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Biophotonics Partnership Initiative III (BPIII)

Biophotonics III

Program Solicitation

NSF-02-012

DIRECTORATE FOR ENGINEERING

FULL PROPOSAL DEADLINE(S): February 25, 2002

NATIONAL SCIENCE FOUNDATION

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SUMMARY OF PROGRAM REQUIREMENTS

GENERAL INFORMATION

Program Title: Biophotonics Partnership Initiative III (BPIII)

Synopsis of Program:

The Division of Bioengineering and Environmental Systems (BES) of the National Science Foundation (NSF) announces the third in a series of Biophotonics Partnership initiatives seeking high risk/high return, multidisciplinary studies of novel concepts in biophotonics. Incremental advances of existing technologies will not be considered. NIH and DARPA will participate in the reviews and identify proposals of mutual interest and may provide co-funding for programs of high quality that meet their programatic and relevancy requirements. The reviews and panels will be run by NSF utilizing the NSF merit review process. All awards will be made by NSF and will be subject to NSF terms and conditions.

Cognizant Program Officer(s):

- Leon Esterowitz, Biomedical Engineering, Program Director, Engineering, BES, Room 565, telephone: 703-292-7942, e-mail: lesterow@nsf.gov.
- Carol Lucas, Biomedical Engineering, Program Director, Engineering, BES, Room 565, telephone: 703-292-7942, e-mail: clucas@nsf.gov.
- Fil Bartoli, Photonics and Device Technologies, Program Director, Program Director, ECS, Room 675, telephone: 703-292-5388, e-mail: fbartoli@nsf.gov.
- Alan Rudolph, Program Manager, DARPA/DSO, telephone: 703-696-2240, e-mail: arudolph@darpa.mil.
- Greg Farber, NIH/NCRR, telephone: 301-435-0778, e-mail: farberg@ncrr.nih.gov.
- Michael Marron, Assoc. Dir. for Biomed. Tech., NIH/NCRR, telephone: 301-435-0766, e-mail: marronm@ncrr.nih.gov.
- Larry Clarke, Imaging Tech., Branch Chief, NIH/NCI/EPN/800, telephone: 301-435-9190, e-mail: lclarke@mail.nih.gov.
- Houston Baker, Imaging Tech., NIH/NCI/EPN/800, telephone: 301-594-9117, e-mail: bakerhou@mail.nih.gov.

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

- 47.041 --- Engineering

ELIGIBILITY INFORMATION

- **Organization Limit:** Proposals may be submitted by U.S. academic institutions and nonprofit research institutions in support of individual investigators or small groups. Synergistic collaboration among researchers and collaboration or partnerships with industry or government laboratories is encouraged when appropriate; however, NSF awards will be made to U.S. academic institutions and nonprofit research institutions. Group and collaborative proposals involving more than one institution must be submitted as a single administrative package from one of the institutions involved.

- **PI Eligibility Limit:** Only one proposal may be submitted by a Principal Investigator. However, a Principal Investigator for one proposal may be a co-Principal Investigator on one other proposal. Due to the limited availability of funds, prospective applicants are strongly urged to contact one of the program officers listed at the end of this document for guidance.

- **Limit on Number of Proposals:** None

AWARD INFORMATION

- **Anticipated Type of Award:** Standard or Continuing Grant

- **Estimated Number of Awards:** 8

- **Anticipated Funding Amount:** $3 million, subject to the availability of FY 2002 funds

PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

- **Full Proposals:** Supplemental Preparation Guidelines

    - The program announcement/solicitation contains supplements to the standard Grant Proposal Guide (GPG) proposal preparation guidelines. Please see the full program announcement/solicitation for further information.

B. Budgetary Information

- **Cost Sharing Requirements:** Cost Sharing is not required.

- **Indirect Cost (F&A) Limitations:** Not Applicable.

- **Other Budgetary Limitations:** Other budgetary limitations apply. Please see the full program announcement/solicitation for further information.

C. Deadline/Target Dates

- **Letters of Intent (*optional*):** None
- **Preliminary Proposals (*optional*):** None
- **Full Proposal Deadline Date(s):** February 25, 2002

D. FastLane Requirements

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

PROPOSAL REVIEW INFORMATION

- **Merit Review Criteria:** National Science Board approved criteria apply.

AWARD ADMINISTRATION INFORMATION

- **Award Conditions:** Standard NSF award conditions apply.
- **Reporting Requirements:** Standard NSF reporting requirements apply.

I. INTRODUCTION

Photonics is the technology of generating and harnessing light and other forms of radiant energy whose quantum unit is the photon. The unparalleled combination of spatial resolution, sensitivity, and spectral specificity of optical techniques has provided new biomedical research tools for visualization, measurement, analysis, and manipulation. Photonic techniques are under investigation for noninvasive diagnostic and monitoring applications such as early detection of breast cancer and glucose monitoring for people with diabetes. In 1998 the National Research Council published a report on "Optical Science and Engineering for the 21st Century". The members of the committee responsible for the report were chosen for their expertise by the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine. In their Summary and Recommendations they state that "NSF should increase its efforts in biomedical optics and pursue opportunities in this area aggressively." Innovative basic research in biomedical photonics that is very fundamental in the science and engineering is needed to lay the foundation for new technologies beyond those that are mature and ready for application in medical diagnostics and therapies.

The intent of this initiative is to continue exploitation of the power of photonics to advance biomedical engineering. Developing noninvasive, molecularly specific sensing, imaging, monitoring, and therapeutic systems with high optical sensitivity, and resolution would be an enormous accomplishment with powerful applications to both biology and medicine. Low cost diagnostics will require novel integration of photonics, molecular biology and material science. Complex biosensors capable of detecting and discriminating among large classes of biomolecules could be important not only to biology and medicine but also to environmental sensing. These advances will require multidisciplinary integration of optical technologies with molecular biology in novel engineered systems.

