

Ecology of Infectious Diseases (EID)

PROGRAM SOLICITATION

NSF 08-601

REPLACES DOCUMENT(S):

NSF 07-513



National Science Foundation

Directorate for Biological Sciences

Directorate for Geosciences

Directorate for Social, Behavioral & Economic Sciences



National Institutes of Health

John E. Fogarty International Center



U.K. Economic and Social Research Council

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

December 10, 2008

Second Wednesday in December, Annually Thereafter

REVISION NOTES

This revision adds a request for collaborative projects between U.S. scientists and social scientists in the U.K. through a joint effort of the U.S. National Science Foundation, the U.S. National Institutes of Health, and the U.K. Economic and Social Research Council. See details in the program announcement in the sections titled "US-UK Collaborative Projects."

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Ecology of Infectious Diseases (EID)

Synopsis of Program:

The Ecology of Infectious Diseases program solicitation supports the development of predictive models and the discovery of principles governing the transmission dynamics of infectious disease agents. To that end, research proposals should focus on understanding the ecological and socio-ecological determinants of transmission by vectors or abiotic agents, the population dynamics of reservoir species, the transmission to humans or other hosts, or the cultural, social, behavioral, and economic dimensions of disease communication. Research may be on zoonotic, vector-borne or enteric diseases of either terrestrial, freshwater, or marine systems and organisms, including diseases of non-human animals and plants, at any scale from specific pathogens to inclusive environmental systems. Proposals for research on disease systems of public health concern to developing countries are strongly encouraged. Investigators are encouraged to include links to the public health research community, including for example, participation of epidemiologists, physicians, veterinarians, medical social scientists, medical entomologists, virologists, or parasitologists.

Cognizant Program Officer(s):

- N. Thompson Hobbs, Program Director/NSF, NSF, telephone: 703 292-8481, email: nhobbs@nsf.gov
- Joshua Rosenthal, Program Director, FIC/NIH, telephone: (301) 496-1653, fax: (301) 402-0779, email:

joshua_rosenthal@nih.gov

- Donald Rice, Program Director, GEO/NSF, telephone: (703) 292-7708, email: drice@nsf.gov
- Deborah Winslow, Program Director, SBE/NSF, telephone: (703) 292-7315, email: dwinslow@nsf.gov
- Joy Todd, Research Development Leader, ESRC, telephone: 44 1793-413109, email: joy.todd@esrc.ac.uk
- Erin (Liz) Lawrence, Science Assistant, telephone: (703) 292-8997, email: elawrenc@nsf.gov

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

- 47.050 --- Geosciences
- 47.074 --- Biological Sciences
- 47.075 --- Social Behavioral and Economic Sciences
- 93.989 --- John E. Fogarty International Center

Award Information

Anticipated Type of Award: Standard Grant or Continuing Grant

Estimated Number of Awards: 7

Anticipated Funding Amount: \$8,500,000 in FY 2009, pending the availability of funds. That amount includes approximately \$7.5M from NSF for new standard or continuing awards and approximately \$1.0M from NIH for new continuing awards in FY 2009. The expected funding from the ESRC for the UK component of the US-UK Collaborative Projects will be a maximum of £800,000.

Eligibility Information

Organization Limit:

None Specified

PI Limit:

U.K. researchers applying under the U.S.-U.K. Collaborative Projects heading must meet normal ESRC eligibility requirements, and must apply through an institution eligible to receive ESRC funding (http://www.esrcsocietytoday.ac.uk/ESRCInfoCentre/opportunities/research_funding/). Applications with non-eligible U.K. partners will not be considered for funding as a U.S.-U.K. Collaborative Project. Proposals including collaborations with other U.K. partners are eligible to apply to this competition outside of this special subcategory; contact one of the Program Officers if you have questions concerning such other proposals.

Limit on Number of Proposals per Organization:

None Specified

Limit on Number of Proposals per PI:

None Specified

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

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

B. Budgetary Information

- **Cost Sharing Requirements:** Cost Sharing is not required under this solicitation.
- **Indirect Cost (F&A) Limitations:** Not Applicable
- **Other Budgetary Limitations:** Not Applicable

C. Due Dates

- **Full Proposal Deadline(s)** (due by 5 p.m. proposer's local time):
 - December 10, 2008
 - Second Wednesday in December, Annually Thereafter

Proposal Review Information Criteria

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

Award Administration Information

Award Conditions: Additional award conditions apply. Please see the full text of this solicitation for further information.

