: (703) 292-8320, e-mail: fheineke@nsf.gov.

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

- 47.074 --- Biological Sciences
- 47.041 --- Engineering

ELIGIBILITY INFORMATION

- **Organization Limit:** None
- **PI Eligibility Limit:** None
- **Limit on Number of Proposals:** None

AWARD INFORMATION

- **Anticipated Type of Award:** Standard or Continuing Grant
- **Estimated Number of Awards:** 10

- **Anticipated Funding Amount:** The total estimated amount of funding (including agency in-kind contributions) available for Inter-Agency ME support is up to $6M (up to $2M of FY 2002 NSF support), subject to the availability of funds.

PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

- **Full Proposals:** Supplemental Preparation Guidelines
    - The announcement contains supplements to the standard Grant Proposal Guide (GPG) proposal preparation guidelines. Please see the full announcement for further information.

B. Budgetary Information

- **Cost Sharing Requirements:** Cost Sharing is not required.
- **Indirect Cost (F&A) Limitations:** Participating Agencies may have Indirect Cost Limitations
- **Other Budgetary Limitations:** Other budgetary limitations apply. Please see the full announcement for further information.

C. Deadline/Target Dates

- **Letters of Intent (*optional*):** None
- **Preliminary Proposals (*optional*):** None
- **Full Proposal Deadline Date:** March 20, 2002

D. FastLane Requirements

- **FastLane Submission:** Required
- **FastLane Contact(s):**
    - Marcia A. Rawlings, Program Assistant, Bioengineering and Environmental Systems Division, Room 565, telephone: (703) 292-7956, e-mail: mrawling@nsf.gov.

PROPOSAL REVIEW INFORMATION

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

AWARD ADMINISTRATION INFORMATION

- **Award Conditions:** Additional award conditions apply. Please see the announcement for further information.

- **Reporting Requirements:** Additional reporting requirements apply. Please see the full announcement for further information.

I. INTRODUCTION

This Announcement describes a collaborative effort among the Department of Agriculture, Department of Commerce, Department of Defense, Department of Energy, Environmental Protection Agency, National Aeronautics and Space Administration, National Institute of General Medical Sciences (National Institutes of Health), and the National Science Foundation. The intent of this Inter-Agency Announcement is to:

1. Provide an opportunity for an Inter-Agency granting activity in the area of Metabolic Engineering (ME). Eight Agencies or Departments are to make available up to $6M from current research funding (including agency in-kind support ie, equipment, laboratory space, personnel time, materials, etc.) in support of this Announcement. This is the fourth competition in an anticipated total of five competitions.

2. Draw attention to Federal Research and Development (R&D) interests and opportunities in Metabolic Engineering. The Federal R&D effort is coordinated through the Metabolic Engineering Working Group (MEWG).

In July 1995, the Biotechnology Research Subcommittee (BRS), an Inter-Agency Coordinating Committee under the Office of Science and Technology Policy (OSTP), released the report "Biotechnology for the 21st Century: New Horizons" that identifies research priorities and opportunities in biotechnology. One of the research priorities included the need for a better understanding of metabolic pathways and metabolic engineering in living systems. To stimulate increased awareness and attention to this field, the Subcommittee on Biotechnology established MEWG. Amongst its various activities, MEWG has held three grant competitions (NSF 98-49, NSF 99-85, and NSF 01-19). The first competition resulted in 19 Proposals with five Awards totalling $3.6M, and the second competition resulted in 29 Proposals with six Awards totalling $3.1M. Awards for the third competition are still being made. It is currently estimated that a total of between 11 to 13 Awards will be made from 33 Proposals with total funding in excess of $6M.

Participating Agencies have varied research interests in Metabolic Engineering. Information on Agency interests can be obtained at:

http://www.epa.gov/opptintr/metabolic/index.htm

II. PROGRAM DESCRIPTION

In order to continue to support a coordinated effort of Federal Metabolic Engineering R&D interests, MEWG is calling for research proposals in ME.

For purposes of this Announcement, Metabolic Engineering (ME) is defined as follows: An approach to the understanding and utilization of metabolic processes. As the name implies, ME is the targeted and purposeful alteration of metabolic pathways found in an organism in order to better understand and utilize cellular pathways for chemical transformation, energy transduction,

and supramolecular assembly. ME typically involves the redirection of cellular activities by the rearrangement of the enzymatic, transport, and regulatory functions of the cell through the use of recombinant DNA and other techniques. Much of this effort has focussed on microbial organisms, but important work is being done in cell cultures derived from plants, insects, and animals. Since the success of ME hinges on the ability to change host metabolism, its continued development will depend critically on a far more sophisticated knowledge of metabolism than currently exists. This knowledge includes conceptual and technical approaches necessary to understand the integration and control of genetic, catalytic, and transport processes. While this knowledge will be valuable as fundamental research, per se, it will also provide the underpinning for many applications of immediate value.

