# Program Guide to Federally Funded Environment and Natural Resources R&D

## National Science and Technology Council
## Committee on Environment and Natural Resources

**February 1998**

# THE WHITE HOUSE
WASHINGTON

February 1998

Dear Colleague:

I am pleased to transmit the third edition of the *NSTC Program Guide to Federally Funded Environment and Natural Resources R&D,* which has been prepared by the Committee on Environment and Natural Resources (CENR). This document compiles into a single reference a wealth of information on Federal agency R&D programs in the environment and natural resources areas. It is designed to assist ready identification of funding opportunities by members of the research community at colleges, universities, national laboratories, and other institutions. This third edition includes funding in the Fiscal Year 1998 budget cycle.

The *Program Guide* also provides the reader with an understanding of the scope of environment and natural resources research supported by Federal agencies. It describes the competitive process for merit review and evaluation for federally-funded R&D. The funding opportunities section identifies agency staff who may be contacted for additional information, and guides the reader to Web sites for details on application procedures and deadlines. This year, in addition to a summary by Agency, we provide a table by environmental research area (Natural Disaster Reduction, Global Change Research, Air Quality, Ecological Systems, and Toxics and Risk).

Environmental research is an important component of the Federal government's R&D portfolio. We consider this user-friendly program guide as an important way to ensure the best possible research for the taxpayer's dollar.

Sincerely,

John H. Gibbons
Assistant to the President
for
Science and Technology

# Table of Contents



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**About the National Science and Technology Council**

President Clinton established the National Science and Technology Council (NSTC) by Executive Order on November 23, 1993. This cabinet-level council is the principal means for the President to coordinate science, space, and technology policies across the Federal Government. The NSTC acts as a "virtual" agency for science and technology to coordinate the diverse parts of the Federal research and development enterprise. The NSTC is chaired by the President. Membership consists of the Vice President, the Assistant to the President for Science and Technology, Cabinet Secretaries and Agency Heads with significant science and technology responsibilities, and other senior White House officials.

An important objective of the NSTC is the establishment of clear national goals for Federal science and technology investments in areas ranging from information technology and health research, to improving transportation systems and strengthening fundamental research. The Council prepares research and development strategies that are coordinated across Federal

agencies to form an investment package that is aimed at accomplishing multiple national goals.

To obtain additional information regarding the NSTC, contact the NSTC Executive Secretariat at (202) 456-6102.

**About the Committee on Environment and Natural Resources**

The Committee on Environment and Natural Resources (CENR) is one of five committees under the NSTC, and is charged with improving coordination among Federal agencies involved in environmental and natural resources research and development, establishing a strong link between science and policy, and developing a Federal environment and natural resources research and development strategy that responds to national and international issues.

To obtain additional information about the CENR, contact the CENR Executive Secretary at (202) 482-5916.

**About the Office of Science and Technology Policy**

The Office of Science and Technology Policy (OSTP) was established by the National Science and Technology Policy, Organization, and Priorities Act of 1976. OSTP's responsibilities include advising the President on policy formulation and budget development on all questions in which science and technology are important elements; articulating the President's science and technology policies and programs; and fostering strong partnerships among Federal, State, and local governments, and the scientific communities in industry and academia.

To obtain additional information regarding the OSTP, contact the OSTP Administrative Office at (202) 395-7347.

# Introduction

## Overview

The Federal government supports a diverse array of research and development (R&D) to provide the scientific and technical information needed to address environment and natural resources issues ranging from global climate change to toxic waste remediation. Ten major Federal agencies support environmental research through extramural funding to colleges, universities, Federal laboratories, and other research institutions. The results of this research assist decision makers in the development of sound policies for protecting air and water quality, managing the Nation's ecosystems, and reducing the impacts of natural disasters.

Agencies that support major R&D programs in environment and natural resources include the Department of Agriculture (USDA), the Department of Commerce's National Oceanic and Atmospheric Administration (DOC/NOAA), the Department of Defense (DOD), the Department of Energy (DOE), the Department of the Interior (DOI), the Department of Transportation (DOT), the Environmental Protection Agency (EPA), the National Aeronautics and Space Administration (NASA), the National Institutes of Health (NIH), and the National Science Foundation (NSF).

The Federal government spent approximately $5 billion per year on environmental R&D over the FY 1994-1998 time period. Analyses of environmental research funding in the mid- 1990s indicated that the majority of these funds was competitively awarded, with about half going to support extramural R&D efforts. Only about one third of environmental R&D funding supports non-competed research, and this is predominantly intramural R&D.

Science funding agencies such as NSF, NIEHS, and NASA have a larger portion of their funds devoted to extramural research than agencies with resource management functions (e.g., USDA, DOC, DOI) or regulatory functions (EPA). Some of these agencies (e.g., EPA) have recently shifted the focus of their funding to more strongly emphasize extramural research grant programs. For example, EPA's Science to Achieve Results (STAR) Program, which funds extramural research proposals that focus on some of the most pressing environmental concerns, grew substantially over the last few years.

## Competition, Review, and Evaluation

The U.S. Government has a general policy of encouraging full, open, and fair competition for research supported by Federal funding (e.g., the Competition in Contracting Act of 1985). Competition helps ensure that the highest quality, most cost-effective research projects are selected for funding. A fundamental Federal agency goal as stated, for example, in the CENR strategy document, *Preparing for the Future through Science and Technology: An Agenda for Environment and Natural Resources Research* (March 1995) is to "...improve the quality and effectiveness of their R&D programs by increasing the use of external peer and merit review, increasing the use of open competition to award funds, and by strengthening their extramural academic research programs where feasible." Indeed, recent guidance to the agencies from the Office of Management and Budget (OMB) and OSTP identifies competitive selection, merit

review, and peer evaluation as broad R&D policy principles.

In general, rigorous merit review enhances the overall quality and value of science. Merit review includes both evaluation of R&D efforts for their relevance to science and policy needs and scientific peer review for technical soundness. In addition to prospective merit review, Federally funded research also undergoes performance reviews that are conducted to evaluate the progress, contributions, responsiveness, and relevance of ongoing or completed R&D activities.

## Opportunities By Agency

The remainder of this document describes the types of environment and natural resources R&D currently supported by Federal agencies, potential opportunities for funding, and points of contact. This Program Guide is meant to provide the reader with an understanding of the scope of Federally funded environment and natural resources research opportunities. While every effort was made to ensure completeness in the programs described here, there may be additional programs that are not included. The CENR updates this Guide annually, and will add any programs that have been omitted in future editions.

The CENR was established to foster a new multi-agency, interdisciplinary approach to environment and natural resources R&D. Many research initiatives described in this document are supported as joint efforts by multiple agencies. Examples include the many projects under the U. S. Global Change Research Program, such as the Joint Program on Terrestrial Ecology and Global Change, in which DOE, NSF, NASA, NOAA, and USDA participate.

The five Subcommittees of the CENR are Air Quality Research, Ecological Systems, Global Change, Natural Disaster Reduction, and Toxics and Risk. These five subject matter areas serve as broad themes for grouping environment and natural resources R&D. The table on the following page provides a rough cross cut of which agencies support research in each topic area to facilitate use of the Program Guide.

For additional or more detailed information on the programs described below, the reader should communicate with the points of contact listed. Furthermore, agencies are required to advertise their research opportunities prior to issuing a solicitation in the Commerce Business Daily (CBD), which is available electronically. Many agencies, such as NASA, also advertise solicitations via the Internet. Links to agency on-line sources can be accessed through the White House homepage. Its Uniform Resource Locator (URL) is: http://www.whitehouse.gov.

Finally, although some of the deadlines for submitting FY 1998 proposals have passed, they have been left here for informational purposes. Many of the research programs listed for FY 1998 will continue in FY 1999.

# Crosscut of Agency Research Programs by CENR Subcommittee Topics

| | Natural Disaster Reduction | Global Change | Air Quality | Ecological Systems | Toxics and Risk |
|---|---|---|---|---|---|
| National Science Foundation (NSF) | **X** | **X** | **X** | **X** | **X** |
| Environmental Protection Agency (EPA) | | **X** | **X** | **X** | **X** |
| Department of the Interior (DOI) | **X** | **X** | **X** | **X** | **X** |
| Department of Commerce/ National Oceanic and Atmospheric Administration (NOAA) | **X** | **X** | **X** | **X** | **X** |
| Department of Agriculture (USDA) | | **X** | **X** | **X** | **X** |
| National Institutes of Health (NIH) | | **X** | **X** | | **X** |
| Department of Energy (DOE) | | **X** | **X** | **X** | **X** |
| Department of Defense (DOD) | | | | **X** | **X** |
| National Aeronautics and Space Administration (NASA) | **X** | **X** | **X** | **X** | |
| Department of Transportation (DOT) | **X** | **X** | **X** | **X** | **X** |

# Department of Agriculture

USDA is responsible for ensuring a safe, healthy, abundant, and affordable food and fiber supply, while sustaining and enhancing the resource base. Over the last decade, USDA has faced challenges in the areas of water quality, biodiversity, and pest and disease control that have required new approaches to food production and renewable natural resource management. In response to these changing needs, opportunities have surfaced in new uses for agricultural and forestry products, biofuels and biomass energy, and recycling technologies.

## Types of Environment and Natural Resources Research Supported

**Global Change**. USDA focuses on understanding atmosphere/biosphere gas and energy exchange, altered carbon storage, effects of increased incidence of fire, insect and disease disturbance in forest ecosystems resulting from global change, and the response of terrestrial and aquatic ecosystems and their components (including agricultural crops) to physical and chemical changes in the atmosphere.

**Biodiversity and Ecosystems**. USDA supports research to understand how community composition and structure relate to function and sustainability. Specific research needs are to understand the interaction of the biological community, including its environment, and to identify sustainable management practices for forest, range, crop, and aquatic ecosystems.

**Toxic Substances**. USDA conducts and supports research on alternatives to chemical pesticides, such as crop rotations, and residue and waste management. This is part of USDA's larger Integrated Pest Management (IPM) initiative to develop environmentally benign methods to control pests and reduce pesticide risks.

**Water Resources**. USDA research is designed to improve watershed management systems and to reduce nonpoint source pollution due to the use of pesticides and fertilizers and from agricultural wastes.

**Air Quality**. Research focuses on technologies that reduce and control airborne particles from soil and fires, and fire safety. USDA also supports management research to help mitigate natural disaster repercussions.

## Research Funding Opportunities

### Cooperative State Research, Education, and Extension Service (CSREES)

The *National Research Initiative Competitive Grant Program* (NRICGP) within CSREES sponsors research in the areas of (1) natural resources and the environment, (2) nutrition, food safety, and health, (3) animals, (4) pest biology and management, (5) plants, (6) markets, trade, and rural development, (7) enhancing value and use of agricultural and forest products, and (8) agricultural systems research. Topics included under the natural resources and environment

category include plant responses to the environment; improved utilization of wood and wood fiber; soils and soil biology; and water resources assessment and protection. The topics in this area are a base from which proposals for both *Conventional Projects* (Standard Research Grants and Conference Grants) and *Agricultural Research Enhancement Awards* may be developed. The latter include Postdoctoral Fellowships, New Investigator Awards, and Strengthening Awards, as well as sabbatical awards and equipment and seed grants. These awards are intended to ensure that faculty of small and mid-sized academic institutions and institutions in the USDA-EPSCoR (Experimental Program for Stimulating Competitive Research) states receive a portion of available monies.

Potential applicants may obtain an NRICGP Application Kit from the following address: NRICGP,c/oProposalServices Unit/OEP/CSREES/USDA, STOP 2245, 1400 Independence Avenue, S.W., Washington, D.C. 20250-2245, (202) 401-5048. These materials may also be obtained via Internet by sending a message with your name, mailing address (not e-mail), phone number, and list of materials requested to psb@reeusda.gov. The materials will be mailed, not e-mailed. The NRICGP Web Site can also be consulted for information at the URL: http://www.reeusda.gov/nri.

Pending Congressional approval of budgets, deadlines for FY 1999 competitions in the natural resources and environment category are as follows:

· *Plant Responses to the Environment/Fo-rest/Range/Crop/Aquatic Ecosystems, Water Resources Assessment and Protection, and Soils and Soil Biology* - November 15, 1998

· *Improved Utilization of Wood and Wood Fiber* - January 15, 1999

Information on other deadlines can be obtained from the above NRI Web site.

Contact: Sally Rockey, (202) 404-1766, fax (202) 401-1782 (srockey@reeusda.gov)

· *Fund for Rural America* (FRA) - The 1996 Federal Agriculture Improvement and Reform Act (FAIR) established a 3-year FRA to be supported with $100 million per year. The USDA is to use FRA to address critical needs and to use cutting edge research to address a number of challenges ranging from the phasing out of agricultural support programs included in FAIR, trade liberalization, technological advances, and natural resources management to economic and demographic pressures on rural communities.

One-third of the FRA is earmarked for competitive research, education, and extension grants supported through the Cooperative State Research, Education and Extension Service; the second third is earmarked for USDA rural development programs; the last third can be used for either initiative at the Secretary's discretion. The last request for proposals (RFP) for the research component was published in the Federal Register on January 28, 1997. It calls for research, education and extension in the areas of: (1) international competitiveness, profitability, and efficiency; (2) environmental stewardship; and, (3) rural community enhancement. A peer review process will be used to make awards, with emphasis placed on multidisciplinary, multipartner research, education, and extension projects. The first Fund solicitation will support

standard project grants; Planning Grants for Centers Proposals may be submitted by Federal research agencies, national laboratories, colleges and universities, research foundations maintained by a college or university, and/or private research organizations.

The FY 1997 FRA included provision for research, education, and extension projects focused specifically on livestock concentration, food safety, phytonutrients and functional foods, and gleaning and food safety recovery. Please consult the FRA Web page http://www.reeusda.gov/fra/fra.htm for updated information.

Contact: Dr. Patrick O'Brien, (202) 401-6251

· *Interagency Partnership Opportunities* - The USDA participates in several competitively awarded programs which are planned an administered through interagency partnerships. These include:

The Joint Program on Terrestrial Ecology and Global Change (TECO), which is administered through USDA's National Research Initiative Competitive Grants Program (NRICGP) in partnership with NSF, DOE, NASA and NOAA. Visit the web site at http://teco.orln.gov/TEC for more information.

Contact: Dr. Anne Datko, (202) 401-4921, (adatko@reeusda.gov).

The Water and Watersheds Program, which is administered through CSREES' Natural Resources and Environment program area in partnership with NSF and EPA. Visit the web site at http://es.epa.gov/ncerqa/rfa/wshed.html for more information.

Contact: Dr. Maurice Horton, (202) 401-4504, (mhorton@reeusda.gov).

**Forest Service**

The Forest Service supports research to develop scientific information and technology needed to protect, manage, use, and sustain the Nation's 1.6 billion acres of public and private forest and rangelands. The Forest Service conducts research through a network of six regional Forest Experiment Stations, a national Forest Products Laboratory, and the International Institute of Tropical Forestry. Approximately 550 research scientists are organized into Research Work Units at 67 locations. Programs are organized under four broad research areas, each of which includes several activity categories:

· *Vegetation Management and Protection* - This activity involves long-term studies of management practices; alternative management for major forest types; growth, yield, and cultural practice; cost reduction and environmental impact of forest operations; and ways to reduce the impacts of unwanted fires, insects, and diseases. Categories requiring attention include fundamental plant sciences, silvicultural applications, quantitative analysis of forest vegetation, rangeland ecology, agroforestry, forest operations, insect ecology, and prevention and control of insects, diseases, and exotic weeds.

· *Wildlife, Fish, Watershed, and Atmospheric Sciences* - This activity involves research to increase understanding of organisms, ecosystems, and ecological processes. General areas of high-priority research include the analysis of watershed processes and functions;

the analysis of freshwater aquatic communities and habitat; the effects of management on habitat condition for recovery of threatened, endangered, and sensitive plant and animal species; ecosystem response to atmospheric factors such as temperature, precipitation, and chemical composition; and analysis and restoration of riparian communities. Activity categories within this area include wildlife habitat, aquatic habitat, watershed, and atmospheric sciences.

· *Resource Valuation and Use*: Research is - supported to assess the conditions, trends, and capability of forest and rangeland resources; to estimate current and anticipated demands for these resources; and to integrate social, economic, and biological factors to ensure sustainability of the natural resource while meeting people's needs. Activity categories within this area include renewable resources economics; urban forestry; wilderness, recreation, and cultural heritage resources; and forest product use and safety.

· *Resources Inventory and Monitoring* - The Forest Service provides long-term baseline resource data and a scientific basis to assess current extent, condition and outlook for our nation's forest resources. Activity categories within this area include forest inventory and analysis, forest health monitoring, and inventory and monitoring techniques.

**Global Change Research**. The Forest Service is an integral participant in the U.S. Global Change Research Program. Forest Service research efforts relative to global change are highly integrated and consist of a broad spectrum of studies relating to forest and range ecosystems.

In FY 1997, the Forest Service awarded $18.4. million to support grants, cooperative agreements, and contracts to colleges, universities, States, and other research organizations.

Cooperative agreements are used to form partnerships to more efficiently conduct mission-related research. These agreements are generally determined on a scientist-to-scientist basis where funding, need, and expertise co- exist. Cooperative agreements are intended to complement internal Forest Service research efforts, with funding generally deployed for short-term studies and to acquire specific expertise or resources. Cooperators must submit progress reports, approval of which is usually a condition for
continued funding. Funding decisions are made by Research Work Unit Project Leaders in coordination with Forest Experiment Station headquarters.

Some research grants and contracts are solicited on a competitive basis. Funding decisions are made by Forest Service scientists and Experiment Station management in accordance with applicable regulations.

Formal RFPs are issued annually for targeted research on the global change issue. The request for and competitive selection of research proposals is coordinated nationally, but RFPs are issued separately for the northeast, southeast, southwest, and northwest regions of the country.

Information on cooperative agreements, grants, and contracts, as well as the Forest Service Global Change program can be obtained by contacting any of the stations listed below:

North Central Forest Experiment Station
1992 Folwell Avenue
St. Paul, MN 55108
(612) 649-5000

Northeastern Forest Experiment Station
5 Radnor Corp. Center, Suite 200
P.O. Box 6775
Radnor, PA 19087-4585
(610) 975-4222

Pacific Northwest Research Station
333 S.W. 1st Avenue
P.O. Box 3890
Portland, OR 97208
(503) 326-3592

Pacific Southwest Forest and Range Experiment Station
800 Buchanan Street , West Bldg.
Albany, CA 94710
(510) 559-6300

Rocky Mountain Forest and Range Experiment Station
240 West Prospect Road
Fort Collins. CO 80526-2098
(970) 498-1100

Southern Research Station
P.O. Box 2680
Asheville, NC 28802
(704) 257-4300

Forest Products Laboratory
One Gifford Pinchot Drive
Madison, WI 53705-2398
(608) 231-9200

International Institute of Tropical Forestry Call Box 25000
UPR Experimental Station Grounds

Rio Piedras, PR 00928-2500

**Agricultural Research Service (ARS)**

The Agricultural Research Service (ARS) is the principal in-house research agency of the U.S. Department of Agriculture (USDA). It is one of the four component agencies of the Research, Education, and Economics (REE) mission area.

The vision of ARS is to lead America toward a better future through agricultural research and information, and the mission of the agency is to conduct research to develop and transfer solutions to agricultural problems of high national priority and provide information access and dissemination to: ensure high-quality, safe food, and other agricultural products; assess the nutritional needs of Americans; sustain a competitive agricultural economy; enhance the natural resource base and the environment; and provide economic opportunities for rural citizens, communities, and society as a whole.

ARS research has long been associated with higher yields and more environmentally sensitive farming techniques. The impact of ARS research extends far beyond the farm gate and the dinner table. Agricultural research is as much about human health as it is about improving crops and livestock through both modern adaptations of traditional breeding methods and new biotechnology techniques.

ARS research provides solutions to a wide range of problems related to agriculture problems requiring long-term commitment of resources or those problems unlikely to have solutions with quick commercial payoff that would tempt private industry to do the research. These problems range from the ongoing battle to protect crops and livestock from costly pests and diseases, to improving quality and safety of agricultural commodities and products, determining the right mix of nutrients for humans from infancy to old age, making the best use of natural resources, and ensuring profitability for producers and processors while keeping costs down for consumers.

To develop these solutions, ARS scientists carry out basic, applied, and developmental research, which are inextricably linked. Scientists cannot do applied and developmental research without the foundation provided by basic research; ARS basic research must point toward specific uses for new knowledge resulting from the research. Also, basic research is necessary in anticipation of new problems and to provide information needed for rational nationwide policies.

ARS serves a multitude of customers and stakeholders, including USDA and Congress, by communicating research results and transferring new technologies from ARS to other scientists, institutions of higher education, producers, product and process developers, consumers, policy makers, legislators, and other end users through: publications; conferences, workshops, and consultations; and partnerships and patent licenses.

**ARS National Programs**

ARS is aggregating its research activities into a number of National Programs that will soon be available on the ARS homepage which can be accessed at http://www.ars.usda.gov. Beginning on or about February 1, 1998, narrative descriptions of each program will be available for public review and comment. The following is a list of the titles of the proposed National Programs:

| Animal Production, Product Value and Safety | Natural Resources and Sustainable Agricultural Systems | Crop Production, Product Value and Safety |
|---|---|---|
| Animal germplasm, resources, conservation & development | Water quality and management | Plant microbial & insect germplasm conservation and development |
| Animal production systems | Soil quality and management | Improving plant biological & molecular processes |
| Animal diseases | Air quality | Plant diseases |
| Animal pests & parasites | Global change | Crop & commodity pest biology, control & quarantine |
| Animal Well- being and stress control systems | Grazing lands management | Integrated crop production and protection systems |
| Animal product development, quality, & marketability | Animal manure, waste utilization & management | Plant product development, quality & marketability |
| Aquaculture | Integrated farming systems | Bioenergy & energy alternatives |
| Human nutrition requirements, food composition, and intake | | Methyl bromide alternatives* |
| Food safety (animal products) | | Food safety (plant products) |

* Temporary National Program

## Technology Transfer

ARS frequently establishes partnerships with companies and other institutions to develop and transfer new technologies to potential users through Cooperative Research and Development Agreements (CRADAs) and patent licenses. These activities expedite the commercialization of agricultural technologies. Approximately 750 CRADAs have been set up with industry to date; some of these have already led to new commercial products and processes. More than 200 licenses of ARS- developed technologies are currently in place, primarily permitting private industries to make, use, and sell ARS-patented products or processes. ARS technology transfer has had a positive impact on small and rural businesses. ARS gives first preference to exclusive licenses of its technology to small businesses; more than half of the Agency's current licenses and CRADAs are with small, rural, and/or minority- or women-owned businesses, and a similar number of small and/or rural companies were created based on patented ARS technologies.