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

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I. INTRODUCTION

The past decade has seen a dramatic increase in the appreciation of the need to understand the ecological and evolutionary drivers of disease emergence and transmission dynamics. However, our understanding of basic principles is still weak and translation of those principles into public health and management tools is inadequate. Research is needed to accomplish both of these broad goals.

Over the past twenty-five years, the emergence and the reemergence of numerous infectious diseases around the world have coincided with unprecedented rates of change in the structure and diversity of the environment and human social and economic systems. Nearly all of the world's terrestrial and aquatic communities and ecosystems have undergone dramatic changes due to a variety of human activities. These activities include: habitat transformation (deforestation, reforestation, agricultural intensification, fragmentation), human movement, urbanization, rapid long-distance transport, invasions of exotic species, intensification of fishing and mineral extraction, bushmeat and other wildlife trade, chemical waste contamination, and climate change. The coincidence of broad scale environmental changes, the expansion of human social and economic networks, and the emergence of infectious diseases may point to underlying predictable ecological relationships.

For example, habitat fragmentation may reduce populations of mammalian predators of animals that are natural reservoirs of disease agents, resulting in increased transmission to humans. Similarly, runoff from urban and rural sewage systems may carry pathogens that proliferate in shellfish and fish and eventually infect humans via consumption as food. The dramatic increase of logging roads in formerly inaccessible forests has increased access to non-human primates as food, accelerating the rates at which primate diseases reach human populations. Economic restructuring in developing nations has diverted funding from public health infrastructure and sanitation programs, allowing formerly controlled diseases to re-establish themselves. While a descriptive understanding of some cases exists, there is little mechanistic understanding of basic ecological and social-ecological principles that may regulate such complex systems.

The role of biological diversity, habitat structure, and climate in stabilizing communities of plants, animals and micro-organisms has received a great deal of attention from ecologists in recent years. As a result, our capacity to analyze and model biocomplexity and ecological dynamics, and to evaluate spatial and temporal aspects of environmental change has become increasingly sophisticated. However, few of these advances in ecological science have been systematically related to economic and social changes or linked to biomedical research and public health.

Similarly, we have improved our ability to define the molecular identity and dynamics of pathogens or infectious agents and their vectors, and have greatly increased our understanding of the defense systems of their hosts. We also better understand the importance of genetic systems and evolutionary dynamics of infectious diseases. These improvements have contributed significantly to our understanding of epidemiology and transmission patterns of diseases. However, the relationship of these factors to population dynamics of disease reservoirs or the biotic and structural complexity of ecological and socio-ecological systems in which transmission occurs remains a poorly understood area. For example, little is known about how interactions of multiple disease-causing agents with each other or with a common host affect transmission dynamics. In addition, although these dynamics take place in evolutionary time of the pathogens or infectious agents, insufficient attention has been given to integrating ecological, evolutionary, and socio-economic dynamics.

At present, basic and applied research in infectious disease ecology is often piecemeal. The potential benefits of an interdisciplinary research program in this area include: development of disease transmission theory, improved understanding of unintended health effects of development projects, increased capacity to forecast outbreaks, and improved understanding of how diseases (re)emerge.

An under-studied aspect of disease transmission is the importance of socio-ecological factors and processes. To foster research in this area, collaborative partnerships are encouraged between U.S. scientists and social scientists in the U.K.

This activity is a continuation of the previous joint National Science Foundation/National Institutes of Health (NSF/NIH) Ecology of Infectious Disease competition. Information on past awards can be found at [EID Awards](http://www.fic.nih.gov/programs/research_grants/ecology/index.htm) and http://www.fic.nih.gov/programs/research_grants/ecology/index.htm. A review of this program can be found at: http://www.fic.nih.gov/programs/research_grants/ecology/eid_review2005.pdf.

