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Earth System History (ESH)

Program Announcement

NSF 02-005

DIRECTORATE FOR GEOSCIENCES
DIVISION OF ATMOSPHERIC SCIENCES
DIVISION OF EARTH SCIENCES
DIVISION OF OCEAN SCIENCES

FULL PROPOSAL DEADLINE(S): January 15, 2002

NATIONAL SCIENCE FOUNDATION

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SUMMARY OF PROGRAM REQUIREMENTS

GENERAL INFORMATION

Program Title: Earth System History (ESH)

Synopsis of Program: The goals of the ESH program are to: 1) encourage innovative research on the natural variability of the Earth's climate system from records preserved in geo-biologic archives, and 2) provide a comprehensive understanding of Earth's changing climate with regard to forcing mechanisms, interactions, and feedbacks.

Cognizant Program Officer(s):

- Dr. David J. Verardo, Director, Paleoclimate Program, Geosciences, Atmospheric Sciences, 775, telephone: 703-292-8527, e-mail: dverardo@nsf.gov.
- Dr. Richard Poore, Director, Marine Geology & Geophysics Program, Geosciences, Ocean Sciences, 725N, telephone: 703-292-8580, e-mail: rpoore@nsf.gov.
- Dr. Christopher Miller, Associate Program Manager, Climate Change Data and Detection, NOAA, telephone: 301-427-2089 (ext. 143), e-mail: miller@ogp.noaa.gov.

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

- 47.050 --- Geosciences

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:** Approximately 25 new awards with an average award size of $100,000 per year. Typical award duration is expected to be two to three years but may be longer.
- **Anticipated Funding Amount:** Approximately $5 million is expected to be available each year for new awards, pending availability of funds.

PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

- **Full Proposals:** Standard Preparation Guidelines
  - Standard GPG Guidelines apply.

B. Budgetary Information

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

C. Deadline/Target Dates

- **Letters of Intent (*optional*):** None
- **Preliminary Proposals (*optional*):** None
- **Full Proposal Deadline Date(s):** January 15, 2002

D. FastLane Requirements

- **FastLane Submission:** Required

- **FastLane Contact(s):**
  - Kandace Binkley, Geosciences, Ocean Sciences, 725, telephone: 703-292-8582, e-mail: ocefl@nsf.gov.

PROPOSAL REVIEW INFORMATION

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

AWARD ADMINISTRATION INFORMATION

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

I. INTRODUCTION

The Earth System History (ESH) program is a coordinated paleoscience research initiative of the U.S. Global Change Research Program (USGCRP) that is supported by the National Science Foundation (NSF) Divisions of Atmospheric Sciences (ATM), Earth Sciences (EAR), and Ocean Sciences (OCE) as well as the National Oceanic and Atmospheric Administration (NOAA) Office of Global Programs. Furthermore, it is allied with the Past Global Changes (PAGES) project of the International Geosphere Biosphere Programme (IGBP) and the Climate Variability and Predictability (CLIVAR) project of the World Climate Research Program(WCRP).

As the paleoscience component of the USGCRP, the emphasis of the ESH program is upon the Earth's paleoenvironmental system. In this context, the term "Earth system" refers to elements of the coupled atmosphere-biosphere-cryosphere-hydrosphere and terrestrial system critical to understanding changing climate over geologic time.

The importance of ESH research, as an element of the USGCRP, stems from its unique capability, on timescales longer than the instrumental record, to: (1) document the past temporal and spatial variability of the Earth system; (2) assess the rates of change associated with this variability; (3) determine the sensitivity of the Earth system to variations in climate-forcing factors; and (4) evaluate the simulations of numerical models.

Research supported by the ESH program is intended to increase our knowledge of the natural variability inherent in the Earth's climate system, as evidenced in geo-biologic archives, and to provide insights into to the role of forcing mechanisms, interactions, and feedbacks among its various components. Proposals to the ESH program must clearly state how the proposed project will contribute to achieving these goals.

II. PROGRAM DESCRIPTION

Understanding how changing climate affects ecosystems and humans requires knowledge of the full range of Earth's climate variability and how ice, ocean, atmosphere, continents, and biosphere respond to varying climate conditions over time. Integrated responses of the Earth system to climatic perturbations are preserved in natural archives of many types including: tree-rings, ice cores, corals, ancient soil deposits and marine, lake and terrestrial sediments. These records provide the data needed to understand the natural behavior of the Earth system and will provide the temporal perspective for evaluating more recent human-induced impacts.

Geo-biologic archives preserve unique information on temporal and spatial variability, periods of rapid changes in climate and ecosystems, changes in ocean and atmospheric composition and circulation, and regional manifestations of climate oscillations. These features present intellectual, observational, and analytical challenges that are critical to understanding changes in climate, especially those that occur on time scales of interest to society.

The ESH program encourages innovative projects that integrate and synthesize paleoclimatic data to extend our knowledge of past climatic conditions and processes. This will increase our understanding of future climatic trends and their impacts on ecosystems and societies. The ESH program seeks to achieve this goal by providing funds to collect critical new data, develop novel tools for research and analysis, and enable integrative efforts among researchers.

AREAS OF RESEARCH INTEREST

The ESH Program accepts proposals from individual investigators or from teams of investigators working on crosscutting scientific issues involving multi-proxy and interdisciplinary efforts in the following four areas of research.