Contact: K.D. Murrell, Deputy Administrator, National Program Staff, (301) 504-5084, fax (301) 504-7302.

# Department of Commerce
# National Oceanic and Atmospheric Administration

The National Oceanic and Atmospheric Administration (NOAA) mission includes two equally important components: 1) Promoting global environmental stewardship to conserve and wisely manage the Nation's marine and coastal resources; and, 2) describing, moni-toring, and predicting changes in the Earth's environment.

## Types of Environment and Natural Resources Research Supported

**Long-Term Monitoring of the Oceans and Atmosphere**. NOAA provides both satellite and *in situ* observations, data, and information necessary to understand the Earth system, to assess changes to that system, and to predict future changes. NOAA's polar-orbiting and geostationary satellites provide continuous, long-term, quality environmental observations of the high seas, upper and lower atmosphere, and land areas to sustain major science programs involving global monitoring, sustainable development, climate change, coastal and marine resources, and natural disasters. NOAA data and observations will comprise a significant component of the U.S. contribution to an international global observing system.

**Forecasting and Predicting the Future State of the Atmosphere**. Air quality research focuses on gaining a fundamental understanding of the atmospheric processes that must be characterized for credible and useful predictions. The primary issues that NOAA addresses are surface-level ozone, acidic deposition, and visibility. NOAA also addresses two important research aspects of global climate change and stratospheric ozone depletion. NOAA has a significant role in operational observation, research, prediction, and information management efforts for the national global change effort.

**Social and Economic Sciences Research**. This area of study focuses on the human dimensions of global change and the relationship of near-term climate forecasts and their impact on the economy. NOAA provides forecasts and warnings of various natural hazards related to the atmosphere and ocean, to better understanding of the underlying environmental processes, and predictive methodologies for natural hazards. NOAA provides flood and hydrological forecasts and warnings for the protection of life and property. Research is geared to advanced water quantity forecasting.

**Monitoring Renewable Marine Resources and Their Attendant Uses**. NOAA pursues a multidisciplinary approach to enhance the ability of scientists and managers to identify, understand, and manage anthropogenic impacts to marine ecosystems against a background of natural system variability. NOAA's social and economic sciences research focuses on the social and economic impacts of fisheries management and damage assessment methodologies.

**Coastal and Marine Observations, Modeling, Assessment, Ecosystem Prediction, and Information Management**. Ongoing research includes remote sensing, modeling of oceanic and near-shore processes, developing key indicators of coastal and marine ecosystem health, effects

of cumulative impacts on coastal and marine environments, and environmental valuation and human dimensions research.

**Research on and Management of Marine Ecosystems and Their Biodiversity**. Research in this area includes surveying and monitoring the abundance of and trends in marine biota; measuring and evaluating the impacts of pollution, exotic species, and habitat degradation on marine biodiversity and ecosystem integrity; and understanding and generating models to simulate large-scale marine ecosystems. NOAA's role extends to the restoration of degraded ecosystems and establishment and management of marine and estuarine sanctuaries and reserves.

## Research Funding Opportunities

### Coastal Ocean Program

The Coastal Ocean Program (COP) Office regularly issues funding announcements to support multi-investigator, multidisciplinary projects in modeling, process studies, observations, and synthesis. The goal of these efforts is to better understand ecosystem processes to improve the management of coastal resources and to develop the scientific basis for improved coastal ocean forecasting to protect lives, property, and resources. These Announcements of Opportunity (AO) are distributed widely, electronically and otherwise, to Government agencies, academia, and to the general scientific and management com-munities; they are also posted on the COP homepage http://hpcc.noaa.gov/cop/ Each announcement on project goals includes detailed instructions how to apply, application requirements, and points of contact for additional information. The COP Office does not accept unsolicited proposals.

Coastal ecosystem research studies focus on regional-scale systems, investigate high-priority coastal ecosystem issues, and develop tools and information for use in management and policy decisions. These projects seek to develop an understanding of the factors that influence fish population levels, of the cumulative effects of multiple stressors on coastal ecosystems, and of the causes and impacts of current coastal ocean problems, such as harmful algal blooms. The general life-cycle designs of the projects are 4 to 6 years, and are intended to develop a fundamental understanding of ecosystems or processes; relate that understanding to decision makers; and develop useful methods or tools for application of that scientific understanding.

Present and planned efforts are:

*ECOHAB (Ecology and Oceanography of Harmful Algal Blooms)* - COP is leading NOAA's effort in this new emphasis in coastal ocean science research. Because of the escalating importance of understanding harmful algal blooms and the number of Federal agencies with responsibilities in this research area, an Interagency Working Group has developed a Harmful Algal Bloom Initiative. The ECOHAB program began in FY 1997 and includes NOAA, NSF, the Office of Naval Research, and EPA.

*Florida Keys Cumulative Effects of Multiple Stressors* - This study is developing indicators of stress for key organisms and characterizing the effects of these stresses on Keys' ecosystems. Research is being conducted that analyzes impacts of both human-induced and natural stressors with particular attention to over-fishing, temperature, salinity, coastal storms, turbidity and sedimentation, and nutrients. The goal is to integrate this information into a process-oriented, ecosystem-level model useful for management.

*Global Ecosystem Dynamics (GLOBEC), Northeast Pacific Ocean Study* - This is a joint research effort with NSF. The goals of U.S. GLOBEC in the Northeast Pacific are (1) to understand the effects of climate variability and climate change on the distribution, abundance, and production of marine animals (including salmon and other commercially important living marine resources) and (2) to embody this understanding in predictive models capable of elucidating ecosystem dynamics and responses. The area of study extends along the west coast of North America from Point Conception, California to Shelikof Strait, Alaska. (Canada has a complementary program underway for Canadian waters). Research results will be provided routinely through the National Marine Fisheries Service (NMFS) Southwest, Northwest, and Alaska Fishery Science Centers to their regional Fishery Management Councils and others responsible for the management and restoration of important fisheries in the region.

*Global Ecosystem Dynamics* (GLOBEC), *Northwest Atlantic Study* - Northwest Atlantic GLOBEC is a large multidisciplinary, multi-year oceanographic effort jointly funded by NSF and NOAA/COP. Its goals are to predict changes in the distribution and abundance of key planktonic species as a result of changes in the physical and biotic environment, and to anticipate how plankton populations might respond to climate change. The COP Georges Bank Predation Study, which has been integrated with the GLOBEC study, focuses on higher trophic levels. Its goals are to develop multispecies models of the synergistic effects of predation and exploitation on fish community dynamics and to evaluate the consequences of alternative harvesting strategies on yield, productivity, and community structure. Together, these studies explore both natural and anthropogenic sources of variability in Georges Bank fish populations and will assess fishery ecosystem recovery times. Major users of data from the joint study are the Northeast Fisheries Management Council and other coastal resource managers.

*Great Lakes Ecosystem Regional Study* - Several areas in the Great Lakes have been identified by the International Joint Commission as a Great Lakes Area of Concern. Major factors in the degradation of the Great Lakes are nutrient enrichment, sedimentation, and toxic contamination. This joint NSF-COP program plans to develop and test strategies for assessing and predicting impacts of multiple stressors to evaluate the importance of nonpoint source pollution and episodic events; a model of how the ecosystem behaves under stress; and a management model for resource and habitat issues.

*Pacific Northwest Coastal Ecosystem Regional Study (PNCERS)* - This study focuses on the perception that large-scale declines of some key fisheries resources suggest a systemic problem in addition to better known local and isolated factors. PNCERS will develop ecosystem models relating the effects of land use, coastal dynamics, and natural and human stressors on coastal-dependent resources. Additional focus will be placed on the social and economic impacts of management practices.

*Patuxent River Ecosystem Cumulative Effects Study* - This project is developing a framework for understanding, predicting, and managing the effects of multiple stressors on a representative system, the Patuxent River, a sub-estuary of the Chesapeake Bay, which has been degraded. The research objectives are to determine the current cumulative effects of toxic inorganic elements

and excess nutrients on the Patuxent River system; how ecological complexity, variability, and spatial structure affect the response of this system to multiple stressors and the ability of managers to predict that response; and how management options may affect both the biota and the economic value of the system.

*South Florida Ecosystem Restoration, Prediction and Modeling* - COP's involvement in South Florida Restoration is part of a larger interagency effort to restore water quality and ecosystem integrity to all of South Florida. COP's program will conduct empirical studies, develop and run models, assess risks, and evaluate the ecological response of the South Florida coastal marine ecosystem. It will also include an education and outreach effort.

*Southeast Bering Sea Carrying Capacity Study (SEBSCC)* - Responding to recommendations from the National Research Council, this expanded study is a follow-on to the Bering Sea Fisheries-Oceanography Coordinated Investigation (BS-FOCI). It is exploring the linkages among environmental factors; pollock recruitment, growth rates, and predation; and distribution and relationships among key ecosystem components. A particular focus is ecosystem-wide resource dynamics, particularly the role of pollock as a key species in the ecosystem. Like BS-FOCI, research results are routinely provided through the NMFS Alaska Fishery Science Center to the Northwest Pacific Regional Fishery Management Council and to the broader community through the Internet and other means.

**FY 1998 COP Funding Opportunities**:

*Ecology and Oceanography of Harmful Algal Blooms*

To view opportunities that are currently open, visit the COP Website at: http://hpcc.noaa.gov/cop/.

Contact: Donald Scavia, Director, NOAA Coastal Ocean Office (NCOP), 1315 East West Highway, Silver Spring, MD (dscavia@cop.noaa)

**Climate and Global Change Program**

NOAA's Climate and Global Change Program is a key contributing element of the U.S. Global Change Research Program and is designed to complement other agency contributions to that national effort. Current program plans assume that over 50% of the total resources for this program will support extramural efforts. Program Announcements are issued annually for projects to be conducted by investigators both inside and outside of NOAA, primarily over 1-, 2-, or 3-year periods. All submissions should be directed to the Office of Global Programs (OGP), National Oceanic and Atmospheric Administration, 1100 Wayne Avenue, Suite 1225, Silver Spring, MD 20910-5603.

General Contact: Irma duPree, (301) 427-2089, ext. 17, fax (301) 427-2073, (duPree@ogp.noaa.gov)

NOAA maintains a balanced program of observations that includes analytical studies, climate prediction, and information management. There are ongoing efforts *in situ* and satellite observations with an emphasis on oceanic and atmospheric dynamics (including sea level), circulation and chemistry, and development of new measurement techniques. Research is supported on ocean-atmosphere interactions, the global hydrological cycle, the role of ocean circulation and biogeochemical dynamics in climate change, atmospheric trace gas/climate interactions, and the response of marine ecosystems and living resources to climate change and related stress. Efforts to improve climate modeling, prediction, and information management capabilities are also supported, as are global change economics, human dimensions research, archival management, and dissemination of data and information useful for global change research.

Related NOAA activities include advance short-term forecast and warning services; prediction, observation, and process research in implementing seasonal to interannual climate forecasts; prediction and assessment of decadal to centennial environmental change; facilitating the dissemination of global change information; and strengthening facets of environmental technology. The DOC's National Institute of Standards and Technology (NIST) also has ongoing programs in atmospheric chemistry, physical properties of chlorinated fluorocarbon (CFC) alternatives and engineering design for systems utilizing CFC alternatives.

Contact: Lisa Farrow, NOAA/Office of Global Programs, (301) 427-2089, ext. 25, fax (301) 427-2082 (farrow@ogp.noaa.gov)

**Climate and Global Change Program Opportunities**

In FY 1998, NOAA will give priority attention to individual proposals in the areas listed below. Investigators are asked to specify clearly which of these areas is being pursued. The names, affiliations, and phone numbers of relevant Climate and Global Change Program Officers are provided. Funding for some programs may be limited to ongoing projects or may be used to fund projects proposed in FY 1997 that were unable to be funded due to unusual budgetary circumstances. New opportunities are expected to be funded in 1998, full proposals were due in August, 1997.

Prospective applicants should communicate with Program Officers for information on priorities within program elements and prospects for funding. Proposals should be sent to the NOAA Office of Global Programs rather than to individual Program Officers, unless specifically stated otherwise in the program descriptions below.

*Atlantic Climate Change/World Ocean Circulation Experiment* - The goal of this program is to determine the nature and influence of interactions between the meridional circulation of the Atlantic Ocean, sea surface temperature and salinity, and the global atmosphere. In FY 1998, new opportunities are expected to be funded.

Contact: James Todd, NOAA/OGP, (301) 427-2089, ext.32 (todd@ogp.noaa.gov)

*Aerosols* - The Aerosols Project focuses on research to improve the predictive understanding of the role of anthropogenic aerosols in climate forcing. Due to limited funds anticipated in FY 1998, all funding is expected to be used to maintain support for ongoing research activities. Unfortunately, therefore, we are unable to seek applications to fund new starts.

Contact: Joel Levy, NOAA/OGP, 427-2089, ext. 21 (levy@ogp.noaa.gov)

*Atlantic Climate Change Program (ACCP)* - This program examines the climate variability that has come into focus in the past few years, with the North Atlantic Oscillation and the Atlantic tropical sea surface temperature +dipole- playing a central role.

Contact: James Todd, NOAA/OGP, (301) 427-2089, ext.32 (todd@ogp.noaa.gov)

*Atmospheric Chemistry* - The Atmospheric Chemistry Project focuses on global monitoring, process-oriented laboratory and field studies, and theoretical modeling to improve the predictive understanding of atmospheric trace gases that influence the Earth's chemical and radiative balance.

Contact: Joel Levy, NOAA/OGP, (301) 427-2089, ext. 21 (levy@ogp.noaa.gov)

*Climate Change Data and Detection* - The scientific goals of this element include efforts to (1) provide data and information management support (i.e., data assembly, processing, inventory, access, distribution, and archiving) for a variety of national and international programs of primary interest to NOAA's Climate and Global Change Program; (2) provide data and information management support related to cross-cutting science efforts necessary to assess seasonal, interannual, decadal, and longer climate variations; (3) document the quantitative character of observed climate variations and changes; and (4) attribute changes in the observed climate record to specific climate forcings.

Contacts: Tom Karl, NOAA/NESDIS /National Climatic Data Center, Asheville, NC, (704) 271-4319, (tkarl@ncdc.noaa.gov); Bill Murray, NOAA/OGP, (301) 427-2089, ext. 26 (murray@ogp.noaa.gov); Chris Miller, NOAA/NESDIS, (301) 713-1264, (miller@esdim.noaa.gov)

*Climate Dynamics and Experimental Prediction* - The Geophysical Fluid Dynamics Laboratory-University Consortium is an Applied Research Center that increases the involvement of the university community in studying atmospheric variability and predictability by critically analyzing model output generated at the NOAA Geophysical Fluid Dynamics Laboratory.

Contact: Mark Eakin, NOAA/OGP, (301) 427-2089, ext. 19 (eakin@ogp.noaa.gov)

*Climate Observations* - This program element focuses on ocean, atmosphere, and land surface climate observations, measurement systems, and techniques. Within the ocean focus, we are currently working to develop an interagency program addressing integrated ocean observations; applications will be solicited under a separate call for proposals.

Contact: Bill Murray, NOAA/OGP, (301) 427-2089, ext. 26 (murray@ogp.noaa.gov)

*Economics and Human Dimensions of Climate Fluctuations* - This program element is aimed at understanding how social and economic systems are currently influenced by fluctuations in short-term climate (seasons to years), and how human behavior can be (or why it may not be)

affected based on information about variability in the climate system.

Contacts: Claudia Nierenberg or Caitlin Simpson, NOAA/OGP, (301) 427-2089, ext. 46, (nierenberg@ogp.noaa.gov) or (301) 427-2089, ext. 47 (simpson@ogp.noaa.gov)

*Education* - The principal objective of the Climate and Global Change Education Program is to develop innovative and creative methods for educating community leaders and the general public concerning current knowledge on climate and global change issues, such as natural climate variability, ozone depletion, greenhouse warming, marine and terrestrial response, and sea level rise. This program is not seeking new starts in FY 1998 due to limited funding, but will accept applications for renewal of funding for ongoing activities.

Contact: Daphne Gemmill, NOAA/OGP, (301) 427-2089, ext. 20 (gemmill@ogp.noaa.gov)

*Global Energy and Water Cycle Experiment (GEWEX)* - NOAA's principal contribution to GEWEX will be directed at improving our understanding of physical processes associated with the transfer of heat, moisture, and momentum across the land/atmosphere interface and through the atmospheric boundary layer. Particular emphasis will be placed on issues involving integration of these processes in climate models. In addition to issuing joint calls for the GEWEX Continental Scale International Project with NASA, NOAA is also participating in the interagency Joint Program on Terrestrial Ecology and Global Change (TECO) as part of the USGCRP.

Contact: Rick Lawford, NOAA/OGP, (301)427-2089, ext.40 (lawford@ogp.noaa.gov)

*Global Ocean-Atmosphere-Land System* (GOALS) - The objectives of the GOALS Program are to understand global climate variability on seasonal-to-interannual time scales, to determine the extent to which this variability is predictable, develop the observational, theoretical, and computational means to predict this variability, and make experimental predictions within the limits of proven feasibility. GOALS is intended to build upon the El Nino/Southern Oscillation research of the World Climate Research Program's (WCRP) Tropical Ocean Global Atmosphere program completed in 1994, to extend predictability of seasonal to interannual fluctuations beyond the tropical Pacific and include the effects of the other tropical upper oceans, higher latitude upper oceans, and land surface processes.

Contact: Michael Patterson, NOAA/OGP, (301)427-2089, ext. 12 (patterson@ogp.noaa.gov)

*Ocean-Atmosphere Carbon ExchangeStudy (OACES)* - This program is part of NOAA's contribution to the Joint Global Ocean Flux Study and is a continuing effort aimed at improving our understanding of the role of the ocean in sequestering the increasing burden of anthropogenically-derived carbon dioxide in the atmosphere.

Contact: James F. Todd, NOAA/OGP, (301) 427-2089, ext. 32 (todd@ogp.noaa.gov)

*Paleoclimatology* - The NOAA Paleocli-matology Program will entertain proposals that support the new collaboration between the International Geosphere-Biosphere Program's program in Past Global Changes with WCRP's Climate Variability and Predictability (CLIVAR) Research Initiative, which is being jointly supported by NOAA and NSF.

Contacts: Mark Eakin, NOAA/OGP, (301) 427-2089, ext. 19 (eakin@ogp.noaa.gov) or Jonathan Overpeck, NOAA/National Global Data Center, Boulder, CO, (303) 497-6172, (jto@mail.ngdc.noaa.gov)

**National Sea Grant College Program**

The National Sea Grant College Program sponsors research, education, training, and extension activities in order to increase the understanding, development, and wise use of ocean, coastal, and Great Lakes resources. The Secretary of Commerce, through NOAA, awards grants on a competitive basis for these purposes. One-third of the total grant award must come from non-Federal matching funds. The Federal appropriation for FY 1998 was $56 million. The core of the program is carried out through a network of 29 Sea Grant College Programs, located in coastal and Great Lakes states and in Puerto Rico, involving hundreds of universities nationwide. Applicants should contact the Sea Grant College Program in their area or the National Sea Grant Office in NOAA, 1315 East West Highway, Silver Spring, MD 20910, (301) 713-2448, fax (301) 713-0799.

The National Sea Grant College Program supports a broad array of research, education, and outreach activities related to the environment and natural resources, as described below.

**Economic Leadership.** Sea Grant research, education, and extension programs produce scientific knowledge and technology required to strengthen U.S. leadership in ocean and marine-related industries and to enhance the social, environmental, and economic well-being of coastal communities:

*Commercial Biotechnology* - Sea Grant contributes to economic development, especially in the pharmaceutical, chemical, and seafood industries, by using the tools of biotechnology. Research and technology transfer programs develop fundamental knowledge of natural products and processes of marine organisms to provide models for new commercial products and new approaches to industrial processing and bioprocessing.

*Environmental Technology* - Sea Grant develops technologies that enhance environmental monitoring and assessment required to improve policy making, to prevent and control pollution, and to restore polluted areas. Emphasis is on development of instrumentation and autonomous platforms for remote sensing and sampling of environmental features; technology and biotechnology that reduces or eliminates pollutant discharge in waste streams, such as seafood processing and aquaculture facilities; and processes that restore or remediate contaminated Great Lakes and coastal waters and sediments.

*Ecosystem-Based Fisheries Management* - Assessing the status of fisheries resources for sustained profitability must incorporate knowledge of ecosystems. Sea Grant research is focused on improving prediction of future fishery yields through development of better assessment tools to account for population changes, natural and human causes of change in the environment, and species interactions.

*Assessing the Social and Economic Aspects of Fisheries Management* - Declining stocks have led to increased competition for available resources. Identification of feasible and effective management tools is a high priority. Sea Grant, through research and information transfer, helps fisheries managers, industry, and coastal communities understand the social, economic, and legal impacts resulting from new management strategies.

*Minimizing Bycatch* - Although the ecosystem implications of fishery bycatch are not well understood, there is growing evidence of its detrimental effects in some of the Nation's fisheries. In addition, there is the unwanted capture of marine mammals, endangered or threatened species, and commercial fish allocated to other fisheries. Sea Grant research continues to evaluate the efficacy of devices and practices designed to minimize bycatch, to improve the economic return to the industry by more effective harvest of target species, and to conserve protected species.

*Enhancing Wild Stocks through Aquaculture* - Sea Grant research is focused on developing technology for using aquaculture to enhance natural populations of key aquatic species and on evaluating the technical and economic feasibility of this approach to stock restoration.

*Improve Aquaculture Production Systems* - Coastal aquaculture industries are confronted by limited water supply and quality, competition from other resource users, and a host of environmental obstacles. Sea Grant research focuses on aquaculture systems, including offshore cages and pens, high-density recirculating systems for onshore production, and practices required to reduce harmful impacts on coastal systems, to provide sustained water quality and reduce nearshore conflicts.

*Improve Aquaculture Husbandry* - Sea Grant research seeks to improve brood stock and to meet the demand for reliable seed stocks. It targets genetics, physiology, disease diagnosis and control, nutrition, biotechnology, and systems management.