II. PROGRAM DESCRIPTION

This initiative will continue to emphasize multidisciplinary, exploratory studies of novel concepts in biomedical photonics for diagnostics and therapeutics with emphasis on, but not limited to, the topical areas given below. These technologies could be used for minimally invasive optical imaging, monitoring, and sensing of complex systems such as tissues at the cellular level and cells at the subcellular level. Areas that will not be considered for this initiative include a) incremental advances of existing technologies; b) photon migration; c) two-photon and multi-photon imaging and spectroscopy; d) terahertz technology; e) fiber delivery systems and imaging catheters; and f) optical coherence tomography (OCT), unless coupled with novel enabling technologies.

BIOPHOTONIC TOPICAL AREAS

* The development of new classes of photonic probes, contrast agents, and reporters to label structures and push the envelope of optical sensing to the limits of detection, resolution, and identification

* New optical approaches for non-invasive diagnosis, localization, and treatment of small tumors (i.e. either entirely new methods or major removal of limitations within existing technology)

* Development of biocompatible detection technologies that could serve as massively parallel interfaces for communicating with cells and tissue such as neural tissue

* Novel methods for "endoscopic" optical imaging at the subcellular level

* Noninvasive optical sensing techniques to detect key physiological and molecular concentrations in-vivo for anemia, jaundice, dehydration, glucose levels, drug levels, etc.

* Innovative methods for fluorescent labeling of macromolecules, use of enzyme-activated fluorophores, new compositions of matter/methods of fabrication of multi-color probes for in-vivo diagnostics such as marking and detection of tumors

* Innovative miniaturized optical surgical tools, devices, and systems

* Functional molecular imaging and cellular chemical imaging

III. ELIGIBILITY INFORMATION

Proposals may be submitted by U.S. academic institutions and nonprofit research institutions in support of individual investigators or small groups. Synergistic collaboration among researchers and collaboration or partnerships with industry or government laboratories is encouraged when appropriate; however, NSF awards will be made to U.S. academic institutions and nonprofit research institutions.
Only one proposal may be submitted by a Principal Investigator. However, a Principal Investigator for one proposal may be a co-Principal Investigator on one other proposal. Group and collaborative proposals involving more than one institution must be submitted as a single administrative package from one of the institutions involved. Due to the limited availability of funds, prospective applicants are strongly urged to contact one of the program officers listed at the end of this document for guidance.

IV. AWARD INFORMATION

Estimated program budget ($3 million), number of awards (8) and average award size/duration are subject to the availability of funds.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Full Proposal:

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 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.

The applicants are asked to submit two PowerPoint slides that succinctly summarize their proposal. This is not a hard requirement and will not impact the proposal rating, but these slides will be used in the panel review process and should improve the evaluation process. The PowerPoint slides must be e-mailed to Leon Esterowitz at lesterow@nsf.gov.

Proposers are reminded to identify the program solicitation number (NSF-02-012) 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 Program Solicitation.

Other Budgetary Limitations:

Total award amounts (including indirect costs) for a single investigator should not exceed $300,000 for 3 years (i.e. about $100,000 per year). Total award amount (including indirect costs) for small multi-disciplinary groups (two or more principal investigators) should not exceed $500,000 for three years (i.e. about $166,000 per year). Applicants for small group awards should contact the Program Director prior to proposal submission for clarification of appropriateness of the contemplated group proposal. The total anticipated funding amount for FY2002 is $3 million, subject to the availability of funds.

C. Deadline/Target Dates

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

Full Proposals *by 5:00 PM local time*: February 25, 2002

D. FastLane Requirements

Proposers are required to prepare and submit all proposals for this Program Solicitation 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?

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.

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.

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/solicitation will be reviewed 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 is striving to be able to tell applicants whether their proposals have been declined or recommended for funding within six months for 70 percent of proposals. The time interval begins on the date of receipt. 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 its 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 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.

C. Reporting Requirements

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. 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 Biophotonics Partnership Initiative III should be made to:

- Leon Esterowitz, Biomedical Engineering, Program Director, Engineering, BES, Room 565, telephone: 703-292-7942, e-mail: lesterow@nsf.gov.
- Carol Lucas, Biomedical Engineering, Program Director, Engineering, BES, Room 565, telephone: 703-292-7942, e-mail: clucas@nsf.gov.
- Fil Bartoli, Photonics and Device Technologies, Program Director, Program Director, ECS, Room 675, telephone: 703-292-5388, e-mail: fbartoli@nsf.gov.
- Alan Rudolph, Program Manager, DARPA/DSO, telephone: 703-696-2240, e-mail: arudolph@darpa.mil.
- Greg Farber, NIH/NCRR, telephone: 301-435-0778, e-mail: farberg@ncrr.nih.gov.
- Michael Marron, Assoc. Dir. for Biomed. Tech., NIH/NCRR, telephone: 301-435-0766, e-mail: marronm@ncrr.nih.gov.
- Larry Clarke, Imaging Tech., Branch Chief, NIH/NCI/EPN/800, telephone: 301-435-9190, e-mail: lclarke@mail.nih.gov.
- Houston Baker, Imaging Tech., NIH/NCI/EPN/800, telephone: 301-594-9117, e-mail: bakerhou@mail.nih.gov.

For questions related to the use of FastLane, contact:

- Marcia Rawlings, Program Assistant, Engineering (ENG), Bioengineering and Environmental Systems (BES), 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.

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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, 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.

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