1. Holocene Climate Variability, Forcing Mechanisms, and Impacts

The last 10,000 years of Earth history is an important archive of data on natural climate variability at annual-to-millennial timescales under planetary boundary conditions similar to those prevalent today. The goal of this area of research is to define the full range of natural environmental and climatic variability and to understand how this variability is affected by changes in external forcing.

Proposals should address the collection and analysis of high-resolution time series to advance the global study of patterns, processes, and causes of annual-to-millennial scale climatic and environmental variability beyond the instrumental record.

Priority will be given to proposals that seek to: 1) collect new Holocene paleoclimate records from key terrestrial and marine archives, 2) examine marine-terrestrial-atmosphere-cryosphere connections and North American climate response, and 3) synthesize and integrate data and model efforts expanding our understanding of forcing mechanisms relevant to Holocene climate variability. Research and implementation plans that address these priorities are available on the ESH web page.

2. Regional Patterns and Phasing of Climate Change

Understanding spatial patterns of past climate changes, the degree of synchronicity or phasing between different areas, and the relation between low latitude and high latitude regions are critical aspects of paleoclimate studies to test and improve climate models.

Proposals should address spatial aspects of climate change, such as tropical and extra-tropical linkages and inter-hemispheric comparisons revealed in marine and terrestrial records.

Priority will be given to proposals that seek to examine the regional links and phasing of century to millenial scale resolution climate records for the last several glacial cycles.

3. Rapid Climate Change

Climate change sometimes occurs as sudden shifts from one climate regime to another. The evidence for sudden shifts occurring over years to centuries comes from a variety of proxy records including tree-rings, ice cores, lake cores, and ocean sediments. Fully

understanding the causes, mechanisms, and frequency of these rapid changes is crucial to anticipating future changes in climate and may help separate human-induced change from natural variation of the climate system.

Proposals should address the use of paleoclimate records to document the frequency, temporal resolution, and spatial extent of past rapid climate changes. Proposals may address rapid changes in the Earth's climate system that have occurred over the range of geologic time from regional-scale regime shifts to global-scale reorganizations of the climate system. The use of paleoclimate data in combination with modern climate dynamics, meteorology, and climate modeling is particularly encouraged.

Priority will be given to proposals that seek to: 1) understand the mechanisms and forcing associated with rapid climate changes, as well as the feedbacks that reinforce or counteract such changes, and 2) characterize and quantify the response of the various components of the Earth system to rapid changes in climate.

4. Modeling of Past Change
Evaluating model simulations of climate change using paleoclimatic and paleoenvironmental data is an important step in assessing the ability of these models to simulate future climate.

Proposals should focus on the use of Earth system models to investigate the causes, patterns, mechanisms, processes, and linkages between different elements of the marine-terrestrial-atmosphere-cryosphere system. Paleoclimate modeling proposals must address one of the other three ESH research areas above and incorporate data-model comparisons to ensure that the predictive Earth system models being used provide realistic simulations of climate variability, rapid change, or regional change.

Data Management: Each proposal must adhere to the USGCRP data management policy and the policies applying to recipients of Federal funding in the geosciences which can be found at the world wide web site http://www.gcdis.usgcrp.gov/policies/dmwg/dmwg-gcp.html. Unless otherwise specified in the proposal, the PI/PD will be responsible for ensuring that all data generated by the funded project will be documented and submitted to the World Data Center for Paleoclimatology at the National Geophysical Data Center in Boulder, CO. The guidelines for data submission are available on the world wide web at http://www.ngdc.noaa.gov/paleo/contrib.html.

III. ELIGIBILITY INFORMATION

The categories of proposers identified in the Grant Proposal Guide are eligible to submit proposals under this program announcement/solicitation.

IV. AWARD INFORMATION

Approximately $5 million is expected to be available each year for new awards, pending 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.

Proposers are reminded to identify the program solicitation number (NSF-02-005) in the program announcement/solicitation block on the NSF Form 1207, *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.

B. Budgetary Information

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

C. Deadline/Target Dates

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

Full Proposals *by 5:00 PM local time*: January 15, 2002

D. FastLane Requirements

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

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
In the evaluation of proposals submitted to this competition, consideration is also given to how relevant the proposed research is to the Areas Of Research Interest.

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 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.

In most cases, proposers will be contacted by the Program Officer after his or her recommendation to award or decline funding has been approved by the Division Director. This informal notification is not a guarantee of an eventual award.

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 Earth System History should be made to:

- Dr. David J. Verardo, Director, Paleoclimate Program, Geosciences, Atmospheric Sciences, 775, telephone: 703-292-8527, e-mail: dverardo@nsf.gov.
- Dr. Richard Poore, Director, Marine Geology & Geophysics Program, Geosciences, Ocean Sciences, 725N, telephone: 703-292-8580, e-mail: rpoore@nsf.gov.
- Dr. Christopher Miller, Associate Program Manager, Climate Change Data and Detection, NOAA, telephone: 301-427-2089 (ext. 143), e-mail: miller@ogp.noaa.gov.

For questions related to the use of FastLane, contact:

- Kandace Binkley, Geosciences, Ocean Sciences, 725, telephone: 703-292-8582, e-mail: ocefl@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, 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.

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