*Seafood Quality and Safety* - Sea Grant works with seafood processors to develop techniques to decrease costs and ensure high-quality products. These include implementation of efficient manufacturing processes, use of biochemical techniques to determine food quality, and education of consumers, media, and public health officials on issues of seafood safety.

*Seafood Processing Technology and Practices* - To remain competitive, domestic processors must increase efficiency through technological improvements in processing, storage and transportation, and control of costs through improved worker efficiency and reduced accidents

and lost time. Priority research topics include improving energy and processing efficiency in production of fresh, frozen, and canned products; using automation in production; and improving technology for storing and transporting seafood.

*Seafood Waste Management and Byproduct Recovery* - New techniques are required to cut down the wastes from processing, including those for increased byproduct recovery and for treatment of residual waters. Sea Grant develops technology for water conservation, waste management, effluent control, and recovery of byproducts such as enzymes, hormones, and aquacultural feed.

*Seafood Product Development* - Cultured and wild-harvested marine resources provide opportunities to expand markets for seafood by developing new products and product forms. Sea Grant researchers develop technology for producing high-quality products from under-utilized and mixed species, especially those with potential to replace depleted traditional species.

**Coastal Ecosystem Health and Environmental Safety.** Sea Grant strives to protect and enhance coastal ecosystem health as the basis for sustained growth of the coastal economy. Goals include improved water quality in coastal and Great Lakes ecosystems; high-quality habitats for living marine resources; a prosperous and environmentally sound seafood production and processing sector; and the integration of the physical, natural, and social sciences in the development of resource management policies.

*Contaminants* - Control of toxic substances and their elimination from the environment is a fundamental requirement for sustaining coastal ecosystems and their resources. Sea Grant emphasizes research on contaminant sources, trends, transport, fate, and effects.

*Eutrophication* - Sea Grant researchers continue to investigate the causes and consequences of eutrophication in coastal and estuarine waters and to work with policy makers to identify cost-effective alternatives for control.

*Biotoxins* - Sea Grant, in close collaboration with public health officials, seeks to develop new methods for detecting these toxic compounds and for conducting the ecological research needed to predict and mitigate outbreaks.

*Habitat Loss and Modification* - Sea Grant, in collaboration with scientists from the NMFS and regional and State resource agencies, seek a better understanding of the role estuarine and coastal habitats play in maintaining the health of living marine and Great Lakes resources.

*Nonindigenous Species* - Using tools from engineering, biotechnology, ecology, and genetics, Sea Grant researchers help identify nonindigenous organisms and their life cycle and ecological relationships. With outreach specialists, Sea Grant entrains Government and industry participation to develop cost-effective, environmentally sound management strategies.

*Coastal Development* - Population density and growth continues to place extraordinary demands on coastal communities. To help minimize the impact of coastal hazards, Sea Grant evaluates

alternative policies (e.g., building codes, legal provisions, economic incentives) and works closely with community leaders to assess their role in hazard reduction.

*Human Dimensions of Coastal Change* - Sea Grant develops new approaches for evaluating the effectiveness of policies and management approaches to coastal resources; assesses the usefulness of new tools and management approaches; analyzes and provides alternatives for the resolution of conflicts between coastal resource users; and assesses the capacity of legal and management schemes to deal with the issues critical to sustaining coastal ecosystem health and economic vitality.

**Education and Human Resources.** Sea Grant draws on its partnership of people, universities, government, and business to inform and educate citizens about the oceans and their resources, and to provide the advanced education required to ensure the contributions of a technically trained work force. Two strategic needs have been identified: development of a highly trained work force and enhanced scientific and environmental education. To address these needs, Sea Grant focuses on four main audiences: 1) precollege teachers; 2) students in undergraduate and graduate science, engineering, and policy programs; 3) adults whose occupations are tied to marine and coastal resources (commercial and recreational fishers, resource planners, coastal developers, government decision makers); and 4) the general public:

*Scientists and Engineers* - The Nation requires a reliable supply of qualified scientists and engineers in marine and coastal fields, and Sea Grant provides fellowships and research assistantships to highly qualified students. In addition, Sea Grant has initiated an industrial fellowship program in which qualified graduate students conduct research within a corporate setting under both academic and industrial supervision.

*Resource Managers* - To meet the growing need for policy and resource managers at all levels of government, Sea Grant is increasing the number of decision makers with post-graduate education in natural resource management; developing workshops that teach integrated ecosystem management techniques to local decision makers using advanced technologies; and developing outreach programs to address merging coastal resource issues such as habitat restoration and water pollution.

*Technical Training* - With realignment of the U.S. economy away from primary manufacturing and natural resource extraction, a need exists to focus human resource development on the emerging industrial and service sectors related to marine industry. Sea Grant develops training, retraining, and job-to-work programs for employees of marine industries (such as boat building, marine electronics, aquaculture, and recreation and tourism).

*Precollege Education* - The precollege (kindergarten through grade 12) educational system has not met the U.S. need for informed graduates in science and mathematics. During the coming decade, Sea Grant educators will design, implement, and assess education programs to complement the national systemic initiatives to improve K-12 education. The goal is to provide current research-based marine and coastal information and curricula that reflect a

multidisciplinary base, as well as a focus on issues relevant to local communities and ecosystems.

Sea Grant marine education has always stressed the natural sciences but included other disciplines such as the social sciences, humanities, and the arts. The principle vehicle for transferring this knowledge concentrates on teaching the teacher through training and direct outreach to classrooms. Through programs such as Operation Pathfinder, Sea Grant makes special efforts to include minority teachers, teachers of minority students, and particularly students from economically disadvantaged backgrounds.

**National Undersea Research Program**

The National Undersea Research Program (NURP) is the nation's only program dedicated to advancing undersea research in the oceans and Great Lakes. The NURP mission is to advance undersea exploration and experimentation in support of NOAA's national research priorities. A national network of regional research centers in partnership with NOAA headquarters in Silver Spring, MD helps place scientists underwater using state-of-the-art submersibles, an underwater laboratory, specialized diving gear, and remotely operated vehicles. The Federal appropriation for FY 1998 was $15.5M.

The headquarters office coordinates research in support of the entire program that deals with human diving safety, undersea technology, or areas of international cooperation. The regional centers listed below support undersea research relating to building sustainable fisheries, sustaining healthy coasts, predicting and assessing decadal to centennial change, and short term warnings and forecasts. General support of at-sea operations including submersible time, supplies and some limited salary is provided. Proposals are competitively reviewed and are submitted in response to announcements.

Requests for support may be made by scientists and engineers at universities or research institutions. For further information applicants should contact the National Undersea Research Center in their region or NURP headquarters in NOAA. NURP also maintains a homepage that provides information on its programs. The homepage URL is: http://www.ucc.uconn.edu/~wwwnurc/nurp.html.

**Headquarters Office:** National Undersea Research Program, 1315 East-West Highway, Silver Spring, MD 20910, (301) 713-2427, fax (301) 713-1967.

**Regional Centers:**

*North Atlantic and Great Lakes:* National Undersea Research Center, University of Connecticut -Avery Point, 1084 Shennecossett Road, Groton, CT 06340, (860) 405-9121, fax (860) 445-2969

*Southeastern U.S., Gulf of Mexico:* National Undersea Research Center, University of North Carolina -Wilmington, 7205 Wrightsville Avenue, Wilmington, NC 28043, (910) 256-5133, ext. 265, fax (910) 256-8856

*Mid-Atlantic:* National Undersea Research Center, Dept. of Marine & Coastal Sciences, Rutgers University, Cook College, P.O. Box 231, New Brunswick, NJ 08903, (732) 932-6555, fax (732) 932-8578

*Caribbean:* Caribbean Marine Research Center, National Undersea Research Center, 1501 North Point Parkway, West Palm Beach, Florida 33407, (407) 471-7552, fax (407) 471-7553

*West Coast & Polar Regions:* West Coast National Undersea Research Center, University of Alaska Fairbanks, P.O. Box 757220, 208 O'Neill Bldg., Fairbanks, AK 99775-7220, (907) 474-5870, fax (907) 474-5804

*Hawaii and Pacific:* National Undersea Research Center, (HURL), University of Hawaii-Manoa, 1000 Pope Road, MSB 303, Honolulu, HI 96822, (808) 956-6335, (fax) (808) 956-9772 (main office), (808) 956-6802, (fax), (808) 956-2136 (director's office)

**National Ocean Service**

NOAA's National Ocean Service (NOS), in partnership with EPA and NASA (NASA), is providing an opportunity to participate in the establishment of pilot sites for the development of a network of intensive, long-term monitoring and research sites around the U.S. marine and Great Lakes coasts. The focus of NOAA's funding is research and monitoring programs at pilot sites utilizing ecological indicators and investigating the ecological effects of environmental stressors.

The Coastal Intensive Site Network (CISNet), developed between NOAA, EPA, and NASA, was formed in response to CENR's report entitled, "Integrating the Nation's Environmental Monitoring and Research Networks and Programs: A Proposed Framework." These sites are to fill a critical gap identified in the nation's capability to integrate the results from environmental monitoring and related research programs and thus to provide an improved basis for development of comprehensive assessments of the condition of the nation's environmental resources.

CISNet has three objectives:

(1) To develop a sound scientific basis for understanding ecological responses to anthropogenic stresses in coastal environments, including the interaction of exposure, environment/climate, and biological/ecological factors in the response and spatial and temporal nature of these interactions.

(2) To demonstrate the usefulness of a set of intensively monitored sites for examining short-term variability in long-term trend behavior in the relationships between changes in environmental stressors, including anthropogenic and natural stresses, and ecological response.

(3) To provide intensively monitored sites for development and evaluation of indicators of change in coastal systems.

The CISNet is a three year pilot project which will be reviewed at the end of the three years to assess its success in meeting its goals.

Contact: Dr. Andy Robertson, NOAA/NOS/ORCA, (301)713-3032 x132, (andrew.robertson@noaa.gov)

Section 315 of the Coastal Zone Management Act (CZMA) of 1972 authorized the establishment of "estuarine sanctuaries" to serve as field laboratories for demonstrating how linked programs in research and education can enhance coastal management. In 1974, DOC/NOAA designated South Slough the first estuarine sanctuary. In 1985, Congress amended the CZMA., changing the name to the National Estuarine Research Reserve System (NERRS) and increasing the research dimension of the program. Over the past two decades, approximately one new reserve has been designated per year. As of January 1998, 22 research reserves are designated, placing nearly 545,000 acres of estuarine waters, wetlands, and uplands into active management and stewardship programs.

The NOS Sanctuaries and Reserves Division (SRD), in the Office of Ocean and Coastal Resource Management, has a graduate fellowship program that is intended to fund high-quality research focused on improving coastal zone management while providing students with hands-on training in conducting ecological monitoring. Fellowships are for $16,500 with a 30% match requirement. Individual fellowships are structured to last two to three years.

Graduate fellow research proposals must address one of the following coastal management issues: effects of non-point source pollution on estuarine ecosystems; evaluative criteria and /or methods for estuarine ecosystem restoration; importance of biodiversity and effects of invasive species on estuarine ecosystems; or mechanisms for sustaining resources within estuarine ecosystems. Research must be conducted within one or more research reserves.

NERRS Graduate Research Fellowship opportunities will be announced annually in the Federal Register in the form of a notice soliciting applications. Interested parties may submit an application in response to SRD's notice.

Contacts: Randall Schneider/NERRS, (301) 713-3132, ext. 123,

or Dwight Trueblood/SRD, (301) 713-3145, ext. 174, fax (both) (301) 713-4363

**National Marine Fisheries Service**

The NMFS administers programs that support the domestic and international conservation and management of living marine resources. NMFS provides services and products to support fisheries management operations, fisheries development, enforcement, protected species and habitat conservation operations, and the scientific and technical aspects of NOAA's marine fisheries program. NMFS supports extramural research in two programs via two types of requests for proposals, one that solicits proposals supporting a specific research program, the other encouraging new fisheries R&D efforts, in general.

*The Antarctic Marine Living Resources Program* is a national program providing information needed for the development and support of U.S. policy regarding the conservation and management of the marine living resources in the ocean areas surrounding Antarctica. The Program emphasizes directed research to manage Antarctic ecological resources from an ecosystem perspective. The principal objective of the research program is to provide the

scientific information needed to detect, monitor, and predict the effects of commercial krill harvesting on target, dependent, and related species and populations of the Antarctic marine ecosystem. The scientific information obtained directly supports U.S. participation in the Commission for the Conservation of Antarctic Marine Living Resources. Studies in support of the Program's objectives include monitoring of oceanographic conditions, phytoplankton productivity, zooplankton composition, krill distribution and biomass, and land-breeding predator performance. The Program is managed by the Antarctic Ecosystem Research Group located at the Southwest Fisheries Science Center.

Contact: Rennie Holt, NOAA/NMFS, 619-546-5601 (Rennie.Holt@noaa.gov)

*The Saltonstall/Kennedy (S-K) Grant Program* administered by NMFS is a competitive program that provides grants or cooperative agreements for research and development projects to benefit the U.S. fishing industry (both recreational and commercial). Projects that primarily involve business start-up or infrastructure development are not eligible for funding under the program. Project funding priorities vary from year to year. In FY 1998, priorities included: Aquaculture Development, Rebuilding Overfished Fisheries, Conserving and Enhancing Essential Fish Habitat, Maximizing Social and Economic Benefits from Living Marine Resources, Maintaining Healthy Fish Stocks, and Minimizing Interactions Between Fisheries and Protected Resources.

NMFS solicits proposals through a notice published in the Federal Register once during each year for which grant funds have been appropriated. The notice contains the funding priorities, eligibility requirements, application instructions, and selection criteria. Proposals are due to NMFS 60 days from the date of publication of the solicitation.

Grants or cooperative agreements are generally awarded for a period of one year, and in no case for more than 18 months.

Information on the S-K Program is available from the S-K homepage at http://www.nmfs.gov/sfweb/skhome.html or from the following:

S-K Grant Program

Financial Services Division, SF/2

National Marine Fisheries Service

1315 East West Highway

Silver Spring, MD 20910

Telephone: (301) 713-2358

Regional Administrator, National Marine Fisheries Service (F/NEO)

One Blackburn Drive

Gloucester, Massachusetts 01930-2298

Telephone: (508) 281-9256

Regional Administrator, National Marine Fisheries Service (F/SEO)

9721 Executive Center Drive, North

Koger Building

St. Petersburg, Florida 33702

Telephone: (813) 570-5324

Regional Administrator, National Marine Fisheries Service (F/SWO)

501 West Ocean Boulevard, Suite 4200

Long Beach, California 90802-4213

Telephone: (310) 980-4033

Regional Administrator, National Marine Fisheries Service (F/NWO)

7600 Sand Point Way, NE

BIN C15700, Bldg. 1

Seattle, Washington 98115

Telephone: (206) 526-6117

Regional Administrator, National Marine Fisheries Service (F/AKO)

Federal Building

709 W. 9th Street, 4th Floor (P.O. Box 21668)

Juneau, Alaska 99801

Telephone: (907) 586-7229

# Department of Defense

## Types of Environment and Natural Resources Research Supported

The Department of Defense (DOD) invests in mission-relevant environmental quality R&D to meet its responsibilities to clean up its facilities, move toward non-polluting operations, husband the lands and resources under its control, and be compliant with Federal, State, local, and international regulations. Additionally, the Department's operational needs require investments in R&D to understand and predict the state of the operating environment (e.g., weather, oceanography, terrain) and its effects upon people, platforms, sensors, and weapon systems. Knowledge gained leads directly to tactical and strategic military advantage, which can significantly alter the outcome of conflict.

## Research Funding Opportunities

DOD emphasizes competitive opportunities within all of its R&D program areas. Each of the military service components and the Defense Agency environmental programs - the **Strategic Environmental Research and Development Program (SERDP) and the Environmental Security Technology Certification Program (ESTCP) -** offer continual competitive opportunities through a variety of methods such as RFPs, general R&D announcements (found in the CBD), Broad Agency Announcements (BAAs), and the Federal Register. Unsolicited proposals pertaining to unique and innovative concepts are also accepted by the Department and Defense Agency programs.

Contracts, grants, cooperative agreements, and cost-shared financial assistance awards are standard methods of formalizing responsibilities in developing projects with the Department. Cooperative R&D agreements between Federal laboratories and non-Federal parties, known as CRADAs, serve as a primary vehicle for technology transfer. Under a CRADA, a Government laboratory provides personnel, services, facilities, equipment, or other resources (excluding funds), with or without reimbursement. The non-Federal party provides funds, personnel, services, facilities, equipment, or other resources toward the conduct of specified R&D efforts that are consistent with the mission of the laboratory.

The Services and the Defense Agency environmental quality programs, SERDP and ESTCP offer opportunities in four categories of environment and natural resources R&D:

· *Cleanup* - Pursues the development and evaluation of cost-effective methods and technologies for identifying, evaluating, and cleaning up DoD-related contaminated sites, including risk-based assessment methodologies to establish cleanup levels for planned future land use.

Contact: Dr. John Cullinane, (601) 634-3723 (cullinm@exl.wes.army.mil)

· *Compliance* - Provides technologies to cost-effectively monitor, control, treat, and dispose of DOD wastes, including risk assessment methods.

Contact: Mr. Reid McAllister, (301) 227-4982 (reid@oasys.dt.navy.mil)

· *Conservation* - This technology thrust area involves developing and demonstrating cost-effective tools to enhance stewardship of DOD lands and installations, including natural and cultural resources, and maximizing the availability and use of military training lands with minimal impact to natural and cultural resources.

Contact: Dr. William Goran, (217) 373-6735 (w-goran@cecer.army.mil)

· *Pollution Prevention* - R&D is pursued to develop and demonstrate techniques, methods, and processes to reduce or eliminate pollution from DOD activities, including use of alternative materials and handling and life cycle analysis.

Contact: Mr. Charles Pellerin, (513) 476-3953 (pellercj@ml.wpafb.af.mil)

Queries about SERDP should be directed to the SERDP Program Office, 901 N. Stuart Street, Suite 303, Arlington, VA 22203, (703) 696- 2117. An information source that is regularly updated is the SERDP homepage, the URL for SERDP is:
http://www.hgl.com/SERDP/

General information on the ESTCP program and future opportunities can be obtained by accessing their homepage at http://estcp.xservices.com or by calling (703) 696-2120.

**Terrain, Ocean, Atmosphere, and Space:**

DOD has a major, integrated program to better understand and characterize the natural environment in support of military operations. Generally, the Army is responsible for terrain characterization and mapping, cold weather efforts, and hydrology; the Navy is responsible for ocean R&D; the Air Force has the lead in space environment R&D (with Navy contributions to basic research); and all three Services cooperate in lower atmospheric R&D. The major research centers and laboratories and their areas of interest are as follows:

The **Ocean, Atmosphere, and Space Department** of the **Office of Naval Research** (ONR) consists of two divisions, Sensing and Systems, and Processes and Prediction. They produce affordable and integrated programs in sensing and prediction, environmental science, and sea-based and littoral zone warfare. The Department's science and technology interests include oceanography and meteorology, with a focus on military operational problems and forecast capabilities; environmental acoustic and electromagnetic scattering and propagation for use in inversion and assimilation methods; signal processing for undersea and near-shore surveillance; acoustic transducers and arrays, sensor integration, all-source data fusion, and *in situ* instrumentation development; and the ability to test concepts and demonstrate new capabilities at sea and in littoral areas.

ONR is the lead agency for the **National Oceanographic Partnership Program**. The Program serves as a formal mechanism to coordinate existing, and establish new, partnerships among Federal agencies, academia, industry, and other members of the oceanographic scientific community for the sharing of resources, intellectual talent, and facilities in the ocean sciences

and education. The Program promotes the goals of assuring national security, advancing economic development, protecting quality of life, and strengthening science education and communication through improved knowledge of the ocean. Other participating Federal agencies include NOAA, NSF, NASA, DOE, the U. S. Coast Guard, DOI's U. S. Geological Survey and Minerals Management Service, the Defense Advanced Research Projects Agency, OSTP, and OMB. Proposals for FY 1998 were due January 27, 1998. Additional information can be found on the Program Website: http://www.onr.navy.mil/sci_tech/ocean.

Contact: Dr. Steven Ramberg, Department Head, (703) 696-4358 (rambers@onr.navy.mil)

The **Sensing and Systems Division** conducts an extensive program of scientific inquiry and technology development in ocean acoustics; remote sensing and space; sensing - information dominance; coastal dynamics; sensors, sources, and arrays; ocean engineering and marine systems; undersea signal processing; and tactical sensing support. In addition, the Division manages the operation and maintenance of the Navy's research ships and other platforms.

Contact: Dr. Frank L. Herr, Division Director, (703) 696-4125 (herrf@onr.navy.mil)

The **Processes and Prediction Division** concentrates on improving the Navy's and Marine Corp's understanding of environmental variablity, the assimilation of data, and the limits of predictability. Fields of special interest to the Division include environmental optics, physical oceanography, biological and chemical oceanography, ocean modeling and prediction, marine geology and geophysics, high latitude dynamics, and marine meteorology and atmospheric effects.

Contact: Dr. Melbourne G. Briscoe, Division Director, (703) 696-4120 (briscom@onr.navy.mil)

Additional information on the research of the ONR Department of Ocean, Atmosphere, and Space is available from their Web site: http://www.onr.navy.mil/sci_tech/ocean/.

The **Battlespace Environments Division, Air Force Research Laboratory**, Hanscom, MA, produces affordable and integrated programs in remotely sensing and characterizing the atmospheric and space environments. Science and technology interests include environmental electro-optical scattering and propagation, signal processing for long range radio wave propagation, space environment characterization and forecasting, and general characterization of cloud type and impact on other systems.

Contact: Dr. Hal Roth, Division Director, (781) 377-3604 (roth@plh.af.mil)

The **Battlespace Effects Division, Army Research Laboratory**, and the **Topographic Engineering Center**, maintain integrated programs in depicting the high resolution features of interest to Army tactical operations. This includes very high resolution, micro- meteorological characteristics and high resolution topographic and terrain mapping. Science and technology interests include fine scale electro-optic and electromagnetic propagation in the "dirty" environment and remote topographic characterization and mapping.

