

# EARTH SYSTEM HISTORY (ESH)

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## *Announcement of Opportunity related to the U.S. Global Change Research Program*

Division of Atmospheric Sciences  
Division of Earth Sciences  
Division of Ocean Sciences  
Office of Polar Programs  
Office of Global Programs/NOAA

**Deadline Date:** *15 January, 1998 and 1999*



NATIONAL SCIENCE FOUNDATION

# Earth System History

## Research Opportunity Related to the NSF Global Change Research Program

FY 1998 and 1999

### **EARTH SYSTEM HISTORY (ESH) - Research Opportunity**

Earth System History (ESH) is a research initiative of the U.S. Global Change Research Program (USGCRP). It includes coordinated paleoscience programs supported by the National Science Foundation (NSF) Divisions of Atmospheric Sciences (ATM), Earth Sciences (EAR) and Ocean Sciences (OCE) and the Office of Polar Programs (OPP), and the National Oceanic and Atmospheric Administration (NOAA) Office of Global Programs. ESH contributes to understanding critical elements of the coupled atmosphere-biosphere-cryosphere-earth-ocean system, including those aspects that cross disciplinary boundaries.

The goal of ESH research is to understand the natural variability of the Earth system through records preserved in geo-biologic archives and to contribute to a comprehensive understanding of environmental change with annual to millennial resolution, including the forcing mechanisms, interactions and feedbacks among its components.

The importance of the ESH Program as an element of the USGCRP stems from its unique capabilities to: (1) assess the temporal and spatial characteristics of global-scale environmental and ecosystem variability, (2) define the nature of Earth system sensitivity to a large number of forcing factors, including greenhouse gasses, (3) examine the integrated climatic, environmental, geochemical and biologic response of the Earth system to a variety of perturbations, (4) evaluate the simulations of numerical models under conditions very different from the present day, and (5) assess the rates of change associated with the variability of the Earth system. These attributes represent the criteria by which ESH investigations can be viewed as contributions to the USGCRP.

ESH represents a U.S. contribution to Past Global Changes (PAGES), a core project of the International Geosphere - Biosphere Programme (IGBP). ESH proposals are encouraged to address, but are not limited to, objectives that focus on the PAGES effort. ESH is coordinated with paleoscience efforts in the National Science Foundation, National Oceanic and Atmospheric Administration, U.S. Geological Survey, and other Federal agencies.

Depending on the availability of funds, the ESH Program budget for FY 1998 and FY 1999 is expected to be approximately \$12.0 million in each year.

### **DESCRIPTION**

Assessment of future environmental changes requires understanding the full range of the Earth's variability and how the interlinked systems of ice, ocean, atmosphere, continents and biosphere respond to changing conditions. Integrated responses of the Earth system to climatic and environmental 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 Earth's environmental systems and will provide the temporal perspective for evaluating more recent human-induced impacts.

The paleoclimate and geologic record includes information on: (1) natural temporal and spatial variability, (2) periods of extreme climate and episodes of rapid climate and ecological change, (3) major changes in ocean and atmospheric circulation and composition, and (4) regional effects of climate and environmental fluctuations. These features present intellectual, observational, and analytical challenges that must be met in order to understand changes in climate that occur on societal time scales.

Proposals for the ESH Program will be considered in any one or combination of the following areas of research:

- Systematic compilation of high quality physical, chemical, and biological paleorecords focusing on climatic, biogeochemical and environmental changes and events.
- Quantification and development of biotic, physical, and geochemical proxy indicators for past Earth system processes and the improvement of geochronological techniques.
- Analysis of the sensitivity of climate to changes in forcing mechanisms (e.g., atmospheric greenhouse gas concentrations) and terrestrial and oceanic states.
- Development and testing of models of the processes of climate change and evaluation of climate models with paleoclimatic data and information.

### **AREAS OF SPECIAL EMPHASIS**

In addition to the above, the ESH Program invites proposals addressing areas of special emphasis that require coordinated effort beyond the capabilities of individual investigators. It is anticipated that teams of investigators will form to work on crosscutting scientific issues involving multiproxy or interdisci-

plinary efforts; purely descriptive studies of data sets are not encouraged. Linkage with programs at the international level is encouraged, but not required. For 1998 and 1999, these areas of special emphasis include:

1. **Paleoclimate Variability:** Proposals should address the collection and analysis of seasonal- to annually-dated time series to develop an understanding of the full range of natural environmental variability over the last 2000 years. Research efforts may also focus on temporal and spatial variability and the use of high resolution data sets for climate model evaluation and improvement. Proposals may address, but are not limited to: ENSO and monsoonal systems and regional to global-scale hydrologic system variability. Proposers desiring further information in this area of emphasis should contact: Herman Zimmerman, ESH/ATM Program or Mark Eakin, NOAA/Office of Global Programs.