II. PROGRAM DESCRIPTION

The goal of the Ecology of Infectious Diseases (EID) activity is to encourage development of predictive models and discovery of general principles governing the transmission dynamics and evolution of infectious agents. To that end, research should focus on understanding the ecological and socio-ecological determinants of transmission by vectors or abiotic agents, the population and evolutionary dynamics of reservoir species, the dynamics of social and economic systems, and transmission to humans or other hosts. The most competitive proposals are those that advance broad, conceptual knowledge that reaches beyond the specific system under study and that may lead to public health, economic or management policy usage.

Funded research should aim beyond description to achieve mechanistic insights into disease dynamics. While the aim of this activity is to produce predictive or explanatory models, such models could be analytic, simulations, or statistical. Any such model, though, should provide general understanding beyond the specific system under study. In addition, for complex systems the model should serve as the central organizing principle. Models must include estimates of uncertainty and, when appropriate and possible, experiments should be designed to attain a high level of precision. Proposals should indicate how they will validate or verify any model and how the model will advance our conceptual understanding of disease dynamics. Proposals should identify which individual(s) will oversee the quantitative approaches and provide evidence of their demonstrated expertise in data collection, mathematical modeling, and/or data analysis.

A variety of topics, questions and approaches are appropriate. Research could focus on particular infectious agents, individual diseases, or groups of diseases, and might involve one or more social systems, regions, habitats, or groups of organisms. Depending on the hypotheses and research questions being addressed, investigations might entail laboratory experiments, field observations or manipulations, public health interventions, social surveys, ethnographic studies, novel analyses of existing data, theoretical investigations of ecological and evolutionary dynamics or all of the above. Multidisciplinary studies are encouraged. Field investigations that elucidate extensive temporal and/or spatial patterns from nature are among those most likely to yield important insights. Such insights are likely to be gained through integrating work among several scales of observation, including molecular, individual, population, and regional levels of analysis. Use of remote sensing, geographic information systems, and other information technologies may be useful in such efforts.

Investigations may also consider dynamic processes using model biological and bio-social systems, even in a laboratory setting. New insights gained from the study of biological interactions involving organisms (e.g., plants), ecological settings (e.g., artificial communities), or geophysical and geochemical systems other than those of ultimate concern may very well improve our understanding of complex interactions in natural ecological systems.

The primary focus should be on ecological dynamics related to the population dynamics, evolution, and transmission of pathogens. Analysis of environmental, geophysical, and social influences on the susceptibility of individuals or populations to infection by particular agents is appropriate. However, the research must include a substantial focus on the underlying ecological parameters that influence transmission, evolution, and infection. Questions involving the evolution of pathogens and hosts within an ecological, socio-economic, or geophysical context are appropriate; investigations focused simply on genetic patterns or change in disease-causing organisms or hosts without consideration of ecological dynamics are outside the scope of this activity.

Proposals may focus on terrestrial, freshwater, or marine systems and organisms. They may include diseases of humans, non-human animals, or plants. Proposals for research on disease systems of public health concern to developing countries, including potential pandemic diseases, are encouraged. Investigators are encouraged to include links to the public health research community, including epidemiologists, medical entomologists, physicians, veterinarians, medical scientists, social scientists, microbiologists, and parasitologists.

Examples of the kinds of ecological relationships that may be studied include, but are not limited to, the following:

- effects of changes in species richness on the persistence and relative abundance of pathogenic and non-pathogenic microorganisms, and their transmission to hosts,
- the role of interactions among disease-causing organisms,
- identification and evaluation of habitats favorable to the emergence of new infections,
- identification and evaluation of social and economic systems favorable to disease (re)emergence,
- influences of global climate change and associated extreme events on transmission or risk of disease,
- impacts of local or regional geology and geochemistry on transmission or risk of disease,
- impact of chemical or physical pollutants on abundance of pathogens and rates of transmission,
- consequences of newly introduced species on competitive interactions among hosts,
- impact of deforestation or other landscape transformations on human population density and the incidence of zoonotic and vector-borne disease,
- impact of wildlife trade and bush-meat hunting on inter-species disease transmission,
- effects of pollution-related algal blooms on abundance of associated infectious organisms and their transmission to humans,