Contact: Mr. Don Artis, Office of the Assistant Secretary of the Army for Research, Development and Acquisition, (703) 697-3558

# Department of Energy

The Department of Energy (DOE) has multiple missions that contribute to the environment and natural resources R&D portfolio. These mission areas include basic science and technology, environmental quality, energy resources, national security, and industrial competitiveness.

## Types of Environment and Natural Resources Research Supported

**Energy Resources**. DOE conducts extensive R&D in the areas of energy efficiency and renewable energy resources and other advanced energy supply and demand technologies. These various R&D programs are targeted at achieving diversity and efficiency in energy use, efficiency in its generation, and a more secure national economy. At the heart of some of DOE's programs is the concept of sustainable development. Many of these programs are linked under a conceptual framework that supports pollution avoidance, rather than the traditional end-of-the pipe controls for industrial processes.

**Environmental Quality.** DOE supports substantial R&D in the area of environmental cleanup and remediation technologies. Because of the Department's enormous cleanup mission, DOE is sponsoring some of the most extensive and advanced R&D nationally and internationally to determine safer, cheaper, faster, and more effective ways to clean up contaminated environments, and to reduce or prevent the emission of environmental pollutants. An area of particular R&D interest is radioactive mixed wastes. Technology leveraging with the private sector results in cost-shared risk through dollar leveraging. The result is innovative technology systems to be transferred to the private sector for commercialization.

**Fundamental Science.** DOE programs in science and technology include significant contributions to global change research. Research into the underlying phenomena, ranging from sophisticated modeling of global climate to extensive field programs to gather data on critical processes and responses to climatic and atmospheric changes, are all part of DOE's efforts in this area.

Advanced sensors are being developed to further the accuracy and precision of key climatic measurements. These activities are conducted in response to DOE's need for predicting and assessing the environmental consequences of energy production and use. Additionally, the Department conducts significant research into local air quality and air pollution phenomena, providing a basic science perspective into urban air pollution issues, as well as providing analytical tools that support the prediction and mitigation of consequences from natural disasters.

## Research Funding Opportunities

DOE uses various competitive procurement processes. In addition, DOE accepts and funds unsolicited proposals, establishes grants, and encourages work with its national laboratories through competitive procurement opportunities announced at each laboratory.

The following list is partial and, especially for FY 1998, should be viewed as preliminary due to continuing budget uncertainties. It is recommended that you contact the identified individuals for more current information.

**Resource Utilization and Management**

The **Office of Fossil Energy** sponsors R&D in the area of resource utilization and management, specifically in the category of assessing resources and their use. The Department is committed to developing lower-cost environmental compliance technologies by: (1) providing access to the technical resources of national laboratories and research centers; (2) performing bench-scale and pilot projects to demonstrate the technical feasibility of more advanced, cost-effective environmental technologies; and (3) developing information on technology performance and potential environmental impacts for use in regulatory and industry decision making. These technology projects address: oil and gas drilling and production waste management; air emissions detection and control; treatment and disposal of water associated with oil and gas production; management of naturally occurring radioactive materials (NORM); and remediation of contaminated sites and protection of wetlands and other sensitive environments.

The following specific projects apply to both FY 1997 and FY 1998:

Develop and demonstrate economical and efficient tools and techniques for recovering natural gas from geologically complex low permeability reservoirs containing large volumes of natural gas.

Develop techniques for removing large quantities of impurities from raw natural gas, thus upgrading the quality of the gas to a more pure stream of methane and without poisonous concentrations of hydrogen sulfide.

Maximize oil recovery in an environ-mentally sound manner by providing an understanding of reservoir architecture, reservoir geometry dimensions, boundaries, fluid/rock properties, and fluid flow characteristics within the reservoir

Promote crude oil extraction simulation by developing: process models, reservoir models, economic models, and tracer models suitable for use by independent oil companies; improved oil recovery stimulation methods that support water flooding, pressure maintenance, sweep improvement, infill drilling, and horizontal wells; and advanced oil recovery methods based on chemical flooding, gas flooding, microbial, thermal, and innovative methods.

Contact: Peter Lagiovane, (202) 586-8116 (Peter.Lagiovane@hq.doe.gov)

**Atmospheric Sciences, Global Change, Bioremediation, and Environmental Remediation**

The DOE **Office of Energy Research** (OER) programs address research on the physical, chemical, and biological processes that cycle and transport energy-related materials through the atmosphere and terrestrial and ocean environments. These programs also address research on global environmental change from increases in atmospheric carbon dioxide and other greenhouse gases. The OER publishes an annual notice of continuation of availability of grants and cooperative agreements supporting work in environmental sciences programs relevant to CENR. The notice for FY 1998 was published in the Federal Register on October 31, 1997. Announcements of the availability of grants in most of the specific program areas below which are relevant to the CENR will also be published in the Federal Register in 1998. For further information, contact the Office of Energy Research Grants and Contracts Web page: http://www.er.doe.gov/production/grants/grants.html.

Contact: Art Patrinos, (301) 903-3251.

The general goal of the *Atmospheric Radiation Measurement* (ARM) Program, part of the USGCRP, is to improve the performance of general circulation models (GCMs) and related models of the atmosphere as tools for predicting global and regional change, with emphasis on the treatment of atmospheric radiative and cloud processes. The specific objectives of ARM are (1) to improve the treatment of radiative transfer in GCMs under clear-sky, general overcast, and broken cloud conditions, and (2) to improve the parameterization of the properties and formation of clouds in GCMs. These objectives are accomplished through (a) the measurements acquired through three Cloud and Radiation Testbed (CART) facilities located in critical climatic locales, (b) the ARM Science Team and its various working groups, and (c) the ARM Data System, which provides data collected from the various ARM-CART sites directly to the ARM Science Team members in accordance with their requirements. ARM data are also available to the general scientific community and the general public via the World Wide Web. No announcement of the availability of grants in this program area is planned in FY 1998.

Contact: Patrick Crowley, (301) 903-3069 (p.crowley@oer.doe.gov)

The *Climate Change Prediction Program*, which includes the Computer Hardware, Advanced Mathematics and Model Physics (CHAMMP) Program, develops tools necessary to accurately predict global and regional climate change, including change induced by increasing atmospheric concentrations of greenhouse gases and radiatively active aerosols. The main focus is on theoretical and computational studies of climate change prediction at decade-to-century time scales. This includes development of massively parallel versions of GCMs and the development of new numerical methods, model formulations, and better process para-meterizations for GCMs. The primary emphasis is on developing, validating, and exercising computationally efficient coupled atmosphere-ocean GCMs that are more accurate and have higher resolution than those currently available. This program also documents and determines the differences and agreements in simulated climate among existing models, determines why these differences among model results occur, and why model simulations of climate do not always agree with observed climate.

No announcement of the availability of grants in this program area is planned in FY 1998.

Contact: Patrick Crowley, (301) 903-3069 (p.crowley@oer.doe.gov)

The *Terrestrial Carbon Processes* (TCP) Program supports research to measure, model, and estimate changes in the physical, chemical, and biological processes controlling sources and sinks of atmospheric carbon dioxide in terrestrial ecosystems. The research is intended to help quantify the role of the terrestrial biosphere in the global carbon cycle and to elucidate the effects of environmental factors such as climate and land use changes on the exchange of carbon between the atmosphere and major terrestrial ecosystems. Research on carbon sinks and sequestration processes are a key component of the TCP research. This program also supports research to investigate the response of terrestrial vegetation to excess carbon dioxide and altered climate variables, and augments studies on ecosystem research and carbon cycle research. No announcement of the availability of grants in this program area is planned in FY 1998.

Contact: Roger Dahlman, (301) 903-4951 (roger.dahlman@oer.doe.gov)

The *Program on Ecosystem Research* (PER) seeks to improve the mechanistic understanding of the response of terrestrial organisms and ecosystems to variation and changes in atmospheric composition and climate. It includes quantifying the capacity of ecological systems to adapt to natural and human-induced environmental changes and identifying the processes controlling the responses of biological and ecological systems to such changes. No announcement of the availability of grants in this program area is planned in FY 1998.

Contact: Jerry Elwood, (301) 903-4583 (jerry.elwood@oer.doe.gov)

The *National Institute for Global Environ-mental Change* (NIGEC) is an academically-based institute operated by the University of California for DOE. It funds research on DOE's global change research priorities, emphasizing research that requires a regional or national focus. The purpose of NIGEC is to conduct research through six regional centers to improve the scientific basis for predicting and assessing the effects of human activities on the earth's climate and atmospheric composition, the role of major terrestrial ecosystems in controlling atmospheric carbon dioxide, the consequences of atmospheric and climatic changes on ecological systems and resources at regional scales, and the implications of climatic change on regionally important resources and economic sectors. Information on the availability of grants from this program is available on the NIGEC Web site http://nigec.ucdavis.edu/publications/rfp/access_rfp_97-98.html. The deadline for submitting grant applications for FY 1998 funds in this program has already passed.

Contact: Jerry Elwood, (301) 903-4583 (jerry.elwood@oer.doe.gov)

Within the *Atmospheric Sciences Program*, research focuses on the atmospheric responses to emissions from energy generation sources (the Atmospheric Chemistry Program) and on increased understanding of the atmospheric dynamics and air pollution-dispersion processes (the Environmental Meteorology Program). Of particular interest to the Atmospheric Chemistry Program is research focused on the transport, transformation, and removal of atmospheric oxidants, aerosols, and their precursors. Tropospheric processes are of primary interest. The deadline for submitting grant applications for FY 1998 funds in this program has already passed. No announcement for FY 1999 funding is planned for the Atmospheric Chemistry Program. An announcment is being developed for FY 1999 funding for the Environmental Meteorology Program. The focus is expected to be on vertical transport and mixing.

Contact: Peter Lunn, (301) 903-4819 (peter.lunn@oer.doe.gov)

The *Integrated Assessment Program* supports the analysis of the benefits and costs of potential actions with respect to the control of greenhouse gases and possible climate change as well as the presentation of the scientific results of the USGCRP to the policy-setting process. The determination of energy policy, such as that contained in the Department of Energy's Comprehensive National Energy Strategy and the international negotiations at the climate change Conference of the Parties, is tied to understanding those benefits and costs. A program announcement for FY 1998 funds is being developed.

Contact: John Houghton, (301) 903-8288 (john.houghton@oer.doe.gov)

The *Natural and Accelerated Bioreme-diation Research* (NABIR) Program provides the scientific understanding needed to use natural processes and to develop methods to accelerate

those processes for the bioremediation of contaminated sediments and groundwater at DOE facilities. Early focus of the program is on the fundamental science that will enable in-place bioremediation of complex mixtures of wastes containing metals and radionuclides that are typically characterized by large areas of low-concentration contamination. Additional information is available through the NABIR Website at: http://www.lbl.gov/ NABIR/. A program announcement for FY 1998 funds is being developed and information on submitting grant applications will be posted on the NABIR Website.

Contact: John Houghton, (301) 903-8288 (john.houghton@oer.doe.gov)

The *Environmental Management Science Program* (EMSP) is a fundamental research program for environmental remediation and restoration at DOE sites. Research focuses on those areas that would decrease risk for the public and workers, provide opportunities for major cost reductions, reduce time required to achieve the mission and goals of the Office of Environmental Management (EM), and, in general, address problems that are considered intractable without new knowledge. The program is administered jointly by EM and OER. Additional information is available through the EMSP Website at http://www.em.doe.gov/science/

Contacts: Mark Gilbertson, (202) 586-7150, fax (202) 586-1492 (mark.gilbertson@em.doe.gov), or

Roland Hirsch, (301) 903-3213, fax (301) 903-0567 (roland.hirsch@oer.doe.gov)

The *Joint Program on Terrestrial Ecology and Global Change* (TECO) is an interagency endeavor that is part of the USGCRP with participation by the DOE, NSF, NASA, USDA, and NOAA. The goal of this interagency program is to improve the scientific understanding of (1) the consequences of global-scale environmental changes on terrestrial ecosystems, (2) the role of terrestrial ecosystems as a source or sink of carbon dioxide and other trace gases, and (3) the interactions and feedbacks between terrestrial ecosystems and the atmosphere and between linked ecosystems at watershed and landscape scales.

The program is also intended to enhance capabilities to assess the probable consequences of multiple influences (e.g., concurrent changes in climate, atmospheric composition, land transformations/land) on terrestrial ecosystems.

The research will also increase the capability for extending experimentally- derived information obtained at smaller geographical units (e.g., plot-size, stand-level, patch size) and shorter time frames (e.g., growing seasons) to landscape and larger scales (e.g., regions, river basins) at longer temporal intervals (e.g., decades, centuries). Agencies involved in this announcement encourage multi-disciplinary applications involving companion experimental, manipulative and modeling efforts to provide critically needed data and understanding for improved predictions of global change phenomena in the following, equally important areas: (1) Consequences of Global Change on Terrestrial Ecosystems; (2) CO2, and Other Trace Gases Related to Global Change; and, (3) Terrestrial Ecosystem Feedbacks to Global Change. Research is also encouraged on the development and testing of coupled land-atmosphere models that include interactive surface-atmosphere processes in integrative global models. The FY 1998 announcement for this program is accessible on the NASA World Wide Web Site at the following address: http://www.hq.nasa.gov/office/mtpe/

Contact: Jerry Elwood, (301) 903-4583 (jerry.elwood@oer.doe.gov)

**Energy and the Environment**

The **Office of Energy Efficiency and Renewable Energy** (EERE) implements a balanced portfolio of research, development and commercialization efforts to provide America with clean energy today and to make sure we have inexhaustible supplies of clean energy in the future. Energy efficiency and renewable energy technologies play a key role in improving our environment, energy security, and economy through creation of new businesses and entrepreneurial opportunities here and abroad. Programs are structured to address the needs of major end use sectors including buildings, transportation, industry, and utilities. The Industries of the Future program assists the seven most energy-intensive industries to develop and implement technology road maps for the future. Transportation research is helping to develop radically more efficient automobiles and alternative fuels. Buildings of the 21st Century research uses a systems approach to incorporate energy efficiency, and renewable energy while reducing construction costs. Research on photovoltaics, solar, wind, hydrogen, superconductivity, and geothermal energy is also conducted. EERE's activities include basic and applied research, cost-shared demonstrations, and market collaborative and education programs.

A number of initiatives in these program areas support the Administration's Climate Action Plan. A key approach in R&D, as well as the nearer term outreach efforts, is building customer-driven partnerships with industry, businesses, State and local governments, universities, and energy consumers. The major R&D programs are outlined below:

*Building Technologies*: The Office of Building Technology, State and Community Programs operates a strategic array of programs including research and development and outreach for advanced technologies and construction practices; collaborative programs with state and local governments, industry, universities and consumers to deploy high-efficiency and renewable technologies into the commercial and residential markets; and national standards for appliances and buildings to ensure that they meet minimum energy efficiency levels.

Contact: Donna Hawkins, (202) 586-9389

*Transportation Technologies*: The Office of Transportation Technologies focuses on R&D activities to reduce the Nation's use of petroleum, thereby increasing energy security, and to provide environmental benefits through reduced air pollution. Key program elements include research, development, and deployment of alternative fuels, advanced propulsion systems, electric and hybrid vehicles, and fuel cells. DOE works in partnership with industry on the "Partnership for a New Generation of Vehicles," an Administration initiative to commercialize a mid-size car in the next decade that features three times the fuel economy of today's models.

Contact: Nancy Blackwell, (202) 586-8027

*Utility Technologies*: The Office of Utility Technologies leads the Federal government's effort to help America's electric power producers develop clean, renewable, and more economic forms of energy. These technologies will help U.S. industry capture a significant share of the global electric power market over the next decade. Research, development, and deployment efforts are underway in photovoltaics, biomass power, geothermal, wind, hydrogen, solar thermal, electric and magnetic fields, superconductivity, and energy storage.

Contact: Patrick Booher, (202) 586-0713

*Industrial Technologies*: The Office of Industrial Technologies (OIT) conducts research, development, and technology outreach in partnership with industry to improve energy efficiency and productivity in manufacturing industries. A key focus of the OIT program is the Industries of the Future approach, which includes a strategy of close collaboration with industry that catalyzes R&D in energy-intensive industries (i.e., aluminum, chemicals, forest products, glass, metal casting, and steel). OIT implements a number of nearer term deployment efforts including the program on National Industrial Competitiveness through Energy, Environment, and Economics; Industrial Assessment Centers; and the Motor Challenge Program.

Contact: James Quinn, (202) 586-5725

# Department of Interior

As the Nation's principal conservation agency, the Department of the Interior (DOI) has responsibility for most of the nation's nationally owned public lands and natural resources. This includes fostering sound use of the Nation's land and water resources and assessing energy and mineral resources.

## Types of Environment and Natural Resources Research Supported

The major focus of DOI R&D efforts is to provide the scientific basis for natural and cultural resource policy and management decisions:

**Biodiversity and Ecosystems**. R&D is supported to provide information on the abundance, distribution, and health of biological resources and to develop predictive capabilities of the interactive processes that regulate and influence biodiversity and ecosystem integrity. This includes the functioning of biological systems and their relationship and interdependence to physical, chemical, geologic, and hydrologic factors and their response to human and natural environmental stresses through research focused on species, population, and ecosystem research. Inventory, monitoring, and conservation of living resources and their ecosystems, as well as research toward their sustainable development are high priority programs.

**Global Change Research**. Research is supported to improve understanding of the processes associated with terrestrial-oceanic and terrestrial-atmospheric exchanges of water, energy, carbon, and nutrients; to describe, analyze, and monitor past and contemporary states, changes, and processes in the Earth's physical, biological, geological, chemical, and ecological systems; to facilitate access to and use of global change information for policy decisions, resource management, research, and education; and to develop the ability to predict the effects of global change on public lands and natural resources.

**Natural Disaster Reduction.** Basic research is conducted on geologic (earthquakes, volcanoes, and landslides) and hydrologic hazards (floods, droughts, subsidence, and dam safety). DOI research also provides hazard and risk assessments on national, international, regional, urban, and local scales and develops monitoring networks and geographic information systems. The Department is also responsible for transferring technology needed to enhance professional skills and expand technical capacity for mitigation, preparedness, emergency response, and recovery; and the organization and conduct of post-disaster investigations.

**Resource Use and Management**. Resource assessments and environmental studies of the ecological, economic, and social factors involved in the development and management of offshore oil, gas, and mineral resources are supported. DOI research includes development of new mineral recovery concepts that will safeguard workers and prevent environmental harm, and research to conserve resources through recycling and preventing environmental problems or damage to the infrastructure.

**Toxic Substances and Hazardous and Solid Waste Research**. DOI conducts research primarily directed toward improvements of waste-disposal and clean-up practices and the

mitigation of contamination problems by addressing major types of contamination, by developing new methods to reduce the volume and toxicity of processing wastes from mining and minerals operations, and by assessing the impact of contamination on fish, wildlife, and the environment. DOI also conducts research to understand the fate, transport, and effects of contaminants through ecosystems and the role of biological processes in the control and mediation of chemical speciation; and the development of risk-based action levels of contaminants.

**Air Quality Research**. These studies collect data on air quality conditions and trends in national parks and wilderness areas; effects of air pollution on resources; the pollutants responsible for resource damage; sources of pollutants; and the effect of reducing emissions at these sources. Present monitoring and research programs are focused on acid deposition, ozone, and fine particles as they affect visibility including understanding and predicting the transport and chemical transformation of air pollutants.

## Research Funding Opportunities

### U.S. Geological Survey (USGS)

*National Cooperative Geologic Mapping Program* (NCGMP) - The external research program of the NCGMP consists of two parts, State Geological Survey Mapping (STATEMAP) and Education Geologic Mapping (EDMAP). Funding announcements for both of these programs are issued each year. A competitive proposal process is used to distribute funds. Federal funding in both programs is equally matched by the recipients of the cooperative agreements. The cooperative agreements meet guidelines set out in the annual announcements, which also detail the type of products required for the program. Panels of State geologists, geology professors, and NCGMP staff review the proposals and make funding recommendations to the NCGMP.

STATEMAP is only open to state geologists of the 50 States and U.S. Territories. The State Geological Surveys, in concert with a State geologic mapping advisory committee, typically focus their requests on environmental and societally important issues and, to a lesser degree, economic issues such as infrastructure minerals, economic mineral deposits, and oil and gas resources. Coordination with ongoing studies by USGS geologists is encouraged and many of the STATEMAP projects work with NCGMP geologists and with EDMAP projects.

The EDMAP component of the NCGMP is open to any U.S. college or university that has a graduate-level Geoscience program. Emphasis is on support of masters and doctoral candidate work that has an element of geologic mapping in the United States. Awards are based on a competitive proposal system and the proposed areas of study must be coordinated with the State Geological Survey priorities and USGS geologic mapping priorities. This program, started in FY96, has an anticipated funding of at least 25 awards of a maximum of $15,000 for each student. Geologic maps produced by the graduate students will be published either through the NCGMP or through the State Geological Survey, and the geologic map data incorporated into the National Geologic Map Data Base.

Contact: Peter Lyttle, National Cooperative Geologic Mapping Program, (703)648-6943 (plyttle@usgs.gov)

*Earthquake Hazard Reduction Program* (EHRP) - The External Grants program of the EHRP issues an annual announcement that describes research opportunities in the External Grants Program and the Regional Seismic Networks Program. The grants component is fully competitive, while the regional seismic network component is a closed competition between universities that have developed seismic monitoring networks in seismically active areas of concern to the EHRP. The regional seismic networks are awarded as cooperative agreements because of the strong input from the USGS in data collection and analysis.

This program funds a limited number of unsolicited proposals. It makes the vast majority of its awards competitively. In FY 1997, 162 competitive grants were awarded, and three unsolicited non-competitive awards were made. Grant applications are made according to the rules published in the annual announcements. The Regional Seismic Networks Program supports 17 seismic networks through cooperative agreements. EHRP sponsors a wide range of studies that can be applied to reduce earthquake risk in the United States. Funding decisions are made by six regional panels. Each panel sponsors research aimed at any of five program elements: 1) Evaluating national and regional hazard and risk; 2) evaluating urban hazard and risk; 3) understanding earthquake processes; 4) providing real-time hazard and risk assessment; and 5) providing geologic hazards information services. The program emphasizes certain geographic regions based upon specific earthquake hazards and associated societal risks in them.

In response to guidance from Congress, EHRP places high priority on investigations in four areas where large populations are exposed to significant seismic risk: Southern California,

Northern California, the Pacific Northwest, and the Central United States. Studies in other earthquake-prone regions of the United States are also sponsored by the National-International Panel. In addition, the Process, Laboratory, and Theoretical Panel supports basic and applied research that can lead to new tools for earthquake hazard reduction nationwide.