NOTE: This area of emphasis specifically addresses the goals of the PAGES/CLIVAR Program (IGBP-WCRP). Proposals submitted in response to this emphasis will be jointly reviewed and supported by the NSF/ESH Program and the NOAA/Office of Global Programs. Proposals will be reviewed in accordance with established NSF and NOAA procedures for external merit review.

2. **Terrestrial Earth System Science:** Proposals should address the development or synthesis of large-scale paleoenvironmental data sets that can be used to test and improve Earth system models. Data sets may be drawn from any interval of the geologic past, either as synoptic networks (time slices) to show large-scale spatial patterns *or* as time series that are exceptionally long and detailed. Data may be sedimentological, geochemical, or paleoecological and illustrate the past distributions and changes in ice sheets, vegetation, lake and river systems, dunes, peatlands, and other terrestrial systems. Paired development of data sets and terrestrial components of Earth system models is encouraged and the proposal should explicitly explain how the data set can be applied to model testing and development. Proposals are encouraged for research contributing to the interhemispheric PEP Transects and Paleoenvironmental Multiproxy Analysis and Mapping (PMAP) Project of the PAGES/IGBP Project and for participation in other international research efforts addressing these topics. Other areas of emphasis are projects related to: (a) continental drilling for the recovery and analysis of long, high-resolution sediment cores in regions fundamental to paleoenvironmental reconstruction, (b) the Large Scale Biosphere-Atmosphere Experiment in Amazonia (LBA) and (c) biogeochemical cycles and modeling studies as they pertain to Global Analysis, Interpretation and Modeling Activity (GAIM). Proposers desiring further information on this area of emphasis should contact: John Maccini, Chris Maples, or Leonard Johnson ESH/EAR, or Herman Zimmerman, ESH/ATM.

3. **Arctic Paleoclimate:** Proposals should address research goals of the Paleoenvironmental Studies component of the ARCSS (Arctic System Science) Program. This consists of Paleoclimate from Arctic Lakes and Estuaries (PALE) and the Greenland Ice Sheet Project Two (GISP2). The objectives of PALE are: the reconstruction of Arctic terrestrial and near shore environmental systems from lake and estuary sediments and the determination of circumpolar environmental variability and pa-

leoclimate. The drilling phase of GISP2 was completed with the retrieval of a 3000+ meter ice core from central Greenland. Continuing work should be focused on establishing a detailed multi-parameter record of climate fluctuation and global system history. Both GISP2 and PALE seek to establish linkages between Arctic and global paleoclimate systems. Proposers desiring further information on this area of emphasis should contact: Herman Zimmerman, ESH/ATM.

## Additional Requirements and REVIEW

**Data Management:** Each proposal must adhere to the USGCRP data management policy and the policies applying to recipients of Federal funding in the geosciences. 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-A for Paleoclimatology at the National Geophysical Data Center in Boulder, CO (guidelines for data submission are available at: <http://www.ngdc.noaa.gov/paleo/contrib.html>). The proposal should include a description of the anticipated data and information products, quality control and documentation, as well as any anticipated costs for these activities. A supplemental section entitled "Data and Information Availability" may be added to the proposal (proposal Section I) and is not counted in the Project Description page limitation. Details on this supplemental documentation are included in the NSF *Grant Proposal Guide* (NSF 98-2). All proposals should include a statement in "Results from Prior Research" indicating the disposition of data products generated by recent Federally-funded research projects.

**Collaborative Projects:** Studies requiring a multi-institutional effort may be proposed by submission of several separate, but closely collaborative, proposals having common overall objectives *or* by a single omnibus proposal containing disciplinary components. In the latter case, only one institution should submit the proposal, which should include signed cover pages, budgets, curricula vitae, etc. for all investigators and institutions involved. Additional information on group proposals is found in the NSF *Grant Proposal Guide*. Omnibus proposals may exceed the 15-page limit only if written permission is obtained from one of the Program Officers listed below. A copy of this permission must be included with the proposal in accordance with directions in the NSF *Grant Proposal Guide*.