Topic Descriptions

Proposals are invited that address enabling technologies useful for the study of metabolic processes and metabolic engineering. Three areas are of particular interest:

- Instrumentation, sensors, new analytical tools, and new experimental methods which facilitate the study of metabolic pathways, especially those technologies that allow the examination of individual cells.

- Quantitative and conceptual models integrated with experimental studies that better characterize the regulation and integration of complex, interacting metabolic pathways.

- The use of bioinformatics to deduce the structure, function, and regulation of major metabolic pathways.

This listing is not meant to be all-inclusive, and other areas of research which could contribute to an expanded understanding of metabolic processes and/or a substantial broadening of their utilization would be welcomed.

III. ELIGIBILITY INFORMATION

The categories of proposers identified in the Grant Proposal Guide (GPG), NSF 02-2, are eligible to submit proposals under this Announcement. This includes Academic and Non-Profit Institutions, Industrial Organizations, and Government (Federal, State, and Local) Laboratories. **Before submitting a Proposal, investigators are strongly encouraged to discuss their idea for a Proposal with a member(s) of the MEWG (see Agency Contacts listed in this Announcement).** Proposals that are responsive to this Announcement and are of interest to two or more participating Agencies will be sent to the Inter-Agency review Panel. For a proposal of interest to only one Agency, the Principal Investigator (PI) may be asked by that Agency to submit the proposal through that Agency's normal submission process.

For those Proposals of interest to two or more participating agencies, MEWG has agreed that the NSF format and review criteria are to be used as described in the NSF Grant Proposal Guide (GPG) NSF 02-2. PIs are strongly advised to pay attention to the application intructions described in the GPG, particularly those that refer to page limitations. On the NSF Cover Sheet,

please be sure to indicate that the Proposal is responding to the NSF Announcement (NSF 02-037). NSF will be sending out Proposals for mail review, and NSF review criteria and forms will be used. A multi-disciplinary Panel will be reviewing these Proposals, and is scheduled to meet in the Spring of 2002. Based on the Mail and Panel Reviews, each participating Agency will then decide which of the Proposals they wish to support.

AGENCY CONTACTS

Additional information may be obtained by contacting:

Department of Agriculture (USDA)

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IV. AWARD INFORMATION

The total estimated amount of funding (including agency in-kind contributions ie, equipment, laboratory space, personnel time, materials, etc.) available for Inter-Agency ME support is up to $6M (up to $2M of FY 2002 NSF support). However, Agencies have no obligation to provide this amount of support if the quality of the proposals received does not justify such an expenditure, and/or sufficient funds or Agency in-kind support are not available.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Full Proposal:

Proposals submitted in response to this announcement 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 Web Site at: http://www.nsf.gov/cgi-bin/getpub?gpg. Paper copies of the GPG may be obtained from the NSF Publications Clearinghouse, telephone (301) 947-2722 or by e-mail from pubs@nsf.gov.

Proposers are requested to indicate in the Proposal Summary which of the Participating Agencies or Departments have expressed an interest in their Proposal.

Proposers are reminded to identify the program solicitation number (NSF-02-037) in the program announcement/solicitation block on the proposal Cover Sheet (NSF Form 1207). Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.

B. Budgetary Information

Cost sharing is not required in proposals submitted under this Announcement.

Indirect Cost (F&A) Limitations: Participating Agencies may have Indirect Cost Limitations

Other Budgetary Limitations: Funding up to $550K (total costs for the entire duration of a

project, ie. direct and indirect costs , and/or in-kind support) for single investigator proposals, and up to $1M for multiple investigator proposals, will be considered. A typical project duration is up to three years.

C. Deadline/Target Dates

Proposals must be submitted by the following date:

Full Proposals *by 5:00 PM local time*: March 20, 2002

D. FastLane Requirements

Proposers are required to prepare and submit all proposals for this Announcement through the FastLane system. Detailed instructions for proposal preparation and submission via FastLane are available at: http://www.fastlane.nsf.gov/a1/newstan.htm. For FastLane user support, call 1-800-673-6188 or e-mail fastlane@nsf.gov.