Each proposal should be addressed to a specific regional peer review panel, as listed below:

Southern California - from the Carizzo Plain south to the international border with Mexico

Northern California - from Cape Mendocino south to Parkfield, including the San Francisco Bay area

Pacific Northwest - Washington, Oregon, and California north of Cape Mendocino (Cascadia) and Alaska

Central United States - the New Madrid seismic zone and surrounding areas

National-International - all earthquake-prone geographic areas not included in the above four regions above

Processes, Laboratory, and Theoretical: basic and applied research having the potential for earthquake hazard reduction in many geographic areas.

A program announcement is issued early in February of each fiscal year with a proposal deadline 60 days after the issuing date. The announcement can be accessed through the internet at http://erp.er.usgs.gov.

Contact: John Sims, Earthquake Hazards, (703) 648-6722, (jsims@usgs.gov)

*Offshore Environmental Research* - Offshore environmental research addresses information needs for DOI's Minerals Management Service (MMS). These studies assess the effects of offshore oil and gas development on the marine biota of the Outer Continental Shelf (OCS). Studies target benthic biota, marine mammals, coastal environments, and commercial and sport fisheries. Investigations have also involved sublethal toxicity analyses, assessments of physical and chemical oceanographic regimes, and seabird distribution and abundance estimations.

FY 1998 funding has been determined through the open-competitive procurement process. Limited opportunities will be advertised in the Commerce Business Daily in FY 1999.

Contact: David P. Bornholdt, (703) 648-4068 (david_Bornholdt@usgs.gov)

*State Water Resources Research Institute Program* - This program supports a Regional Competitive Grant Program conducted in cooperation with the State Water Resources Research Institutes, which issue requests for applications each year. Proposals are solicited from university researchers for research on virtually every aspect of water resources. Recipients of awards must match the Federal funds on a 2:1, non-Federal to Federal, basis with funds from non-federal sources. Applications must be made through a Water Resources Research Institute. Panels of Institute Directors review the proposals and make funding recommendations to the USGS.

The addresses of the State Water Resources Research Institutes and a description of the projects funded in the previous years can be accessed through the Internet at http://water.usgs.gov/public/wrri/statewrri.html.

Contact: John Schefter, Chief, Office of External Research, Water Resources Division, U.S. Geological Survey, (703) 648-6800 (schefter@usgs.gov)

*Species at Risk Initiative* (SAR) - SAR develops scientific information on the status of sensitive species, particularly with respect to the relationship of species abundance and distribution to habitat conditions, stresses, etc. The initiative provides an opportunity for investigators to participate through research and inventory activities to fill biological information gaps and to provide resource managers, regulators, and private landowners definable scientific information from which prudent decisions can be made regarding the management of biological resources. Successful SAR projects lead to conservation options and actions that reduce the need for listing species as threatened or endangered.

FY 1998 funding is extremely limited and opportunities are largely restricted to Biological Resources Division (BRD) offices and activities.

Contact: Nancy Milton (703) 648-4074, (nancy_m_milton@usgs.gov)

*National Biological Information Infra-structure* (NBII) - The NBII uses the World Wide Web to support a distributed "federation" of biological data and information sources, including a variety of Federal and State government agencies, universities, museums, libraries, and private organizations (http://www.nbii.gov).

BRD works cooperatively with other agencies and organizations and supports selected projects to help make significant biological data and information accessible to a broad audience via the NBII.

FY 1998 funding is extremely limited and opportunities are largely restricted to BRD offices and activities.

Contact: Anne Frondorf, (703) 648-4205, (anne_frondorf@usgs.gov)

*National Spatial Data Infrastructure (NSDI) Partnership Funding Programs* - The NSDI is viewed as the technology, policies, and people necessary to promote geospatial data sharing throughout all levels of government, the private and non-profit sectors, and academia. Three separate but related programs constitute the NSDI Partnership Funding Programs: the NSDI Cooperative Agreements Program, the NSDI Benefits Program, and the NSDI Framework Demonstration Projects Program. Each of these programs focuses on complementary development and implementation initiatives of the NSDI.

*Cooperative Agreements Program* - The Cooperative Agreements Program funds projects focused on promoting metadata collection and creating clearinghouses of geographic data linked to the Internet, developing NSDI standards, advancing the NSDI through education, and organizing and strengthening state-wide or regional programs for geographic data sharing. FY 1998 funding is estimated to be $1.1M.

Contact: Bruce McKenzie (703) 648-5740 (bmckenzi@usgs.gov)

*Benefits Program* - The Benefits Program funds projects that assess the qualitative or quantitative benefits of using a shared data resource to address important community issues or solve problems over a given geographic area. No restriction is placed on the primary issue or problem being addressed. The problem may be environmental, economic, social, or cultural. For example, projects might involve (but are not limited to) community or regional economic development; planning for and delivering cultural, educational, or community services; public health; advancing the scientific understanding of the impact of human activities on natural resources and the environment; restoring aquatic or terrestrial habitats; mitigating hazards; or responding to natural disasters. Projects may analyze past or current uses of geospatial data. FY 1998 funding is estimated to be $400,000.

Contact: Barbara Poore (703) 648-5971 (bpoore@usgs.gov)

*Framework Demonstration Projects Program* - The Framework Demonstration Projects Program funds projects that demonstrate technical, operational and business capabilities to collaboratively create and maintain certain categories of commonly needed 'Framework' data. Under the framework concept, a geospatial data community works together to produce and maintain commonly needed data for national, regional, state, and local analysis. The information content or data categories for framework consists of geodetic control, digital orthoimagery, elevation/bathymetry, transportation, hydrography, governmental units, and cadastral data categories. FY 1998 funding is estimated to be $680,000.

Proposals must involve partnering between two or more organizations, and participants are expected to cost share in the project. Applications may be submitted by Federal agencies, State

and local government agencies, educational institutions, private firms, private foundations, and Federally acknowledged or state-recognized Native American tribes or groups. Further information about all three of the aforementioned programs is available from the Federal Geographic Data Committee's Web server at: www.fgdc.gov.

Contact: Mike Domaratz (703) 648-4533 (mdomarat@usgs.gov)

**Minerals Management Service**

The MMS uses a number of vehicles to announce research opportunities. Most research projects are competed and advertised in the CBD, inviting proposals on narrow, well-defined topics. Competition may be open or restricted to a smaller field of researchers, such as small businesses. While MMS does accept unsolicited proposals, few are funded due to limited resources. For the past 3 years, the use of BAAs have also been used. This procurement mechanism is widely advertised through the CBD and requires submission of a short "white paper" on proposed research responsive to a series of broad research topics.

*Environmental Studies Program* (ESP) - Research is supported to provide information needed to predict, assess, and manage impacts from offshore marine mineral exploration, development, and production activities on human, marine, and coastal environments. Potential impacts representing subjects of research are associated with offshore natural gas, oil, and non-energy minerals, such as sand and gravel. Studies are supported on the fate of potential pollutants related to the OCS, such as oil, noise, drilling discharges, and products of fuel combustion, in the marine environment and atmosphere. Large-scale oceanographic circulation studies and modeling are supported to provide information for oil spill trajectory analyses. Social and economic research is supported to develop an understanding of how OCS activities affect community composition and infrastructure, employment, and culture. Research designed to provide information needed for an understanding of the environmental consequences of sand and gravel removal prior to actual recovery operations is also supported by the ESP. Opportunities available in FY 1998 include:

Reference Manual & GIS Overlays, Oil-Industry & Other Human Activity (1970-1995) in Beaufort Sea

Mapping of Cook Inlet Tide Rips Using Local Knowledge

Update of Oil Industry Labor Factors for the Alaska Manpower Model

The Upper Boundary Layer Study in the Western and Central GOM

Historical Social and Economic Impacts of OCS Activity on Families and Individuals

Long Term Monitoring at East and West Flower Garden Banks

Shorebirds of the Santa Maria Basin: Vulnerability to OCS Related Activities and Accidents

*Gulf Of Mexico Region Deepwater Studies Program*

Assessing and Monitoring Industry Labor Needs

Fate of Deepwater Subsea Oil Spills

Benefits and Burdens of OCS Activities on Selected Communities and Local Public Institutions

Development of a Deepwater Environmental Data Model

Deepwater Physical Oceanography Historical Data Inventory, Synthesis, and Reanalysis

GOM Deepwater Information Resources: Data Search and Literature Synthesis

Contact: Larry Roberts, (703) 787-1717, fax 787-1053 (larry.roberts@mms.gov)

- *Technology Assessment and Research Program* (TARP) - Research is focused on providing information needed to help ensure that offshore operations are conducted in an environmentally sound and safe manner, and to develop performance-based regulations. The TARP supports coastal and marine research to address technical issues that affect future operational decisions on oil and gas development on the OCS. The TARP also participates in research to either enhance or assess developing technology relevant to offshore oil and gas development. The most recent BAA (Fall 1997) contained the following research topics in general areas of engineering and safety in offshore operations, as well as spill response and cleanup technology:

Deep water operations, including operational safety issues, structural and pipeline integrity, and well control.

Aging infrastructure, including integrity assessment and repair methodologies for damage to older platforms and pipelines that are functioning years beyond their design life. The U. S. has the oldest offshore infrastructure in the world.

Platform removal via explosive and non-explosive techniques so as to minimize energy release into the water column.

Human and organizational factors that contribute to accidents, including assessment methodologies to mitigate concerns relative to offshore operations. It has been estimated that up to 80% of accidents offshore are attributable to human error.

Oil-spill response research, including detection, containment, and clean-up techniques.

Contact: Paul Martin, (703) 787-1559, fax 787-1555 (paul.martin@mms.gov)

# Department of Transportation

The Department of Transportation (DOT) has multiple missions that contribute to its environment and natural resources R&D portfolio. Contributions to overall DOT research and development are provided by the Federal Highway Administration (FHWA), the Federal Transit Administration (FTA), the Research and Special Programs Administration (RSPA), the U.S. Coast Guard (USCG), and the Federal Aviation Administration (FAA). DOT also works closely with the National Science and Technology Council's Sustainable Transportation Planning Team to assure effective coordination of the research it undertakes.

## Types of Environment and Natural Resources Research Supported

**Transportation and Air Quality**. FHWA conducts modeling and analytic compliance research, including travel, emission, and dispersion modeling techniques to provide information and technical guidance to Federal, State, and local officials as well as the public at large on the requirements and methods for compliance. Additional research will be needed as a result of the new National Ambient Air Quality Standards promulgated by EPA in July 1997, which will require additional, more intensive research to understand the contribution of mobile sources to air quality. Expected increases in the spatial classifications of geographic areas, and corresponding changes in pollutant standards will require new techniques and tools to evaluate the transportation impacts of larger nonattainment areas. Understanding will also be needed to identify the potential control strategies required within those areas. The identification of health issues related to fine particulate matter will necessitate new, extensive research and model reform. Data and tools are needed to meet the challenges of understanding how transportation sources contribute to the presence and behavior of fine particles. Current models are inadequate to deal with this issue. The U.S. Government's support for emission limits for greenhouse gases will demand additional research to understand the transportation related causes of, and mitigation strategies for, such emissions.

**Highways and Water Resources.** Previous research sponsored by FHWA has provided tools to State and local transportation officials for assessing potential water quality impacts of transportation improvements, and has developed mitigation techniques to lessen the pollution effects of storm water runoff. Ongoing studies and those planned for the future address the continuing concern over nonpoint water pollution from highway facilities and the continuing need to meet statutory and regulatory requirements. Research is being supported to develop improved methods, techniques, tools, models, and procedures to evaluate the water quality impacts of highway development and operation activities, particularly storm water runoff and changes in hydrology, and to identify and develop innovative best management practices, devices, and other mitigation measures. Legislative and administrative focus on the protection of water resources and on watershed management, will require, in some areas, newly-initiated research to identify and understand optimal transportation practices for their protection.

**Improving Our Knowledge of Wetland Resources**. The construction, use, and maintenance of highway systems have potential primary and secondary impacts on wetlands resources and other ecosystems. FHWA supports research to develop improved methods, tools, and techniques to identify and delineate wetlands, to assess wetland impacts, and to evaluate wetland functions; to improve the effectiveness of compensatory mitigation through better techniques of wetland

restoration, enhancement, and creation; and to improve and enhance the use of mitigation banking as a viable, effective tool of choice in situations where compensatory mitigation is necessary. The Vice President's Clean Water Initiative and the eventual changes in the Clean Water Act will emphasize wetland protection programs, increasing the need for improved impact assessment and mitigation techniques.

**Reinventing the National Environmental Policy Act (NEPA) Process**. Legislation streamlining the environmental and transportation decision making process requires the development of a new surface transportation regulation on NEPA and transportation decision making. FHWA supports research to identify ways to effectively integrate and streamline environmental and transportation decision making to achieve the best overall public interest decisions.

**Communities, Neighborhoods, and People**. FHWA research will focus on the role of transportation systems and projects in contributing to sustainable communities, reflecting community values in design and placement of facilities in communities, and protecting and enhancing the social infrastructure, including finding ways to improve the link between transportation and sustainable development within communities.

**Historic and Archaeological Preservation and Aesthetics**. FHWA's historic and archaeological preservation research addresses the procedural, technical, and legal issues associated with cultural resource identification, evaluation, and rehabilitation in the highway and transportation context. Research is supported to provide the tools necessary to meet technical and procedural requirements for historic and archaeological preservation, historic highway, and bridge rehabilitation, as well as visual impacts and their associated assessment techniques. Information will be developed to identify the viability and the manner in which the various methods can be used to effectively determine the visual impact of highway project proposals. Also, this program includes the various vegetation management practices of roadside maintenance that can benefit visual quality, such as the use of native wildflowers.

**Highway Traffic Noise.** FHWA supports research to increase the knowledge and understanding of the analysis and abatement of highway traffic noise, develop and disseminate innovative, cost effective noise abatement methods, and work with State and local officials to develop effective noise compatible land use planning.

**Environmental Justice**. Presidential Execu-tive Order 12898 and the DOT Order on environmental justice require that programs, policies, and activities not have a disproportionately high and adverse health and environmental effect on minority and low-income populations. These orders are a reaffirmation of the principles of civil rights and related statutes, the NEPA process, and other Federal environmental laws. FHWA supports research to effectively assess, prevent, and address potential discriminatory effects and disproportionately high and adverse community, environmental, and health effects of transportation decisions on low income and minority populations.

**Alternative Fuels**. FTA conducts R&D to support the transit industry use of alternative fuels. This effort has included support for the development of various alternative fueled heavy duty engines for transit bus applications. It also includes support for the development of guidelines for the safe operation, maintenance, and storage of alternative fueled vehicles.

**Electric Vehicle Program**. FTA conducts R&D in the application of electric propulsion technologies to transit bus applications. Electric and hybrid electric transit buses offer significant emissions reduction potential. Electric and hybrid electric buses also offer the potential for greater operating efficiency and lower maintenance costs.

**Fuel Cell Research**. FTA conducts R&D toward the commercialization of fuel cell powered transit buses. Two fuel cell technologies are being developed and evaluated for transit use: phosphoric acid and proton exchange membrane. Preliminary results indicate that an entire fleet of fuel cell transit buses would have emissions equivalent to those of one current diesel transit bus.

In addition, Maritime Administration, USCG and RSPA are working with the Department of the Navy, DOE, NOAA and the Defense Advanced Research Projects Agency on a coordinated research program to develop fuel cells for maritime applications. These systems may eventually find application in surface transportation, and FTA and FRA have participated in developing performance requirements.

**Pipeline Safety Research.** RSPA explores approaches to assess pipeline integrity, determine ways to rehabilitate pipelines, and set long-term goals for improvement. Ultimately, these activities contribute to the safety of pipeline operations, and reduce the danger of environmentally damaging accidents and spills.

**Hazardous Materials Research**. RSPA provides the technical and analytical foundation necessary to support DOT's regulatory, international standards development, compliance, and emergency response programs that deal with hazardous materials transportation safety. This research is part of a comprehensive effort to protect the Nation from risks to life, health, property, and the environment inherent in the transportation of hazardous materials by water, air, highway, and railroad, and to protect the environment from damage by oil and other pollutants.

**Emergency Transportation Research**. This effort focuses on the ability to assess the effects of a natural disaster on the national transportation system, and assure effective tracking of the flow of critical relief supplies during the response phase.

**Innovative Tools in Response Training and Preparedness Evaluation.** Research is being conducted to develop training methods for oil and hazardous material spill response teams, as well as measurement methods to evaluate response team performance. Research is also supporting development of a portable pollution incident control and evaluation system.

**Comprehensive Oil Spill Marine Environmental Protection** (MEP). USCG is conducting R&D in many areas related to Oil Spill MEP. R&D project areas include spill response resource management and tracking; tanker salvage; and, counter measures, including improved product off loading at sea, vessel salvage and stability assessment, oil/water separator systems, *in-situ* burn-hydrodynamic fire boom testing, and predictive models for improved spill response.

**Oil Spill Countermeasures.** Researchers are attempting to improve methods to mitigate oil spills, with a focus on improving mechanical collection systems and alternative countermeasures, such as in situ burning, and on the use of sensing technologies (e.g., infrared) to detect accidental and deliberate spills. Research is also conducted on weathering effects on spilled oil to improve predictive capabilities, thus enhancing input to response strategies.

**Prevention Through People**. Research has shown that up to 80% of marine accidents are attributable to human activity. USCG research is being conducted on human factors and performance (e.g., crew size, bridge design, fatigue) that lead to marine casualties. Knowledge gained will be applied to improve design, training, staffing, licensing, and operating procedures to reduce loss of life and property and environmental damage.

**Waterways Safety**. This focus area seeks to provide improved navigational capabilities and navigation resources for the mariner, including positioning methods and aids to navigation. With these improvements, the chances of incidents resulting in oil or chemical spills is reduced.

**Pollution Prevention**. DOT funds research on methods to minimize the inappropriate use of hazardous materials, reduce the amount of solid and hazardous materials generated by Coast Guard units, determine the most cost-effective and efficient methods for hazardous materials management, and identify the best technologies for remediation of Coast Guard hazardous waste sites.

**Non-Indigenous Species.** USCG is conducting research on the introduction of non-indigenous aquatic nuisance species into U.S. waters through shipping activities. Various control options are being investigated (e.g., ballast water exchange) as countermeasures for non-indigenous species introductions.

**Aircraft Noise Reduction and Control.** The FAA researches technology advances in source noise reduction. This includes engine design parameters, advanced acoustic absorption materials, and active noise control devices. Aircraft technology advances will include high-lift devices and methods to reduce airframe-generated noise.

**Aircraft Engine Emissions Control.** In collaboration with other agencies, DOT investigates aviation effects on the atmosphere. The results of these studies are used in developing future engine emissions regulations and international standards.

**Aviation Environmental Analysis.** Research is supported to develop various tools and methods used to evaluate the environmental impact from alternative aviation policies and strategies. Projects include continually updating and improving an integrated noise model, a heliport noise model, an emissions and dispersion modeling system, and other models to assess the impacts from FAA policies and actions.

## Research Funding Opportunities

### Federal Highway Administration

To fulfill its statutory mandates, FHWA has goals to develop improved tools for assessing highway impacts on air quality, wetlands, water quality, historic and archeological resources, and communities, including low income and minority; more effective and innovative avoidance, detection, mitigation, and enhancement techniques; and environmental expertise within FHWA and State and local transportation agencies that will significantly contribute to an integrated and streamlined environmental and transportation decision making process and to an enhanced environment in accordance with DOT's Strategic Plan and the FHWA's Environmental Policy Statement.

Contact: Steve Ronning, FHWA, HEP-40, 400 Seventh St. SW, Rm 3240, Washington, D. C., 20590, (202) 366-2078 <steven.ronning@fhwa.dot.gov>

**Federal Transit Administration**

FTA is the principal source of Federal financial assistance to U.S. communities for the planning, development, and improvement of public transportation systems. FTA has been working in cooperation with the transit industry to meet the requirements of the Clean Air Act and the Energy Policy Act of 1992, which support the national goals of reducing vehicle emissions and petroleum imports. FTA provides decision makers at all levels with a better understanding of the technologies necessary to meet these requirements, and provides the necessary technical assistance and support to the transit industry to make a safe and successful transition to new technologies.

Grants, cooperative agreements, and contracts are standard instruments used by FTA to execute R&D projects. An annual directory of FTA's R&D projects is available, and the information therein is regularly updated on the FTA homepage http://www.fta.dot.gov. In addition, FTA accepts unsolicited proposals. A Technical Advisory Committee identifies priority technology development areas and establishes guidelines for project development, cost sharing, and execution.

Contact: Shang Hsiung, (202) 366-0241 (hsiungs@tts.dot.gov)

**Research and Special Programs Administration**

Some work on surface transportation-related environmental topics is conducted by DOT's competitively selected University Transportation Centers; however, annually funded research programs carried on by these consortia are not typically competed. Research priorities are set by the schools involved based on the needs of the specific regions of the country they serve. Subcontracts from these centers may or may not be competed to other universities and research providers.

Contact: Fenton Carey, Associate Administrator for Research, Technology and Analysis, (202) 366-4434. (Fenton.Carey@rspa.dot.gov)

**U.S. Coast Guard**

The mission of the Coast Guard's Marine Safety, Security, and Environmental Protection Program is to protect the public, the environment, and U.S. economic interests through the prevention and mitigation of marine incidents. The Coast Guard is also committed to the institution of measures to reduce its own consumption and production of solid waste and hazardous materials.

The Coast Guard has grant authority authorized under the Oil Pollution Act of 1990. A series of regional grants to colleges, universities, and nonprofit research institutions were provided in the mid-1990's; however, no further grants of this type are anticipated.

The vast majority of future projects will be conducted competitively. The Coast Guard has established networks with academia, other Federal and State agencies, industry, and international partners to conduct joint research and technological information exchange.