- meta-analyses of historical patterns of transmission and the underlying environmental, social, and bio-social determinants,
- role of habitat-specific diseases in shaping the community structure of non-human hosts,
- ecology of migration and population structure on emergence or regional maintenance of disease,
- the role of pathogen evolution in ecological time and its effects on disease abundance and spread,
- the relationship of pathogen ecology and evolution on disease characteristics such as abundance, pathogenicity, transmission, and durability,
- the interaction between human social and economic structures, ecological systems, and disease abundance and spread,
- the influence of a specific public health intervention on transmission dynamics of associated diseases,
- predictive modeling of integrated medical and environmental interventions on transmission, including biological, social and economic factors influencing long-term efficacy.

These kinds of problems are fundamentally interdisciplinary, and teams of investigators with expertise in a wide range of scientific training and skills from diverse disciplines are likely to be most effective. Integrated, collaborative efforts might involve infectious disease epidemiologists, physicians, veterinarians, population ecologists, marine scientists, statisticians, immunologists, microbiologists, geologists, taxonomists, molecular biologists, hydrologists, environmental health scientists, sociologists, economists, anthropologists, climatologists, and mathematical modelers, for example. A team approach is encouraged to answer questions that normally cannot be addressed within a single discipline. Work can involve the collection or development of new data, the reanalysis of existing data, or a combination of both. The research plan should indicate how multiple disciplines will be integrated and how new investigators in U.S. and collaborating foreign institutions will be prepared to conduct future multidisciplinary Ecology of Infectious Disease research projects.

US-UK Collaborative Projects

The EID program encourages collaborative projects involving U.S. scientists and social scientists from the U.K. Such projects must include a substantial focus on the roles of socio-ecological factors and processes on disease transmission dynamics. Projects with a substantial social science component in any field relevant to the EID program are welcome. Topics of particular interest include:

Public health practice – Studies of how infectious disease transmission is influenced by public health planning and management systems. This includes research on governance processes, particularly in relation to the mechanisms by which scientific evidence is used in public health management and delivery systems, and the unforeseen impact of interventions.

Demographic change – Studies of how infectious disease transmission is influenced by changes in population structure, social epidemiology, and the spatial distribution of populations, including the ways people mix within society, urbanization and migration, household size or formation, travel, social activities, and school sizes. These studies can include both micro- and macro-level changes and outcomes.

Human behavior – Studies of how infectious disease transmission is influenced by the role of the behavior of individuals, particularly in differing cultural and social contexts. Examples include responses to vaccination policies, health seeking behavior, and the economic impacts of controls of disease spread in agricultural systems.

U.K. researchers applying under this heading must meet normal ESRC eligibility requirements, and must apply through an institution eligible to receive ESRC funding (http://www.esrcsocietytoday.ac.uk/ESRCInfoCentre/opportunities/research_funding/). If UK applicants are unsure of their eligibility, they should contact the ESRC Cognizant Program Officer for confirmation. Applications with non-eligible U.K. partners will not be considered for funding as a U.S.-U.K. Collaborative Project. Proposals including collaborations with other U.K. partners are eligible to apply to this competition outside of this special subcategory; contact one of the Program Officers if you have questions concerning such other proposals.

Individuals considering submitting a proposal as a U.S.-U.K. Collaborative Project are strongly encouraged to contact the ESRC Cognizant Program Officer to confirm that the social science component is appropriate and sufficiently substantive.

III. AWARD INFORMATION

Under this solicitation, the maximum total award size is \$2.5 million, including indirect costs, and the maximum award duration is five years. US-UK Collaborative Projects can request up to an additional £400,000 for the UK component of the project. Approximately 7 new awards are anticipated in FY 2009, depending on the quality of submissions and the availability of funds; the expected funding will be \$8.5 million. That amount includes approximately \$7.5M from NSF for new standard or continuing awards and approximately \$1.0M from NIH for new continuing awards in FY 2009. Of those awards, 2 are anticipated to be US-UK Collaborative Projects, depending on the quality of submissions and the availability of funds; the expected funding from the ESRC will be a maximum of £800,000.