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 certifications within five working days following the electronic submission of the proposal. Further instructions regarding this process are available on the FastLane website at: http://www.fastlane.nsf.gov.

VI. PROPOSAL REVIEW INFORMATION

A. NSF Proposal Review Process

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.

Proposals will be reviewed against the following general review criteria established by the National Science Board. Following each criterion are potential considerations that the reviewer may employ in the evaluation. These are suggestions and not all will apply to any given proposal. Proposers are reminded that both the intellectual merit and the broader impacts of the work to be accomplished should be addressed. While reviewers are expected to address both merit review criteria, each reviewer will be asked to address only considerations that are relevant to the proposal and for which he/she is qualified to make judgements.

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

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

For those proposals where NSF has expressed an interest, Principal Investigators should address the following elements in their proposal to provide reviewers with the information necessary to respond fully to both of the above-described NSF merit review criteria. NSF staff will give these elements careful consideration 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
For all proposals reviewed, a summary rating and accompanying narrative will be completed and signed by each reviewer. In all cases, reviews are treated as confidential documents. The Panel will also give each proposal a numerical score reflecting its relative scientific merit. If an Award, under this competition, is made by a participating Agency other than NSF, that Agency may disclose the entire composition of the Review Panel without revealing individual reviewers of a Proposal. 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.

B. Review Protocol and Associated Customer Service Standard

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 in response to this announcement will be reviewed by Mail Review followed by Panel Review.

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

NSF will be able to tell applicants whether their poposals have been declined, recommended, or recommended for further consideration by another Agency within six months for 70 percent of proposals. The time interval begins on the proposal deadline or target date or from the date of receipt, if deadlines or target dates are not used by the program. 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 NSF 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 dos so at its own risk.

VII. AWARD ADMINISTRATION INFORMATION

A. Notification of the Award

Notification of an NSF award is made to *the submitting organization* by a Grants Officer in the Division of Grants and Agreements. Organizations whose proposals are declined will be advised as promptly as possible by the cognizant NSF Program 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

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 Web site at http://www.nsf.gov/home/grants/grants_gac.htm. Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (301) 947-2722 or by e-mail from 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 Web site 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 Web site at http://www.gpo.gov.

Special Award Conditions
If an Award, under this competition, is made by a participating Agency other than NSF, the conditions of that Award will be made available prior to the Award.

C. Reporting Requirements

For all multi-year NSF 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.

For Awards from participating Agencies other than NSF, reporting requirements will be provided before the Award is activated.

Within 90 days after the expiration of an NSF award, the PI also is required to submit a final project report. Approximately 30 days before expiration, NSF will send a notice to remind the PI of the requirement to file the final project report. Failure to provide final technical reports delays NSF review and processing of pending proposals for that PI. PIs should examine the formats of the required reports in advance to assure availability of required data.

NSF has implemented an electronic project reporting system, available through FastLane. 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.

VIII. CONTACTS FOR ADDITIONAL INFORMATION

General inquiries regarding Interagency Announcement of Opportunities in Metabolic Engineering should be made to:

- Fred Heineken, Program Director, Biochemical Engineering/Biotechnology, Bioengineering and Environmental Systems Division, Room 565, telephone: (703) 292-8320, e-mail: fheineke@nsf.gov.

For questions related to the use of FastLane, contact:

- Marcia A. Rawlings, Program Assistant, Bioengineering and Environmental Systems Division, Room 565, telephone: (703) 292-7956, e-mail: mrawling@nsf.gov.

IX. OTHER PROGRAMS OF INTEREST

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 web site 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.

ABOUT THE NATIONAL SCIENCE FOUNDATION

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 (unless otherwise specified in the eligibility requirements for a particular program).

Facilitation Awards for Scientists and Engineers with Disabilities (FASED) 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 program announcement/solicitation for further information.

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, FIRS at 1-800-877-8339.

The National Science Foundation is committed to making all of the information we publish easy to understand. If you have a suggestion about how to improve the clarity of this document or other NSF-published materials, please contact us at plainlanguage@nsf.gov.

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; 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.

Pursuant to 5 CFR 1320.5(b), 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, Information Dissemination Branch, Division of Administrative Services, National Science Foundation, Arlington, VA 22230, or to Office of Information and Regulatory Affairs of OMB, Attention: Desk Officer for National Science Foundation (3145-0058), 725 17th Street, N.W. Room 10235, Washington, D.C. 20503.

OMB control number: 3145-0058.