Contact: Captain Gary Steinfort, (202) 267-0912 (GSteinfort@comdt.uscg.mil)

**Federal Aviation Administration**

FAA provides a safe, secure, and efficient global aviation system that contributes to national security and the promotion of aviation. As the leading authority in the international aviation community, FAA is responsive to the dynamic nature of customer needs, economic conditions, and environmental concerns. The future aviation system is envisioned as one that is a "good neighbor." The challenges revolve around issues associated with how this good neighbor policy is implemented. The FAA's goal is to provide strong leadership in mitigating aviation's adverse environmental impact on the public consistent with an effective aviation system. FAA is participating with NASA in a series of joint noise and emission reduction research initiatives, including continued implementation of the joint subsonic airplane noise reduction technology research program and assessment of quiet aircraft technology for propeller-driven airplanes and rotor craft. FAA also participates in the NASA Atmospheric Effects of Aviation Project to develop a scientific basis for assessment of the impact of aircraft emissions, particularly on the ozone layer and global climate change. FAA and NASA also began a cooperative program for the development of engine exhaust emissions certification standards and procedures for future subsonic turbojet engine technology.

Contact: Director, FAA Office of Environment and Energy, (202) 267-3576

# Environmental Protection Agency

To fulfill its statutory mandates to protect the environment and human health, EPA promulgates Federal regulations; sets national standards; issues permits to conduct certain activities; licenses and registers products; inspects for compliance; enforces regulations where necessary; and monitors results. To do these things effectively and efficiently, more scientific information is needed in a number of areas. The functions of the Office of Research and Development (ORD) are to conduct or sponsor research in areas important to EPA and provide technical support to the Agency.

## Types of Environment and Natural Resources Research Supported

The current areas of emphasis for research and development are:

- Safe Drinking Water
- High Priority Air Pollutants
- Emerging Issues
- Ecological Risk Assessment
- Human Health Risk Assessment
- Pollution Prevention and New Technologies

More details on these topics can be found in ORD's Strategic Plan and in individual Research Plans as they become available. The ORD Strategic Plan can be found on EPA's Internet homepage at http://www.epa.gov.

### STAR Research Funding Opportunities

In areas of research in which EPA does not have in-house expertise, a large part of that research is sought outside EPA. These extramural research needs are competitively funded through the STAR program. The program is part of EPA's commitment to include the best scientists from this country's universities, colleges, and other research institutions in its research program. The STAR program, now in its fourth funding year, is soliciting Requests for Applications (RFAs) in 23 areas.

The STAR program has four components:

1) **Focused RFA**s are targeted at specific research topics defined by the ORD Strategic Plan and address the science needs of the EPA program offices and regions. This component supports investigator-initiated research by universities and other not-for-profit research institutions that complements the expertise in ORD laboratories. A portion of the program is conducted jointly with other Federal and non-Federal research partners.

2) **The Exploratory Research Grants Program** provides support for investigator-initiated research in broad areas, such as environmental chemistry, environmental physics, and health and ecological effects of pollution, that are not covered by the RFAs.

3) **The Graduate Fellowship Program** supports masters and doctoral students in environmental sciences and engineering to ensure the availability of the expertise needed to address environmental concerns in the future. This program is announced nationally and provides broad opportunities to apply. Applicants are judged by external peer reviewers and are selected based on their past record and future potential.

4) **The Environmental Research Centers Program** involves competitive awards for complex, long-term collaborative research using multidisplinary approaches on issues of broad concern to EPA.

## FY 1998 Opportunities

In FY 1998, subject to the availability of funds, EPA will award STAR grants in research categories of special interest to the EPA mission. Some of the opportunities listed below had closing dates that have already passed; they are included to provide a description of the Agency's areas of interest and contact points for those areas. It is likely that many of these will be ongoing and may have additional solicitations in the future.

- *Exploratory Research* - This RFA invites applications in areas of environmental biology, environmental chemistry, physics, human health, and environmental engineering that are not covered in other research funding announcements. The focus is on aspects of pollution identification, characterization, and abatement and control of the effects of pollutants on human and biological systems. Closing date: 3/31/98.

  Contact: Clyde Bishop, (202) 564-6914 (bishop.clyde@epamail.epa.gov)

- *Indicators of Global Climate Change* - Indicators of ecological impacts can be used to document global change cause and effect directly. The challenge is to demonstrate that already measured shifts in climate and/or greenhouse gas concentrations are both necessary and sufficient sources of hypothesized ecosystem changes that are detected in the field. This RFA seeks to fund research that uses hypothesis testing to define cause-and-effect relationships between changing climate, greenhouse gas concentrations, and ecological impacts and indicators that function as early-warning signals of significant ecological responses to changing climate. Closing date: 2/12/98.

  Contact: Barbara Levinson, (202) 564-6911 (levinson.barbara@epamail.epa.gov)

- *Interindividual Variation in Human Sus-ceptibility to Environmentally-caused Disease* - Research proposals are requested to evaluate the role that interindividual variation plays in the susceptibility of humans to disease caused by environmental agents. Susceptibility can be a function of intrinsic factors such as age, sex, race, and/or genetic polymorphisms. It may also be due to extrinsic factors such as unique patterns of exposure. Factors that affect the susceptibility of individuals to disease need to be

identified and quantified for the general population. Although molecular epidemiological approaches are of interest, studies on experimental animal models that can be extrapolated to humans are also appropriate. Studies that incorporate data into the development of dose-response models for use in risk assessment are of particular interest. Closing date: 2/12/98

Contact: David Reese, (202) 564-6919 (reese.david@epamail.epa.gov)

- *Ecological Indicators* - Research is solicited that leads to the development of indicators to characterize and quantify the integrity and sustainability of ecosystems. Research priorities, beginning with the highest, are described below:

  1) The development of landscape characterization indicators that incorporate multiple resources and spatial scales. Indicators that are useful at regional and broader scales are emphasized over those intended primarily for local use.

  2) The development of indicators that span multiple resource types (e.g., forests, streams, wetlands, estuaries, rangelands). Any indicator that incorporates or integrates multiple scales and multiple levels of biological organization within the context of spanning multiple resources is also emphasized.

  3) The development of indicators within a single resource type (e.g., forests, streams, wetlands, estuaries, rangelands) that link different levels of biological organization or multiple spatial scales. The opportunity to apply cellular and molecular genetics techniques to address genetic diversity in conjunction with other levels of biological organization and multiple spatial scales is emphasized. Closing Date: 2/26/98

  Contact: Barbara Levinson, (202) 564-6911 (levinson.barbara@epamail.epa.gov)

- *Drinking Water* - This solicitation invites research proposals in three areas of special interest: (1) Microbial Pathogens research that focuses on practical analytical methods needed to assist in quantifying the occurrence and viability of these organisms in source water and to identify the cause of waterborne disease outbreaks in drinking water supplies. (2) Disinfection Byproducts research leading to improved methods for estimating human exposures (via the oral, inhalation, and dermal routes) to the byproducts of different disinfection treatments. (3) Additional research is requested for Emerging Contaminants from the Contaminant Candidate List that need additional occurrence and health effects data. Closing Date: 2/26/98

  Contact: William Stelz, (202) 564-6834 (stelz.william@epamail.epa.gov)

- *Air Pollution Chemistry and Physics* - EPA seeks applications for research aimed at generating new knowledge in the areas of fine particulate matter and tropospheric ozone.

Areas of specific research include: atmospheric chemistry, modeling research, ambient measurements and analysis methods, and emissions research. Closing date: 1/29/98.

Contact: Deran Pashayan, (202) 564-6913 (pashayan.deran@epamail.epa.gov)

- *Urban Air Toxics* - This RFA seeks research proposals that address answers to critical questions on the public health risks of toxic air pollutants in the urban environment. Closing date: 2/12/98.

  Contact: Deran Pashayan, (202) 564-6913 (pashayan.deran@epamail.epa.gov)

- *Health Effects and Exposure to Particulate Matter (PM) and Associated Air Pollutants* - Research is needed in three areas: (1) Chronic Epidemiology studies that investigate association between long term exposure to PM (and other air pollutants) and adverse health effects, including amount of life lost, chronic illness, and conditions that increase susceptibility to air pollutants, (2) Studies on mechanisms of PM toxicity in normal and sensitive subpopulations to better understand causal mechanisms by which PM, alone and/or in combination with other air pollutants, may cause health effects at current ambient levels. Research is also needed to examine chronic effects of PM exposure and the relationship between acute and chronic biological responses. (3) Exposure error research, which will provide information on the magnitude and variability of the errors in the assessment of exposure due to the following: (a) measurement error in the mass of fine mode and coarse mode particles as determined through measurement of particle size distribution including the effect of intentional dehumidification; (b) errors in total mass and mass of ammonium nitrate and semi-volatile organic compounds due to loss of such semi-volatile species during sampling and equilibration of filter samples; (c) exposure error introduced by failing to account for spatial variation across a community (i.e., the use of a concentration measurement at one point in a city to represent the community average); and (d) the use of such a community average (based on one or several monitors) to represent the average personal exposure to ambient pollution of individuals in the community. Closing date: 1/29/98.

  Contact: Deran Pashayan, (202) 564-6913 (pashayan.deran@epamail.epa.gov)

- *Regional Scale Analysis and Assessment Research* - EPA seeks proposals for research on novel approaches for either conducting regional scale assessments by combining data from intensive investigations, regional surveys, and remotely sensed data or for novel approaches to determine the "representativeness" of an intensively studied site within a region. Priorities for funding will be: (1) Development and demonstration of methodologies that link remote sensing, regional survey data, and intensively studied site research into an integrated ecological assessment. For example, how would one approach linking (a) studies of carbon allocation at a specific forest research site with (b) production estimates from forest inventory and analysis surveys and (c) remote sensing

estimates of forest cover and leaf area index to provide a better description and understanding of forest productivity? (2) Studies which demonstrate approaches for determining the "representativeness" of individual research locations. Lake Tahoe, for example, has been extensively studied but is also considered unique. How applicable are research findings for Lake Tahoe to other lakes in western North America? If a less "unique" western lake were studied, how would one quantify its "representativeness" among other western lakes? Each of NSF's Long-Term Ecological Research (LTER) sites is located within a particular biome. How would one rigorously quantify how applicable the results from the H.J. Andrews Experimental Forest, for example, are to other forested systems in the northwest? Closing date: 2/12/98.

Contact: Barbara Levinson, (202) 564-6911 (levinson.barbara@epamail.epa.gov)

Under a partnership among Federal agencies, EPA, NIEHS, NSF, NOAA, DOE, USDA, ONR, and NASA, along with non-Federal partners, have issued joint research grant solicitations on the following topics of mutual interest:

- *Centers for Children's Environmental Health and Disease Prevention Research* - This joint competition by NIEHS and EPA will develop multidisciplinary basic and applied research in combination with community-based prevention research projects. Support will go to studies to establish the causes and mechanisms of children's disorders having an environmental etiology, identify relevant environmental exposures, intervene to reduce hazardous exposures and adverse health effects, and eventually decrease the prevalence, morbidity, and mortality of environmentally related childhood diseases. Closing Date: 1/21/98

  Contact: Chris Saint, (202) 564-6909 (saint.chris@epamail.epa.gov)

- *Chemical Mixtures in Environmental Health* - The goals and scope of this joint NIEHS/EPA competition are designed to encourage and support research on chemical mixtures that will take advantage of the latest advances in computational and information technologies and molecular biology techniques. The focus is on the mechanistic basis for chemical interactions in biological systems and related health effects and developing better mathematical tools for risk assessment. In addition, since there is a general lack of knowledge concerning the characterization of real-life mixtures based on human exposure and body burden, research will be supported that focuses on exposure assessment, including environmental transport and fate. Research on the mechanistic basis for cellular and/or molecular perturbations and associated health effects by mixtures of chemicals is encouraged. Research on chemical interactions that exacerbate both cancer and non-cancer effects is strongly encouraged. For example, the toxic effects of chemical mixtures on liver have been extensively studied, but it also has been observed that opposing effects for different organs can occur. Closing date: 2/10/98

  Contact: Chris Saint, (202) 564-6909 (saint.chris@epamail.epa.gov)

- *Water and Watersheds* - The goals of the Water and Watersheds joint competition by NSF, USDA and EPA is to develop (1) an improved understanding of the natural and anthropogenic processes that govern the quantity, quality, and availability of water resources in natural and human-dominated systems, and (2) an understanding of the structure, function, and dynamics of the coupled terrestrial and aquatic ecosystems that comprise watersheds. The emphasis of this year's competition will be on research that considers restoration and rehabilitation of damaged or degraded systems. For this competition, the term rehabilitation will capture any and all improvements up to and including complete restoration. The degradation of ecosystem integrity has many components, including but not restricted to: water quality, hydrology and habitat, biological diversity, and effects of exotic species. Degradation presents a serious long-term threat to the nation's economic prosperity and security and the sustainability of remaining ecological systems. Closing Date: 4/1/98

  Contact: Barbara Levinson,(202) 564-6911 (levinson.barbara@epamail.epa.gov)

- *Technology for a Sustainable Environment* - The 1998 joint competition involving NSF and EPA is designed to address pollution prevention processes, methodologies, and technology research. Proposals are invited that advance the development and use of innovative technologies and approaches directed at avoiding or minimizing the generation of pollutants at the source. Specifically, EPA and NSF are providing funds for fundamental and applied research in the physical sciences and engineering that will lead to the discovery, development, and evaluation of advanced and novel environmentally benign methods for industrial processing and manufacturing. The competition addresses technological environmental issues of design, synthesis, processing, and the production and use of products in continuous and discrete manufacturing industries. Projects must employ fundamental new approaches, and address, or be relevant to, current national concerns for pollution prevention. Closing date: 2/17/98.

  Contact: Barbara Karn, (202) 564-6824 (karn.barbara@epamail.epa.gov)

- *Decision Making and Valuation for Environmental Policy* - This joint NSF/EPA competition seeks to advance research to identify benefits or costs of environmental policy and regulation. Research in ecosystem valuation and cost analysis seeks to understand the interconnectedness among social, economic, physical and biological systems. It focuses on how comprehensive and critical ecosystem changes can be measured in terms of social welfare and helps to quantify and characterize the natural environment for a better understanding of the economic-ecological relationships. Closing date: 1/15/98.

  Contact: Deborah Hanlon, (202) 564-2447 (hanlon.deborah@epamail.epa.gov)

- *Environmental Statistics* - The joint NSF/EPA Environmental Statistics competition invites proposals for the development of innovative statistical methods and models for environmental research. Because problems in environmental research are complex, interdisciplinary collaborations are encouraged. The goal of this competition is to increase understanding of the physical and human dimensions of environmental issues and policies. In particular, this competition supports research in the following areas: (1) Statistical models and methods for environmental social science research; (2) Physical environmental statistics research; and (3) Research that either combines or is fundamental to both items (1) and (2). Closing date: 3/16/98.

  Contact: Chris Saint, (202) 564-6909 (saint.chris@epamail.epa.gov)

- *Research and Monitoring Program on Ecological Effects of Environmental Stressors Using Coastal Intensive Sites* - This joint agency competition involving NOAA, NASA and EPA is requesting applications for research and monitoring programs at pilot sites utilizing ecological indicators and investigating the ecological effects of environmental stressors. Indicators are measures that effectively integrate the environmental condition and response. Proposals are also being requested for research aimed at developing a remote sensing capability that will augment or enhance *in-situ* research and monitoring programs. Closing date: 4/1/98.

  Contact:Barbara Levinson (202) 564-6911 (levinson.barbara@epamail.epa.gov)

- *Bioremediation* - This joint competition involving DOE, NSF, ONR and EPA is designed to further our fundamental understanding of the chemical, physical, and biological processes influencing the bioavailability and release of chemicals in soil, sediments, and groundwater under natural conditions. Research is also needed on the role of chemical contaminants that, when released from the medium and assimilated by living organisms, result in an adverse effect. The objective of the research should be to understand the commonality of processes and/or environmental effects involved in contaminant release, movement, and assimilation in order to determine broadly applicable techniques for measuring the potential impacts of contaminants in complex matrices. Mechanistic and kinetic studies are encouraged. Closing date: 2/28/97.

  Contact: Robert Menzer, (202) 564-6849 (menzer.robert@epamail.epa.gov)

- *Ecology and Oceanography of Harmful Algal Blooms* - This joint competition involving NOAA, NSF, ONR, USDA, NASA and EPA seeks proposals for research on the environmental processes that facilitate and regulate harmful algal blooms in the coastal ocean. Developing an understanding of how physical and biological processes interact to promote bloom development, maintenance, and decline will contribute to the ultimate goal of preventing, managing, controlling, and mitigating their impacts. This interagency research program will support coordinated, well-integrated, interdisciplinary field studies

by research teams. Individual studies will also be supported to develop predictive models and address gaps in knowledge related to mechanisms that regulate harmful algal blooms. Closing Date: 2/23/98

Contact:RobertMenzer (202) 564-6849 (menzer.robert@epamail.epa.gov)

- *Endocrine Disruptors* - The program on endocrine disruptors will seek to develop a coordinated effort to stimulate innovative, multidisciplinary research that investigates the quantitative relationships between ambient environmental exposures to endocrine-disrupting chemicals (EDCs) and adverse effects in humans and wildlife. This research effort is being coordinated by the Endocrine Disruptors Working Group of the CENR. It is anticipated that a multiagency program will be developed to support research proposals on population-level effects of EDCs in wildlife, effects of EDCs in humans, and development of animal models. Closing date: To Be Deter-mined.

  Contact: David Reese (202)-564-6919, (reese.david@epamail.epa.gov)

  Additional STAR research grant solicitations will be available this year in the following areas. Check the NCERQA Internet homepage for updates.

  http://www.epa.gov/ncerqa

  Particulate Matter Research Centers

  Combustion Research

  Hexavalent Chromium Risk Reduction

  Children's Vulnerability to Toxic Substances in the Environment

  **FY 1998 STAR Graduate Fellowship Program**

  EPA has awarded approximately 116 new fellowships under its 1998 STAR Fellowship Program. The program offers up to $34,000 per year of support, depending on the number of months covered by student's enrollment. This amount covers a $17,000 annual stipend and $5,000 for authorized expenses, and up to $12,000 for tuition and fees paid directly to the institution. The purpose of the program is to encourage promising students to obtain advanced degrees and pursue careers in environmentally related fields. See NCERQA Internet homepage for next solicitation.

  To obtain current STAR solicitation information or to learn more about on-going STAR research visit the NCERQA Internet Homepage:

  http://www.epa.gov/ncerqa

# National Aeronautics and Space Administration

NASA brings to environment and natural resources research the ability to view the Earth in its entirety from space. This unique position has led NASA to focus on the study of the Earth as an integrated system, examining physical climate systems, biogeochemical cycles, and the linkages between the two.

## Types of Environment and Natural Resources Research Supported

NASA seeks to foster further understanding of the total Earth system, and the effects of natural and human-induced changes on the global environment. The pursuit of Earth system science would be impractical without the continuous global coverage provided by satellite-borne instruments. NASA's unique ability to develop advanced, space-based research platforms--converging with the national interest in the basic sciences and their practical benefits--has led to the Earth Science Program (formerly Mission to Planet Earth, MTPE).

The Earth Science Program (ESP) is composed of an integrated slate of spacecraft and *in situ* measurement capabilities; data and information management systems to acquire, process, archive, and distribute global data sets; and research and analysis programs to convert data into new knowledge of the Earth system. Myriad users in academia, industry, and Federal, State, and local government tap this knowledge to generate products and services essential to achieving sustainable development. The ESP is NASA's contri-bution to the USGCRP, an interagency effort to understand the processes and patterns of global change. The Earth Observing System (EOS) - the centerpiece of ESP - is a program of multiple spacecraft and interdisciplinary investigations to provide a 15-year data set of key parameters needed to understand global climate change.

Balancing the state of Earth system science with NASA capabilities, funding constraints, USGCRP research priorities, and the needs of external communities, the Office of Earth Science has established the following unifying themes for ESP science and missions over the period 1996-2002:

**Land-Cover Change and Global Productivity**. This area of emphasis involves documenting and understanding the trends and patterns of change in regional land cover, biodiversity, and global primary production.

**Seasonal-to-Interannual Climate Prediction**. The ESP seeks to provide global observations and scientific understanding to improve forecasts of the timing and geographic extent of transient climate anomalies.

**Natural Hazards**. This category applies unique ESP remote-sensing science and technologies to disaster characterization and risk reduction from earthquakes, fires, floods, and droughts.

**Long-Term Climate Variability**. This unifying theme serves to provide global observations and scientific understanding of the mechanisms and factors that determine long-term climate variations and trends.

**Atmospheric Ozone**. This focus continues studies into the detection, causes, and consequences of changes in atmospheric ozone.

Other ESP research efforts in such areas as global climate and Earth system modeling, solid Earth dynamics, and ocean topography combine with these to form an integrated approach to the advancement of Earth system science.

## Research Funding Opportunities

NASA issues RFPs, AOs, and NASA Research Announcements (NRAs) to solicit high-caliber Earth scientists. General information about flight programs and development opportunities should be sent to NASA Headquarters, Office of Earth Science, Flight Systems Division, Mail Code YF, Washington, DC 20546. General information about science programs and research funding opportunities can be obtained from the Science Division at NASA Headquarters, Office of Earth Science, Science Division, Mail Code YS, Washington, DC 20546. In addition, NASA accepts and funds unsolicited proposals. Further information can be obtained from, and applications sent to, the Office of Procurement, NASA Headquarters, Office of Procurement, Mail Code CW, Washington, DC 20546.

### General Funding Opportunities

Specific information about generic funding opportunities should be directed to the individuals listed below. Some of the information contained herein may have been superceded by recent developments. The ESP Website, however, is regularly updated and contains the most recent funding information under its "MTPE Research Announcements" category. Its URL is http://www.hq.nasa.gov/office/mtpe/.

- *Earth System Science Pathfinder* - This program of small satellite missions with development under 36 months and total cost less than $120 million per mission focuses on new scientific measurements not covered by EOS. Proposals should cover spacecraft and instrument development, operations, data analysis, and science.

  Contact: Kevin Niewohner, (202) 358-0751 (kevin.niewohner@hq.nasa.gov)

- *New Millennium Program* - This program focuses on demonstration of technologies and techniques that can enable science missions of the future. The key objectives are to enable new capabilities or to improve the performance and/or decrease the cost of current flight and measurement capabilities. These objectives are critical to meet the advanced technology needs and projected life-cycle cost savings resulting from the mid-1995 "reshaping" of the EOS Program. Actual science investigations may be accomplished, but only as a secondary objective and largely as a result of successful demonstrations of the technologies. Plans are for the New Millennium Program Earth science missions to be launched every 2 years starting in 1998. Calls for industry and other private sector participation will be made to support this schedule.