Upon conclusion of the review process, meritorious proposals may be recommended for funding by either NSF or NIH, at the option of the agencies, not the proposing organizations. Subsequent grant administration procedures will be in accordance with the individual policies of the awarding agency.

For US-UK Collaborative Projects, the UK component of the collaboration will be funded by the ESRC in accordance with the policies of that agency. If the ESRC selects an application for funding, the ESRC will require that the costs for the UK element of the proposal be submitted via the ESRC's Je-S application submission system before final sign-off. UK collaborators should therefore ensure they are registered Je-S users before the proposal is submitted.

IV. ELIGIBILITY INFORMATION

Organization Limit:

None Specified

PI Limit:

U.K. researchers applying under the U.S.-U.K. Collaborative Projects heading must meet normal ESRC eligibility requirements, and must apply through an institution eligible to receive ESRC funding

(http://www.esrcsocietytoday.ac.uk/ESRCInfoCentre/opportunities/research_funding/). Applications with non-eligible U.K. partners will not be considered for funding as a U.S.-U.K. Collaborative Project. Proposals including collaborations with other U.K. partners are eligible to apply to this competition outside of this special subcategory; contact one of the Program Officers if you have questions concerning such other proposals.

Limit on Number of Proposals per Organization:

None Specified

Limit on Number of Proposals per PI:

None Specified

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

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

- Full proposals submitted via FastLane: Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the NSF Grant Proposal Guide (GPG). The complete text of the GPG is available electronically on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg. Paper copies of the GPG may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from pubs@nsf.gov. Proposers are reminded to identify this program solicitation number in the program solicitation block on the NSF Cover Sheet For Proposal to the National Science Foundation. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.
- Full proposals submitted via Grants.gov: Proposals submitted in response to this program solicitation via Grants.gov should be prepared and submitted in accordance with the NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov. The complete text of the NSF Grants.gov Application Guide is available on the Grants.gov website and on the NSF website at: (<http://www.nsf.gov/bfa/dias/policy/docs/grantsgovguide.pdf>). To obtain copies of the Application Guide and Application Forms Package, click on the Apply tab on the Grants.gov site, then click on the Apply Step 1: Download a Grant Application Package and Application Instructions link and enter the funding opportunity number, (the program solicitation number without the NSF prefix) and press the Download Package button. Paper copies of the Grants.gov Application Guide also may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from pubs@nsf.gov.

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

Collaborative Proposals. All collaborative proposals submitted as separate submissions from multiple organizations must be submitted via the NSF FastLane system. Chapter II, Section D.3 of the Grant Proposal Guide provides additional information on collaborative proposals.

Oceanographic Platform Support

For projects requesting ship time on a research vessel operated under the University-National Oceanographic Laboratory System (UNOLS), a copy of the UNOLS request form should be included as an attachment at the very end of the proposal. It should be submitted as Supplementary Documentation in FastLane. The UNOLS form may be obtained from the NSF Division of Ocean Sciences Ship Operations Program, National Science Foundation by calling (703) 292-8581, or directly from the UNOLS World Wide Web site at <http://www.unols.org>. UNOLS costs should not be included in the proposal budget; however, costs for the use of non-UNOLS research platforms must be included in the proposal budget.

US-UK Collaborative Proposals

These proposals should begin the title with "**US-UK Collab:**"

Information for the UK portion of US-UK Collaborative Proposals should be included as Supplementary Documents. That information should include:

1. **Biographical sketches of UK senior personnel:** Those biographical sketches must conform to NSF format and limitations.
2. **UK budget:** The budget format should conform to ESRC format. Blank budget pages can be obtained at [www.esrcsocietytoday.ac.uk/infectiousdiseases]. The budget should not exceed £400,000 over the duration of the project.
3. **Letters of collaboration:** Letters of collaboration from UK scientists are required. **These letters must be restricted to a statement of intent to collaborate only.** Additional information on the nature of the collaboration and the roles of the investigators should be included in the Project Description.
4. **Institutional endorsement:** An institutional certification of the submission must be a signed letter from an authorized institutional representative with the following text: "I confirm on behalf of [insert name of institution] that the U.S.-U.K. Collaborative proposal between [insert name of US PI and institution] and [insert name of UK PI] is endorsed and has been submitted by [name of Research Office]."