**Merit Review Process:** Proposals submitted in response to this program announcement will be subject to the merit review criteria approved by the National Science Board on March 28, 1997 (NSB97-72). The merit review criteria are:

What is the intellectual merit of the proposed activity?

The following are suggested questions that the reviewer will consider in assessing how well the proposal meets this criterion. Each reviewer will address only those questions which he/she considers relevant to the proposal and for which he/she is qualified to make judgments.

How important is the proposed activity to advancing knowledge and understanding within its own field and across different fields? How well qualified is the proposer (individual or team) to conduct the project? (If appropriate, please comment on the quality of 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?

The following are suggested questions that the reviewer will consider in assessing how well the proposal meets this criterion. Each reviewer will address only those questions which he/she considers relevant to the proposal and for which he/she is qualified to make judgments.

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?

In addition to these generic review criteria, it is intended that a review panel be convened to evaluate the relative merits of the proposals and their contribution to the objectives of the parent program, ESH/USGCRP. The panel may consider gaps in knowledge and possible duplications in the overall ESH effort. Each proposal must include a statement demonstrating how the proposed research responds to the objectives and criteria of the ESH Program.

A summary rating and accompanying narrative will be completed and signed by each reviewer. In all cases, reviews are treated as confidential documents. Verbatim copies of reviews, excluding the names of the reviewers, are mailed to the PI/PD by the Program Director. The proposer also will receive a panel summary and an explanation of the decision to award or decline funding.

## PROPOSAL SUBMISSION

**Proposal Format:** The proposal format and requirements are specified in the latest revision of the NSF *Grant Proposal Guide* (<http://www.nsf.gov>), and is available from:

Forms and Publications Unit, Room P15  
National Science Foundation  
Arlington, VA 22230  
TEL: 703-306-1130  
email: [pubs@nsf.gov](mailto:pubs@nsf.gov)

Proposals submitted in response to this announcement must be postmarked no later than January 15, in 1998 or 1999. **Twenty (20)** copies of the proposal must be submitted and the proposal cover sheets should indicate "ESH" and the most appropriate NSF organization (ATM, EAR, or OCE) under NSF Organization Unit. Investigators are urged to contact appropriate Program Officers prior to preparing proposals:

Dr. Herman Zimmerman  
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## ADDITIONAL INFORMATION

Additional information on the Earth System History Program and related awards from FY 1996 and FY 1997 can be accessed on the NSF Website at the address: <http://www.nsf.gov/strata/egch/esh.htm>

This site will also include any updates to the information described in this announcement.

## Grant General Conditions

The Foundation provides awards for research and education in the sciences and engineering. The awardee is wholly responsible for the conduct of such research and preparation of the results for publication. The Foundation, therefore, does not assume responsibility for the research findings or the interpretation.

The Foundation welcomes proposals from all qualified scientists and engineers and strongly encourages women, minorities, and persons with disabilities to compete fully in any of the research and related programs described here. 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, denied the benefits of, or be subject to discrimination under any program or activity receiving financial assistance from the National Science Foundation.

**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 an NSF project. See the program announcement or contact the program coordinator at (703) 306-1636.

Programs described in this publication are included in the Catalog of Federal Domestic Assistance under the following category: 47.050, Geosciences and 47.078, Polar Programs.

**Privacy Act.** Information requested on proposal forms is solicited under the authority of the National Science Foundation

Act of 1950, as amended. It will be used in connection with the selection of qualified proposals and may be used and disclosed to qualified reviewers and staff assistants as part of the review process; to applicant institution of grantees; to provide or obtain data regarding the application review process, award decisions, or the administration of awards; to government contractors, experts, volunteers, and researchers as necessary to complete assigned work; and to other government agencies in order to coordinate programs. See Systems of Records NSF-50, Principal Investigators/ Proposal File and Associated Records,” and NSF 51, 60 Federal Register 4449 (January 23, 1995). Reviewer/ Proposal File and Associated Records, 59 Federal Register 8031 (February 17, 1994).

**Public Burden.** Submission of the information is voluntary. Failure to provide full and complete information, however, may reduce the possibility of your receiving an award.

The public reporting burden for this collection of information is estimated to average 120 hours per response, including time

for reviewing instructions. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to:

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