  Contact: Granville Paules, (202) 358-0706 (granville.paules@hq.nasa.gov)

- *EOS Interdisciplinary Investigations* - NASA and partner agencies are cooperating with other nations in developing EOS. EOS consists of a series of polar-orbiting and lower inclination satellites that will provide global observations of the land surface, oceans, ice sheets, and atmosphere over a minimum period of 15 years, with initial launches scheduled for 1997; a comprehensive data and information system to acquire, process, archive, and make available the resulting information to a broad range of users; and a basic research program supporting development of models/algorithms for retrieval of information content of global observations and interdisciplinary Earth system science investigations.

  Contact: Ghassem Asrar, (202) 358-0274, (ghassem.asrar@hq.nasa.gov)

  **Earth Science Research and Analysis Program**

  A wide range of investigations are ongoing and planned in such areas as land-cover change and global productivity, atmospheric ozone, seasonal-to-interannual climate forecasting, long-term climate change, and natural hazards research/solid Earth science. A short list of candidate opportunities planned for release over the next 2 years is provided below, along with a description of the various ongoing elements of the Research and Analysis Program that accept unsolicited proposals and are planning future competitive opportunities:

- Land-Use and Land Cover Change
- Polar Research Program
- Boreal Ecosystem-Atmosphere Study (BOREAS) Follow-On and Terrestrial Ecology
- JASON Radar Altimetry
- Atmospheric Chemistry Modeling and Ana-lysis
- Solid Earth and Natural Hazards
- Ecological Research in the Large-scale Bio-sphere-Atmosphere Experiment
- Upper Atmosphere Research

  Descriptions and specific points-of-contact for the various program elements are below. Some of the information included here may have been superseded by more recent developments. It is recommended that the reader consult the ESP Website http://www.hq.nasa.gov/office/mtpe/ under "MTPE Research Announcements".

- *Global Modeling and Analysis* - The goal of this effort is to use models and model-assimilated data sets to assess global climate system variability and trends on seasonal-

interannual through century time scales. The strategy behind this program element is to develop, improve, and test global atmospheric climate models and their couplings to models of other parts of the Earth system, and to use them to diagnose and predict climate variations and trends, with the objective of providing analytic and predictive capability for assessments of global climate and Earth system behavior. This element also seeks to develop, improve, test, and assist in implementing a near-real-time model-driven data assimilation system that will have the capability of ingesting EOS and other remotely sensed observational data along with conventional data, with the objective of providing the best possible synthesis of observational information and model skill, in the form of research-quality climate data sets for community use.

Contact: Kenneth Bergman, (202) 358-0765 (kbergman@hq.nasa.gov)

• *Land-Cover and Land-Use Change* - The goal here is to develop the capability to perform repeated global inventories of land-cover and land-use from space, and to develop the scientific understanding and models necessary to evaluate the consequences of the observed changes. The strategy behind this program element is to develop methods and techniques, and to conduct research to evaluate impacts and the consequences of land-use change; to establish ways to quantify them; and to develop the capabilities to explore alternative land-use and monitoring strategies. The program will consist of a combination of satellite- and field-based studies. The broader challenge of accurately accounting for land-use and land-cover change and the underlying research to interpret it will require a partnership with many scientific and natural resource management institutions around the world. Emphasis will be on the regions of the world currently undergoing the most stress, and where stresses from human activities are sure to increase the most rapidly.

Contact: Anthony Janetos, (202) 358-0276 (anthony.janetos@hq.nasa.gov)

- *Global Data Integration and Validation* - The goal here is to support the interdisciplinary interpretation of remote-sensing data from a variety of U.S. and foreign satellites in order to validate atmospheric remote-sensing algorithms, and to study the time and space variations of the derived geophysical parameters. The strategy behind this program element is to acquire appropriate satellite and *in situ* data to validate algorithm performance in regional-global intercomparisons and field experiments for the study of physical interactions between the atmosphere and the land, ocean, or ice surfaces below; to refine the remote-sensing algorithms until their outputs serve as base environmental states and as measures of the natural variability of specific parameters; to provide the determined environmental states, variability, and trends to models for characterizing model performance and validating retrospective model runs to the present; to determine the variability of atmospheric moisture, energy and water cycles, surface fluxes from the oceans, and changes in water vapor radiative forcing; to establish remote measurement capabilities for difficult variables like precipitation, cloud liquid water, water vapor varying with height, and in-cloud particle type effects; and to contribute to assessments of global and regional variability of atmospheric water source availability.

Contact: James Dodge, (202) 358-0763 (james.dodge@hq.nasa.gov)

- *Land Surface and Hydrology* - The goal of this effort is to develop a predictive understanding of the role of water in land-atmosphere interaction and to further the scientific basis of water resources management. The strategy behind this program element is to develop process models for describing mesoscale coupling of atmospheric motion and the exchange of water, energy, and momentum at the land surface; to develop new or improved technology and techniques for measuring hydrologic variables and seek new applications to hydrologic problems; and to formulate new theories about the role of land-atmosphere interactions in regional and global climate.

  Contact: Ming-Ying Wei, (202) 358-0771 (ming-ying.wei@hq.nasa.gov)

- *Atmospheric Dynamics and Remote Sensing* - The goal here is to develop an improved understanding of the physical processes important in establishing the circulation of the atmosphere on all scales, ranging from the cloud, regional, and mesoscale to the global scale. This includes not only a comprehensive understanding of the distributions and variations of mass, energy, momentum, and water vapor in the troposphere at all scales, but also a complete understanding of the coupling between the dynamical and thermodynamical processes with the hydrological and radiative processes. To accomplish this goal, it is necessary to monitor the physical variables that characterize the state of the atmosphere. Therefore, the research programs pursued include the development of ground, airborne, and space-based remote-sensing techniques; participation in field experiments to obtain comprehensive data sets; advanced process modeling studies such as interscale energy transitions; and development of parameterizations for moist convective system frontal zones, internal gravity waves, clouds, and radiative transfer.

  Contact: Ramesh Kakar, (202) 358-0240 (ramesh.kakar@hq.nasa.gov)

- *Geopotential Fields* - The goal of this program element is to increase understanding of the fundamental processes that generate and maintain the Earth's geomagnetic field. The strategy behind this program element is to observe and understand the static and dynamic components of the Earth's gravity field as a means of detecting lithospheric and mantle structure and dynamics, cryospheric and hydrological mass flux, and atmospheric circulation with times scales of months and longer. This also involves observing the dynamics of the Earth's magnetic field as a means of characterizing the core processes that generate the Earth's main magnetic field, the mechanisms leading to main field polarity reversal, and the structure, composition, and evolution of the mantle and lithosphere, and of assessing natural mineral resources with time scales of months and longer.

  Contact: Lou Walter (alternate) (202)358-0442 (lwalter@hq.nasa.gov)

- *Geodynamics* - This program element seeks to enhance science and technology related to the dynamics of the solid Earth and its interactions with the oceans and atmosphere. This program includes the development of geodetic techniques to measure deformation of the solid Earth, including Global Positioning System, Very Long Baseline Interferometry, and Satellite Laser Ranging technology. The strategy behind this program element is to observe, understand, and predict the dynamics and evolution of the Earth's lithosphere in order to mitigate the danger of earthquakes, to understand land subsidence, and to locate and access natural resources with time scales of hours and longer. Other objectives include observing and understanding the dynamics in the Earth's orientation and rotation as a comprehensive indicator of Earth system dynamics including paleoenvironment, oceanic and atmospheric circulation, internal core and mantle motions, and extraterrestrial forcing functions with time scales of hours and longer.

  Contact: Lou Walter (alternate) (202)358-0442 (lwalter@hq.nasa.gov)

- *Polar Research* - The Polar regions play an important role in global climate, and they contain in the form of ice about 80% of the fresh water on Earth - enough to raise sea level more than 70 meters if it melted. The two prime goals of NASA's Polar Research Program are (1) to measure and understand the mass balance of the Greenland and Antarctic ice sheets to be able to assess their potential contributions to sea-level change and improve our ability to predict future changes; and (2) to improve the simulation of ocean/ice/atmosphere processes in climate models to improve the capability of such models to predict future climate. The strategy behind the program is to develop improved techniques for estimating important ice parameters from satellite and *in situ* data, to use time series of these estimated parameters to investigate key processes and their mutual interactions, and to develop ice-sheet and atmosphere/sea-ice/ocean models that incorporate our improved understanding.

  Contact: Prasad Gogeneni, (202) 358-0746 (sgoginen@hq.nasa.gov)

- *Atmospheric Effects of Aviation* - The goal here is to develop a scientific assessment of current and future subsonic and potential supersonic aviation on atmospheric ozone levels and global climate, with a focus on commercial aircraft cruise emissions. The strategy behind this program element is to promote advancements in the conceptual understanding and computational model representations of upper troposphere/lower stratosphere processes and aircraft wake and plume processes; to improve input databases for models, specifically those for operational aircraft scenarios, photolysis rates, chemical reaction rates, and source gas emissions; and to denote and quantify, where possible, uncertainties in the conceptual understanding and model representation of atmospheric processes related to aircraft impacts.

  Contact: S. R. Kawa, (301) 286-5656 (kawa@maia.gsfc.nasa.gov)

- *Terrestrial Ecology* - The goal here is to improve understanding of the structure and function of global terrestrial ecosystems, their interactions with the atmosphere and hydrosphere, and their role in the cycling of the major biogeochemical elements and water. The strategy behind this program element is to use remote sensing to observe the distribution and structure of the Earth's terrestrial ecosystems, to conduct process studies to elucidate ecosystem functions, and to develop realistic models that simulate these ecosystem properties and processes. Emphasis is on integrating process understanding with remote-sensing observations and ecological modeling to extend understanding across spatial and temporal scales. NASA's Terrestrial Ecology program also contributes to the interagency Joint Program on Terrestrial Ecology and Global Change (TECO). For more information about TECO, visit its homepage at http://teco.ornl.gov/TECO/.

  Contact: Diane Wickland, (202) 358-0245 (diane.wickland@hq.nasa.gov)

- *Atmospheric Chemistry Modeling and Analysis* - The goal of this program element is to improve understanding of the distribution of chemically and radiatively active trace constituents and aerosols in the troposphere and stratosphere at regional to global scales, through the development of computational models representing atmospheric chemistry and transport processes, and by model-based analysis and interpretation of atmospheric constituent and dynamical data. The strategy behind this program element is to develop models of atmospheric chemistry and physics for both the troposphere and stratosphere, and to interpret atmospheric trace gas and aerosol data, emphasizing the characterization of spatial and temporal variability and distinguishing between natural and anthropogenic origins of this variability.

  Contact: Jack Kaye, (202) 358- 0757 (jack.kaye@hq.nasa.gov)

- *Upper Atmosphere Research* - The goal here is to understand the physical, chemical, and transport processes of the atmosphere (upper troposphere and stratosphere) and their control on the distribution of stratospheric species such as ozone; to accurately assess possible perturbations to the composition of the atmosphere caused by human activities and natural phenomena; and to understand the distribution of and processes affecting concentrations of radiatively active species and the processes responsible for the dynamical and chemical coupling of the troposphere and stratosphere. Field measurements employing *in situ* and remote-sensing techniques from surface-based, aircraft, balloon, and rocket platforms are supported by laboratory studies of gas phase and heterogeneous kinetics, photochemistry, spectroscopy, and calibration standards development, as well as process-oriented modeling and data analysis.

  Contact: Mike Kurylo, (202) 358-0237 (mike.kurylo@hq.nasa.gov)

- *Tropospheric Chemistry Program* - The goal of this program element is to develop an understanding of global tropospheric chemistry and to assess the susceptibility of the global atmosphere to chemical change from human impacts and natural effects. Special attention is given to the connection of chemical change to climate change and to changes in atmospheric ozone. This effort seeks to determine tropospheric meteorological and chemical influences on the atmosphere as a whole, particularly the stratosphere and upper troposphere; to understand the chemistry of global tropospheric species and the causes of changes in chemical composition, particularly in regions of the world that are expected to experience the greatest stress from human impacts over the next decade; to develop techniques for remote and *in situ* measurement of the concentrations and fluxes of key tropospheric species; and to develop a strategy for chemical measurements from space platforms in combination with *in situ* measurement techniques.

  Contact: Robert J. McNeal, (202) 358-0239 (robert.mcneal@hq.nasa.gov)

- *Radiation Science* - NASA is working to observe and accurately calculate the radiative flux divergences (heating and cooling rates) at all relevant space-time scales and for all major processes that produce radiative forcing and feedbacks in the Earth's climate system. NASA conducts observational and theoretical investigations of major radiative elements of the Earth's climate system and radiative forcing parameters, field experiments and modeling studies of major feedback mechanisms, and analysis and validation of space observations for radiative parameters and processes.

  Contact: Robert Curran, (202) 358-1432 (robert.curran@hq.nasa.gov)

- *Biological Oceanography* - NASA is develo-ping techniques to predict the ocean's biogeochemical response to, and its influence on, climate change; to predict variability in the structure of the phytoplankton community and its link with higher trophic levels and biogeochemical cycles; and to develop the scientific principles and information base required to understand the potential productivity of the coastal marine ecosystem. The Ocean Biology Program has developed two streams of research to address these goals. The first focuses on the production and analysis of decadal-scale time series of phytoplankton biomass and productivity on a global scale. The second emphasizes the development of predictive models of the ocean ecosystem.

  Contact: Janet Campbell, (202) 358-0310 (jcampbe1@hq.nasa.gov)

  *Physical Oceanography*: NASA seeks to understand and determine the role of ocean processes in seasonal-to-interannual and longer climate variations with a particular emphasis on the use of space-based ocean observations. NASA uses existing and future space-based observations to measure quantitative variations in ocean circulation, sea surface temperature, tides and mean sea level, sea surface winds, and air-sea fluxes. Space-based ocean observations provide global coverage, but only indirect subsurface information. In contrast, *in situ* observations give good sampling of the vertical water column, but have poor temporal and geographic distribution. Numerical models can be

used to combine or assimilate disparate observation types into integrated descriptions of the state of the ocean on a regular spatial and temporal grid.

Contact: Eric Lindstrom, (202) 358-4540 (eric.lindstrom@hq.nasa.gov)

- *Resource Vulnerability Assessment* - NASA is working to develop a set of global change observations and indicators that provide early warning and trend information on resource vulnerability issues that directly impact humans through a focus on the direct connection of present and future global observing system data (particularly space-based) to socioeconomic applications and natural resource management. NASA utilizes appropriate satellite and *in situ* physical sciences data and observations combined with socioeconomic data and information to develop resource vulnerability indicators in a number of areas of direct impact to or by humans, such as land use/land cover change, human health, fresh water management, sustainable use of natural resources, food, refugees, natural hazard disaster mitigation, UV radiation at the Earth's surface, and hazardous wastes and pollution. The emphasis of these studies is to improve the understanding of the interactions between human and natural Earth systems through combined studies in the natural sciences and social sciences involved in global environmental change.

  Contact: Nancy Maynard, (202) 358-2559 (nancy.maynard@hq.nasa.gov)

- *Natural Hazards* - The goal of this program is to develop techniques and space-based technology that will be useful to disaster mitigation, risk assessment, warning, and response as applied to earthquakes, volcanic eruptions, flood, drought, wildfires, coastal hazards, and severe storms. The strategy employed is to link Earth science with operational disaster management practitioners through the development and application of appropriate space technologies, remote sensing, geographic information systems, and physical models.

  Contact: Lou Walter, (202) 358-0442 (lwalter@hq.nasa.gov)

# National Institutes of Health

**National Institute of Environmental Health Sciences (NIEHS)**

The Division of **Extramural Research and Training** of the NIEHS is responsible for the Institute's scientific, fiscal, and administrative management of grant-supported research and training programs. These programs are focused on understanding direct relationships between human exposures to environmental agents and potential effects on health. Research is supported at universities, medical centers, research institutions, and other research organizations throughout the U.S. and the world.

The **Chemical Exposures and Molecular Biology Branch** administers research programs in molecular biology; carcinogenesis; biomarkers of chemical exposures and doses, individual susceptibility, and effects; and environmental epidemiology. This branch also administers the NIEHS/EPA Superfund Basic Research Program. The **Organ and Systems Toxicology Branch** supports mechanistic-based research focused on examining non- cancer endpoints of exposures to environmental toxicants. Research supported is concentrated on the molecular mechanisms by which environmental factors disrupt cellular function within target tissues and lead to human health problems. Much of the work involves studies at the intracellular and genetic levels; however, population-based research projects are also supported to identify environmental substances that cause or exacerbate human health problems.

The Division's **Worker Education Training Program** supports the development of training programs for hazardous waste management and remediation workers and their supervisors. The model program encourages innovation in training methods and enhances private sector training by demonstrating new and cost- effective training techniques and materials.

Contacts: Anne P. Sassaman, Director, NIEHS Division of Extramural Research and Training, (919) 541-7723, fax (919) 541-2843,
(sassaman@niehs.nih.gov)
or William A Suk, Deputy Director for Program Development, (919) 541-0797
(suk@niehs.nih.gov)

**National Institute of Child Health and Human Development (NICHD)**

The **Center for Population Research (CPR)** at NICHD is responsible for supporting research on population processes and the physical environment. The **Reproductive Sciences Branch** of CPR supports research on the environmental influences of nutrition, seasonal changes, and chronobiological strategies on reproduction. The **Demographic and Behavioral Sciences Branch** supports studies of how human population change affects the natural environment. Both branches use investigator-initiated research grants and a wide variety of other funding mechanisms. Further information may be obtained by contacting the staff listed below.

Contacts: Michael McClure, Chief, Reproductive Sciences Branch, (301) 496-6515, fax (301) 496-0962 (mcclurem@hd01.nichd.nih.gov)

or Jeffery Evans, Demographic and Behavioral Sciences Branch, (301) 496-1174
(evansj@hd01.nichd.nih.gov)

# National Science Foundation

The National Science Foundation (NSF) supports fundamental research across the entire range of science and engineering disciplines. NSF does not operate laboratories. All of its funding is devoted to extramural research. NSF makes approximately 20,000 awards per year through competitive merit review to more than 2,000 colleges, universities, and other research institutions in all parts of the U.S.

NSF supports research and education to enhance understanding of the complex dynamics among natural and human systems; to generate knowledge needed to preserve, manage, and enhance the environment; and to support national and international policymaking activities.

NSF seeks to draw on the participation of relevant science and engineering disciplines to promote interdisciplinary research necessary for improved understanding of complex environmental and global change processes. To accomplish these goals, NSF environment and natural resources activities involve support of basic disciplinary research, focused interdisciplinary research, and a broad range of educational and outreach functions that cut across the entire portfolio of environment and natural resources scientific interests.

## Types of Environment and Natural Resources Research Supported

Examples of the types of research that NSF contributes to the U.S. Global Change Research Program (USGCRP) include the following: Research on climate processes and interactions, and seasonal to interannual variability; monitoring and research on ozone depletion and ultraviolet (UV) radiation; modeling of oceanic, atmospheric, vegetative, economic, and other components of the whole Earth system, as well as research to integrate those components in an integrated assessment framework; research on ecological diversity, ecosystem dynamics, and terrestrial ecology; and research on the human dimensions of global change, including research on social dynamics, human interactions, and influences, as well as research on policy sciences and options for responding to environmental change.

NSF has also been serving as a major catalyst for related research on other important environment and natural resources issues within the context of the CENR. NSF actively supports research activities across a broad spectrum of scientific disciplines to address issues related to the preservation, management, and enhancement of the environment. Several specific areas of interest include air and water quality, biodiversity and ecosystem dynamics, environmental technology, natural disaster reduction, water and watersheds research, and risk assessment.

The Directorates for Biological Sciences (BIO); Education and Human Resources (EHR); Engineering (ENG); Geosciences (GEO); Mathematics and Physical Sciences (MPS); and Social, Behavioral, and Economic Sciences (SBE); and the Office of Polar Programs (OPP) all contribute to environment and natural resources activities. International research activities can be supported by any of the directorates; those involving collaboration with international partners are also eligible for support from the Division of International Programs (INT).

The combined environment and natural resources activities seek to encourage scientific understanding of our environment through support of unsolicited investigator-initiated research and activities in the following categories:

**Understanding Fundamental Processes**. The bulk of environment and natural resources support helps fund research efforts focused on understanding fundamental processes involved in physical system, biological system, and human system interactions. These analyses might include any disciplinary or interdisciplinary effort that seeks to deepen or broaden understanding of different elements or interactions of a particular system. Research is also supported that focuses on the interactions among those systems. Examples from the diverse set of environment and global change basic research focused on the understanding of fundamental processes include ecosystem dynamics, cell function, atmospheric chemistry, political or economic institutional processes, chemical and biogeochemical dynamics, life in extreme environments, Earth system history, solar influences, and the study of the interactions responsible for the ozone hole. Many other fields of research contribute to the understanding of fundamental processes.

**Observation Systems and Data Management**. These activities include long-term observation platforms supported by NSF (e.g., Long-Term Ecological Research sites, the National Center for Ecological Analysis and Synthesis, seismic networks, and other facilities and activities to promote the continued collection of relevant data sets). In order to support and facilitate environment and global change research by individual scientists, NSF also provides funds for the maintenance and management of important databases such as climatic data bases at the National Center for Atmospheric Research (NCAR), archival observatories, such as natural history museums and field stations, and other networks or activities to encourage access, maintenance, and sharing of data.

**Modeling Activities**. To enhance under-standing of Earth, biological, and human systems and processes, NSF also supports diverse modeling activities. This emphasis includes research on modeling approaches, model enhancement, and model integration. Examples of modeling activities supported by NSF include economic modeling, vegetative modeling, weather and climate modeling, and a program focused on methods and models for integrated assessment.

**Analysis and Development of Mitigation, Harm Avoidance, and Response Options**. This category includes research and analyses of possible human and technological responses to environmental changes. Examples of activities in this category include the study of economic evaluation and impact methodologies, mitigation and risk assessment approaches, policy sciences analysis to evaluate the tools and options for decision makers, and engineered technologies to avoid, alleviate, or minimize environmental harms.

**Education and Outreach**. In addition to research activities, NSF also seeks to advance science education and human resource capabilities. NSF supports science education and science literacy related to the environment using a diverse set of approaches. EHR supports programs to provide quality science education experiences for students at all levels, including those students from groups traditionally under-represented in science, mathematics and technology. Among these are the science, mathematics, and engineering programs that support graduate and undergraduate studies as well as programs designed to enhance elementary, secondary, and informal educational opportunities.