B. Budgetary Information

Cost Sharing: Cost sharing is not required under this solicitation.

Budget Preparation Instructions: Every year, the PI's of the EID awards will be asked to attend a meeting to be held at either the National Science Foundation or an alternate location. Include the necessary travel costs for attendance at the meeting in the proposed budget.

C. Due Dates

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

December 10, 2008

Second Wednesday in December, Annually Thereafter

D. FastLane/Grants.gov Requirements

- **For Proposals Submitted Via FastLane:**

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

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

- **For Proposals Submitted Via Grants.gov:**

Before using Grants.gov for the first time, each organization must register to create an institutional profile. Once registered, the applicant's organization can then apply for any federal grant on the Grants.gov website. The Grants.gov's Grant Community User Guide is a comprehensive reference document that provides technical information about Grants.gov. Proposers can download the User Guide as a Microsoft Word document or as a PDF document. The Grants.gov User Guide is available at: <http://www.grants.gov/CustomerSupport>. In addition, the NSF Grants.gov Application Guide provides additional technical guidance regarding preparation of proposals via Grants.gov. For Grants.gov user support, contact the Grants.gov Contact Center at 1-800-518-4726 or by email: support@grants.gov. The Grants.gov Contact Center answers general technical questions related to the use of Grants.gov. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this solicitation.

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

VI. NSF PROPOSAL PROCESSING AND REVIEW PROCEDURES

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

A. NSF Merit Review Criteria

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

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

What is the intellectual merit of the proposed activity?

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

What are the broader impacts of the proposed activity?

How well does the activity advance discovery and understanding while promoting teaching, training, and learning?
How well does the proposed activity broaden the participation of underrepresented groups (e.g., gender, ethnicity,

disability, geographic, etc.)? To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships? Will the results be disseminated broadly to enhance scientific and technological understanding? What may be the benefits of the proposed activity to society?

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

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

Integration of Research and Education

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

Integrating Diversity into NSF Programs, Projects, and Activities

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

Additional Review Criteria:

- **Significance:** Does this study address an important problem? If the aims of the proposal are achieved, how will scientific knowledge be advanced? What will be the effect of these studies on the concepts or methods that drive this field?
- **Investigator:** Is the investigator appropriately trained and well suited to carry out this work? Is the work proposed appropriate to the experience level of the principal investigator and other researchers (if any)?
- **Innovation:** Does the project employ novel concepts, approaches or methods? Are the aims original and innovative? Does the project challenge existing paradigms or develop new methodologies or technologies?
- **Approach:** Are the conceptual framework, design, methods, and analyses adequately developed, well integrated, and appropriate to the aims of the project? Does the investigator acknowledge potential problem areas and consider alternative tactics? For work in developing countries is there a plan to strengthen research capacity at the foreign site, including training for local scientists.
- **Environment:** Does the scientific environment in which the work will be done contribute to the probability of success? Do the proposed experiments take advantage of unique features of the scientific environment or employ useful collaborative arrangements? Is there evidence of institutional support?

Where relevant, proposals will also be reviewed with respect to the following:

- The adequacy of the plans to include both genders, minorities and their subgroups, and children as appropriate to the scientific goals of the research. If the proposed research includes human subjects plans for the recruitment and retention of subjects should be included. (see http://grants.nih.gov/grants/funding/women_min/guidelines_update.htm and <http://grants.nih.gov/grants/funding/children/children.htm>)
- The reasonableness of the proposed budget and duration in relation to the proposed research.
- The adequacy of the proposed protection for humans, animals, or the environment, to the extent they may be adversely affected by the project proposed in the application.

US-UK Collaborative Projects will also be reviewed with respect to the extent which they demonstrate a substantial collaboration between the US and UK partners and enhance research on the socio-ecological dimensions of infectious disease transmission. The review will take into account the UK research context.

B. Review and Selection Process

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

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

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

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

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

VII. AWARD ADMINISTRATION INFORMATION

A. Notification of the Award

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

B. Award Conditions

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

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

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

Special Award Conditions: Standard ESRC award conditions will apply to the UK element of US-UK Collaborative projects (<http://www.esrcsocietytoday.ac.uk/ESRCInfoCentre/opportunities/research%5Ffunding/>).

C. Reporting Requirements

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

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

PIs are required to use NSF's electronic project-reporting system, available through FastLane, for preparation and submission of annual and final project reports. Such reports provide information on activities and findings, project participants (individual and organizational) publications; and, other specific products and contributions. PIs will not be required to re-enter information previously provided, either with a proposal or in earlier updates using the electronic system. Submission of the report via FastLane constitutes certification by the PI that the contents of the report are accurate and complete.

NIH Awardees are subject to NIH reporting and administration rules and processes for annual renewal of their awards as outlined at: <http://grants.nih.gov/grants/policy/policy.htm> and in the Notice of Grant Award.

ESRC Awardees are subject to ESRC reporting and administration requirements as outlined in the ESRC Research Funding Guide at http://www.regard.ac.uk/ESRCInfoCentre/opportunities/research_funding/index.aspx. US-UK Collaborative Projects should report on activities of the entire collaborative effort and submit that information to both NSF and ESRC as part of the annual and final reports.

VIII. AGENCY CONTACTS

General inquiries regarding this program should be made to:

- N. Thompson Hobbs, Program Director/NSF, NSF, telephone: 703 292-8481, email: nhobbs@nsf.gov
- Joshua Rosenthal, Program Director, FIC/NIH, telephone: (301) 496-1653, fax: (301) 402-0779, email: joshua_rosenthal@nih.gov
- Donald Rice, Program Director, GEO/NSF, telephone: (703) 292-7708, email: drice@nsf.gov
- Deborah Winslow, Program Director, SBE/NSF, telephone: (703) 292-7315, email: dwinslow@nsf.gov
- Joy Todd, Research Development Leader, ESRC, telephone: 44 1793-413109, email: joy.todd@esrc.ac.uk
- Erin (Liz) Lawrence, Science Assistant, telephone: (703) 292-8997, email: elawrenc@nsf.gov

For questions related to the use of FastLane, contact:

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

For questions relating to Grants.gov contact:

- Grants.gov Contact Center: If the Authorized Organizational Representatives (AOR) has not received a confirmation

message from Grants.gov within 48 hours of submission of application, please contact via telephone: 1-800-518-4726; e-mail: support@grants.gov.

IX. OTHER INFORMATION

The NSF Website provides the most comprehensive source of information on NSF Directorates (including contact information), programs and funding opportunities. Use of this Website by potential proposers is strongly encouraged. In addition, MyNSF (formerly the Custom News Service) is an information-delivery system designed to keep potential proposers and other interested parties apprised of new NSF funding opportunities and publications, important changes in proposal and award policies and procedures, and upcoming NSF Regional Grants Conferences. Subscribers are informed through e-mail or the user's Web browser each time new publications are issued that match their identified interests. MyNSF also is available on NSF's Website at <http://www.nsf.gov/mynsf/>.

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

A notice on the Ecology of Infectious Disease research initiative and this announcement is also posted in the NIH Guide to Grants and Contracts <http://grants.nih.gov/grants/guide/index.html>, along with all NIH opportunities.

Information about this initiative and announcement are also available on the ESRC website on the 'International Funding Opportunities' pages: <http://www.regard.ac.uk/ESRCInfoCentre/opportunities/international/index.aspx>.

ABOUT THE NATIONAL SCIENCE FOUNDATION

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

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

NSF receives approximately 40,000 proposals each year for research, education and training projects, of which approximately 11,000 are funded. In addition, the Foundation receives several thousand applications for graduate and postdoctoral fellowships. The agency operates no laboratories itself but does support National Research Centers, user facilities, certain oceanographic vessels and Antarctic research stations. The Foundation also supports cooperative research between universities and industry, US participation in international scientific and engineering efforts, and educational activities at every academic level.

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

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

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

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

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

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

PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

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

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

Suzanne H. Plimpton
Reports Clearance Officer
Division of Administrative Services
National Science Foundation
Arlington, VA 22230

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The National Science Foundation, 4201 Wilson Boulevard, Arlington, Virginia 22230, USA
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