**Enhancement of International Research Infrastructure**. NSF environment and natural resources programs also involve international collaborations, participation in international scientific field experiments, research networks, and coordination activities. For information on funding activities through INT, request NSF Publication 96-14 from their Internet address

<pubs@nsf.gov> or call (703) 306-1130. Information on these programs is also available at the URL: http://www.nsf.gov/sbe/int/start.htm NSF has also been the lead agency for the Inter-American Institute for Global Change Research (IAI) within the U.S. For additional information, contact Dr. Paul Filmer, IAI Program Director, at (703) 306-1515 or refer to the IAI homepage, found at URL http://www.iai.int

## Research Funding Opportunities

NSF supports environment and global change-related activities through existing NSF programs. General information on NSF-supported environment-related activities is available in the NSF Guide to Programs (NSF Publication 97-30). The NSF Grant Proposal Guide (NSF Publication 98-2) provides necessary forms and information for the submission of proposals. Copies of either publication can be requested by calling the NSF Publication Unit at (703) 306-1130, or by sending an Internet message to pubs@nsf.gov.

NSF also maintains a homepage that provides similar program information at URL: http://www.nsf.gov. To access information on NSF's environment and global change research opportunities, the extended address is http://www.nsf.gov/geo/egch/.

Abbreviated descriptions of some of the focused environment and natural resources research opportunities follow. Similar descriptions appear in the NSF Environment and Global Change Research Opportunities brochure, NSF 97-43.

Many of these descriptions also include a homepage address to access further information, which in some cases includes past awards lists, updated contact information, and related links. These opportunities are supported by multiple NSF programs in support of interdisciplinary and focused research goals. Please contact the appropriate program officer before submitting a proposal to NSF. Please also note that proposal deadlines vary by program.

NSF program officers may also be reached by e-mail. Most NSF e-mail addresses are derived from the first letter of the first name with the last name up to eight characters, then @nsf.gov. Any exceptions are listed. Example: the e-mail address for Monica Mazurek is mmazurek@nsf.gov; for Michael Ledbetter it is mledbett@nsf.gov.

*Air Quality* - Fundamental research is supported that develops improved understanding of the sources, formation, and atmospheric processing of ambient air pollutants. Atmospheric oxidant species (and their precursors), sulfur dioxide, nitrogen oxides, carbon monoxide, fine particles, and acid deposition (and its precursors) are important atmospheric constituents that influence air quality. Field experiments, laboratory studies, instrumentation development, new methods of chemical analysis, and improved models of atmospheric chemical transport and depositional phenomena are examples of air quality research supported by NSF. These categories provide scientific and technical input for management and control of atmospheric pollutant gases and particles. Proposals may be submitted at any time.

Contact: Monica Mazurek or Anne Marie Schmoltner, Division of Atmospheric Sciences, GEO, (703) 306-1522

http://www.nsf.gov/geo/egch/airqual.htm

*Antarctic Ecosystems* - Interdisciplinary investigations of terrestrial, limnetic, and marine ecosystems in Antarctica are conducted through ecosystem monitoring and studies of long-term ecological responses to global change at the Palmer Station Long Term Ecological Research site. Deadline for proposals: June 1.

Contact: Polly Penhale, Office of Polar Programs, (703) 306-1033

*Arctic System Science* (ARCSS) - Interdisciplinary studies are supported to understand the physical, geological, chemical, biological, and social processes of the Arctic system that interact with the total Earth system, and therefore contribute to or are influenced by global change. Target dates for submission of proposals: June 1 and December 15.

Contact: Michael Ledbetter, Office of Polar Programs, (703) 306-1029

http://www.nsf.gov/geo/egch/arcss.htm

*Biodiversity and Ecosystem Dynamics* - Research on biodiversity (population/com-munity, animal behavior, ethology and beha-vioral ecology, systematic biology, biological surveys, habitat analysis, conservation biology, and ecological dynamics); physiological and biochemical ecology; genetic processes and responses; basic ecosystem processes; and population and community responses to stress is supported. Proposals must be submitted to regular programs in the Directorate for Biological Sciences, Geosciences, and the Office of Polar Programs. Deadlines vary, please consult the homepage for further information.

Contact: James Rodman, Environmental Biology, (703) 306-1481

http://www.nsf.gov/geo/egch/biodiv.htm

*Bioremediation* - A joint program sponsored by four Federal agencies (NSF, EPA, DOE, and ONR) supports research on principles under-lying biodegradation of chemical contaminants, especially metals, and bioremediation of contaminated sites. The FY 1998 announce-ment is posted by EPA, and may be accessed through the EPA Web site at http://es.epa.gov/ncerqa/rfa/bio.html. The closing date for all submissions to EPA is February 27, 1998.

Contact: James Rodman, Environmental Biology, (703) 306-1481

*Climate Modeling, Analysis, and Prediction* - Supports research leading to improved understanding and modeling of the processes that affect climate variability and change. Priority is given to studies that address issues related to coupling the atmosphere to its lower boundaries -- the ocean, land surface, and cryosphere. Temporal and spatial scales of interest are seasonal, interannual, decadal-to-centennial, and regional-to-global.

Contact: Jay Fein, Division of Atmospheric Sciences, GEO, (703) 306-1527

http://www.nsf.gov/geo/egch/cmap.htm.

*Climate Variability and Predictability* (CLIVAR) - Research goals are to describe and understand the physical processes responsible for climate variability and predictability on time scales ranging from seasonal to centennial, and to extend the range and accuracy of seasonal to

interannual climate prediction through the development of global coupled models. CLIVAR is organized around three areas: 1) Climate variability and predictability from seasons to years, 2) climate change and the world ocean, and 3) human impacts on climate. Deadline for proposals: February 15 and August 15 for the Division of Ocean Sciences; proposals for the Division of Atmospheric Sciences may be submitted at any time.

Contacts: Eric Itsweire, Division of Ocean Sciences, GEO, (703) 306-1583, or Jay Fein, Division of Atmospheric Sciences, GEO, (703) 306 -1527

http://www.nsf.gov/geo/egch/clivar.htm

*Earth System History* (ESH) - Supports coordinated projects that focus on the past behavior of the coupled Earth-Ocean-Atmosphere-Biosphere system which are conducted to provide insight into the factors that govern environmental variability, rates of climate change, and large-scale responses to climate forcing. Deadline for proposals: January 15, 1998. Please consult the homepage at URL:

http://www.nsf.gov/geo/egch/esh.htm.

Contacts: Herman Zimmerman, Division of Atmospheric Sciences, GEO, (703) 306-1527; Connie Sancetta, Division of Ocean Sciences, GEO, (703) 306-1586; or Chris Maples, Division of Earth Sciences, GEO, (703) 306-1551.

*Ecological Diversity* - Research support is provided for interdisciplinary activities that focus on the relationship between ecological processes and biological diversity through improved understanding of total community composition, including microbial diversity, survival and adaptation mechanisms, natural rates of change, and human-caused changes such as exotic invasions, increased extinction rates, and habitat loss. In FY 1998, the interagency Terrestrial Ecology and Global Change (TECO) competition will be the primary contributor to this program. This year's TECO competition is being organized by NASA. The FY 1998 announcement may be accessed at http://teco.ornl.gov/teco/. See also

http://www.nsf.gov/geo/egch/ecoldiv.htm.

Contact: Gaius Shaver, Division of Environ-mental Biology, BIO, (703) 306-1479

*Ecological Rates of Change* - Research is supported for projects studying the effects of both natural and human-induced changes on ecological processes, specifically how human-induced global change affects ecological rates of change.

Contact: Scott Collins, Division of Environmental Biology, BIO, (703) 306-1479

http://www.nsf.gov/geo/egch/eroc.htm

*Environment and Global Change Education* - Activities are primarily funded through programs of the Directorate for Education and Human Resources (EHR). This support comes under the program areas of Teacher Enhancement and Instructional Materials Development for the K-12 activities and Faculty Enhancement and Course and Curriculum Development for the undergraduate level. In addition, graduate fellowships in all areas of NSF, including global environmental education are available. Related activities are also funded in the Informal Science

Education (ISE) Program, which is designed to support projects that provide rich and stimulating learning environments outside of school. ISE is currently funding supplements for research awards to assist in the broader dissemination of research results and to promote science literacy for the general public. The administering program officer for an existing award should be contacted for more information on this opportunity. For further information about any of these EHR opportunities, including deadlines for the above programs, please consult the EHR homepage at http://red.www.nsf.gov. Other EGC directorates also provide some support for related educational efforts.

Contacts: M. Patricia Morse (mpmorse@nsf.gov), Division of Elementary, Secondary, and Informal Education, EHR; Herbert Levitan, Division of Undergraduate Education, EHR, (703) 306-1666; Susan W. Duby, Division of Graduate Education, EHR, (703) 306-1694; Michael Mayhew, Geosciences Education, (703) 306-1557

http://www.nsf.gov/geo/egch/egced.htm

*Environmental Remediation* - Supports research aimed toward the discovery or application of engineering principles to reduce adverse effects of solid, liquid, and gaseous discharges to land, water, and air that impair their values. Support is given to research on innovative biological, chemical and physical processes to restore the usefulness of polluted land, water and air resources. Proposals may be submitted at any time.

Contacts: Edward Bryan, Norm Caplan, or Fred Thompson, Division of Bioengineering and Environmental Systems, ENG, (703) 306-1318.

*Environmental Technology* - Research support is provided to assess any environmental technology (including hardware and software), system, or service -- the primary purpose of which is to reduce residual risk or cost, and/or to improve process efficiency. This research area includes avoidance of environmental harm, pollution control, monitoring and assessment, and restoration. For the NSF/EPA Technology for a Sustainable Environment component of Environmental Technology, the FY 1998 deadline is February 17, 1998. Please contact program officers regarding submission of other Environmental Technology-related proposals.

Contacts: Margaret Cavanaugh, Division of Chemistry, MPS, (703) 306-1842; Robert Wellek, Division of Chemical and Transport Systems, ENG, (703) 306-1370; or Fred Thompson, Division of Bioengineering and Environmental Systems, ENG, (703) 306-1318

http://www.nsf.gov/geo/egch/envtech.htm

*Geosystem Databases* (GEODATA) - In cooperation with other agencies, long-term global synoptic data needed to understand global change processes and to develop and validate earth system models are assembled, documented, archived, and disseminated. Proposals may be submitted at any time.

Contact: Jay Fein, Division of Atmospheric Sciences, (703) 306-1527

http://www.nsf.gov/geo/egch/geodata.htm

• *Global Ocean Ecosystems Dynamics* (GLOBEC) - Supports research and analysis of the impact of changes in the global environment on marine ecosystems, with special emphasis placed on physical and ecological mechanisms that determine the variability of marine animal populations. Deadlines for proposal sub-missions vary, please consult the program director or homepage for information.

Contact: Phillip Taylor, Division of Ocean Sciences, GEO, (703) 306-1587

http://www.nsf.gov/geo/egch/globec.htm

*Global Tropospheric Chemistry Program* (GTCP) - This program supports research that measures, analyzes, and predicts changes in the chemistry of the global atmosphere through field measurements, laboratory studies, and computer modeling. Emphasis is placed on factors affecting radiative processes and oxidizing capacity of the Earth's atmosphere. Relevant process-based research includes study of the atmospheric components of biogeochemical cycles that involve key elements such as sulfur, carbon, nitrogen, and the halogens. Please contact the program director for information on target dates for submission of proposals.

Contacts: Anne Marie Schmoltner or Monica Mazurek, Division of Atmospheric Sciences, GEO, (703) 306-1522

http://www.nsf.gov/geo/egch/gtcphtm

*Greenhouse Gas Dynamics* research is conducted to analyze interactions of greenhouse gases with light, other atmospheric gases, surfaces, and other relevant substances and the complex natural and industrial processes that lead to greenhouse gas production and release. Please contact the program director for information on target dates for submission of proposals.

Contact: Margaret Cavanaugh, Division of Chemistry, MPS, (703) 306-1842

http://www.nsf.gov/geo/egch/ggd.htm

*Human Dimensions of Global Change* - Analyses are conducted of both direct human activity and indirect social, structural, and institutional issues related to the complex interactions among human and natural systems in a dynamic framework. Proposals should be submitted to the most appropriate NSF program. Please contact most relevant program officer for further information and submission deadlines.

Contacts: Cheryl Eavey, Division of Social, Behavioral, and Economic Research, SBE, (703) 306-1729; Rachelle Hollander, Division of Social, Behavioral, and Economic Research, SBE, (703) 306-1743; Carole Seyfrit, Office of Polar Programs, (703) 306-1029

http://www.nsf.gov/geo/egch/hgdc.htm

*Joint Global Ocean Flux Study* (JGOFS) - Through international collaboration, key elements of the ocean carbon cycle and their atmospheric connections are analyzed. Deadlines vary, please consult the homepage for information and announcements of opportunity.

Contact: Phillip Taylor, Division of Ocean Sciences, GEO, (703) 306-1587 (ptaylor@nsf.gov)

http://www.nsf.gov/geo/egch/jgofs.htm

*Life in Extreme Environments* - This interdisciplinary research program explores the relationships between microorganisms and the environments within which they exist, with a strong emphasis on those life-supporting environments that exist near the extremes of planetary conditions. The study of these microbes and the extreme environments they inhabit on Earth can provide important new insights into how organisms form and adapt to diverse environments. This knowledge will provide the basis for detecting and understanding the life forms that may exist beyond our own planet and for developing useful new products and processes.

Contact: Phil Taylor, Division of Ocean Sciences, (703)306-1580, (prtaylor@nsf.gov),

http://www.nsf.gov/home/crssprgm/lexen/start.htm

*Natural Hazard Reduction* - These programs fund research that studies the causes and effects of natural hazards, societal and behavioral responses to these hazards, and the means for reducing their impacts. The research topics include weather-related hazards (storms, hurricanes, typhoons, tornadoes, floods, droughts), geological hazards (volcanoes, earthquakes), and wildfires. NSF is a participant in the interagency U.S. Weather Research Program, the National Space Weather Program, and the National Earthquake Hazards Reduction Program (NEHRP). Deadlines vary by program.

Contacts: Bill Anderson, Division of Civil and Mechanical Systems, ENG, (703) 306-1362; Jim Whitcomb, Division of Earth Sciences, GEO, (703) 306-1556; Rachelle Hollander, Division of Social, Behavioral, and Economic Research, SBE, (703) 306-1743; Steve Nelson, (703) 306-1526, for the U.S. Weather Research Program; Rich Behnke, Division of Atmospheric Sciences, GEO, (703) 306-1518

http://www.nsf.gov/geo/egch/nathaz.htm

*Polar Ozone Depletion/UV Radiation Effects* - Laboratory studies of detailed chemical processes, field observations of concentrations and distribution of chemical species, and improvements in modeling of stratospheric chemistry and dynamics are supported, along with research that focuses on UV radiation climatology, and on the effects of enhanced UV radiation on biological systems. Deadline for proposals: June 1.

Contact: Polly Penhale, Office of Polar Programs, (703) 306-1033

http://www.nsf.gov/geo/egch/stratoz.htm

*Ridge Interdisciplinary Global Experiments* (RIDGE) - Research focuses on the physical, chemical, and biological causes and consequences of energy transfer through time and space between the mid-ocean ridge volcanic system and the ocean environment. In addition, the ecological dynamics of life in and around the hydrothermal vents are investigated. For information on this program, please request a copy of the Ridge Program Announcement, NSF 95-132. Target dates for submission of proposals: February 15 and August 15.

Contacts: David Epp, (703) 306-1586, or Philip Taylor, (703) 306-1587, Division of Ocean Sciences

http://www.nsf.gov/geo/egch/ridge.htm

*Sea Level Changes* - Scientific observations and analyses are undertaken to improve understanding of the trend in absolute sea level over decadal time frames, and how local and regional tectonics may counter or amplify worldwide sea-level change. Deadline for proposals: June 1 and December 1.

Contact: Robin Reichlin, Division of Earth Sciences, (703) 306-1556

http://www.nsf.gov/geo/egch/sealev.htm

*Solar Influences* - Research is supported on aspects of the Earth's space environment that are most important to global change, including the coupling, energetics, and dynamics of atmospheric regions (CEDAR); geospace environment modeling (GEM); and radiative inputs of the Sun to Earth (SunRISE). Deadlines for proposals: CEDAR, May 1; GEM, October 15; SunRISE proposals may be submitted at any time.

Contact: Richard Behnke, Division of Atmospheric Sciences, GEO, (703) 306-1518

http://www.nsf.gov/geo/egch/solar.htm

*Toxic Substances/Solid and Hazardous Waste*- This research involves environmental toxicants (e.g., pesticides, oil spills, hazardous waste, and solid waste), including physical analyses, fate and transport, exposure modeling, waste prevention, minimization, recycling, and cleanup.

Contacts: Margaret Cavanaugh, Division of Chemistry, MPS, (703) 306-1842;

Robert Wellek, Division of Chemical and Transport Systems, ENG, (703) 306-1370;

Fred Thompson, Division of Bioengineering and Environmental systems, ENG, (703) 306-1318.

http://www.nsf.gov/geo/egch/toxics.htm

*Water and Energy: Atmosphere, Vegetative, and Earth Interactions* - Research is supported to gain better understanding of energy and water in climate processes and to clarify how the atmosphere, surface hydrologic, and biotic processes maintain the global energy balance and feedback to the overall climate system. Expected target dates for proposals are June 15 and December 15 for the Division of Environmental Biology (submitted through regular Division programs) and June 1 and December 1 for the Division of Earth Sciences. Proposals are accepted anytime for the Division of Atmospheric Sciences.

Contacts: Scott Collins, Division of Environmental Biology, BIO, (703) 306-1479; Pamela Stephens, Division of Atmospheric Sciences, GEO, (703) 306-1528; L. Douglas James, Division of Earth Sciences, GEO, (703)306-1549

http://www.nsf.gov/geo/egch/weave.htm

*World Ocean Circulation Experiment* (WOCE) - Observations are made and analyses are conducted to understand global ocean circulation well enough to model its present state, predict its evolution, and relate changes to long term climatic change. During 1998-2000, focus will be on analysis, interpretation, modeling, and synthesis of observations and results obtained during

the 1990-1997 WOCE period. Deadlines vary; please consult the homepage or program officer for details.

Contact: Richard Lambert, Division of Ocean Sciences, GEO, (703) 306-1583

http://www.nsf.gov/geo/egch/woce.htm

## Announcements of Special Funding Opportunities

NSF frequently announces special funding opportunities related to environment and global change. These announcements are posted to the Environment and Global Change homepage soon after they are made available at http://www.nsf.gov/geo/egch/ In FY 1998, Environment and Global Change-related special funding opportunities include:

Environmental Geochemistry and Biogeo-chemistry (NSF 97-172)

Earth System History (NSF 97-161)

NSF/EPA Technology for a Sustainable Environment http://es.epa.gov/ncerqa/rfa/98tse.html (EPA/600/F-97/018)

NSF/EPA/USDA Water and Watersheds http://es.epa.gov/ncerqa/rfa/wshed.html

NSF/EPA Environmental Statistics http://es.epa.gov/ncerqa/rfa/ensta98.html

NSF/EPA Decision-Making and Valuation for Environmental Policy http://es.epa.gov/ncerqa/rfa/98valrfa.html

NSF/NOAA U.S. Global Ocean Ecosystems Dynamics Program and Coastal Ocean Processes Program: The Northeast Pacific Study (NSF 97-25)

NSF/DOE/USDA/NASA Special Competition for Terrestrial Ecology and Global Change

NSF/DOE/EPA/ONR Joint Program on Bioremediation http://es.epa.gov/ncerqa/rfa/bio.html

NSF/NOAA/EPA/ONR/USDA/NASA Ecology and Oceanography of Harmful Algal Blooms (NSF 97-49)

http://es.epa.gov/ncerqa/rfa/

Surface Heat Budget of the Arctic Ocean (SHEBA) (NSF 96-118)

Please consult the homepage to find out if similar competitions will be held in FY 1999.

# Acronyms

ACCP-- NOAA's Atlantic Climate Change Program

AO-- Announcement of Opportunity

ARCSS -- NSF Arctic Systems Sciences

ARM-- Atmospheric Radiation Measurement

ARS-- USDA Agricultural Research Service

BAA-- Broad Area Announcement

BIO-- NSF Directorate for Biological Sciences

BOREAS-- NASA Boreal Ecosystem-Atmosphere Study

BRD-- USGS Biological Resources Division

BS-FOCI-- NOAA Bering Sea Fisheries-Oceanography Coordinated Investigation

CART-- Cloud and Radiation Testbed

CBD-- Commerce Business Daily

CCL-- EPA Contaminant Candidate List

CEDAR-- NSF Coupling, Energetics, and Dynamics of Atmospheric Regions

CENR-- Committee on Environment and Natural Resources

CFC-- Chlorinated fluorocarbon

CHAMMP-- DOE's Computer, Advanced Mathematics, and Model Physics Program

CISNet-- Coastal Intensive Site Network

CLIVAR-- NSF Climate Variability and Predictability

COP-- NOAA Coastal Ocean Program

CPR-- NIH Center for Population Research

CRADA-- Cooperative Research and Development Agreement

CSREES-- USDA Cooperative State Research, Education, and Extension Service

CZMA-- Coastal Zone Management Act

DOC-- Department of Commerce

DOD-- Department of Defense

DOE-- Department of Energy

DOI-- Department of the Interior

DOT-- Department of Transportation

ECOHAB-- Ecology and Oceanography of Harmful Algal Blooms

EDC-- Endocrine Disrupting Chemical

EDMAP-- USGS Education Geologic Mapping

EERE-- DOE Office of Energy Efficiency and Renewable Energy

EHR-- NSF Directorate for Education and Human Resources

EHRP-- USGS Earthquake Hazards Reduction Program

EM-- DOE Office of Environmental Management

EMSP-- DOE Environmental Management Science Program

ENG-- NSF Directorate for Engineering

EOS-- NASA's Earth Observing System

EPA-- Environmental Protection Agency

EPSCoR-- USDA Experimental Program for Stimulating Competitive Research

ESH-- NSF Earth System History

ESP-- MMS Environmental Studies Program

ESP-- NASA Earth Science Program

ESTCP-- DOD Environmental Security Technology Certification Program

FAA-- Federal Aviation Administration

FAIR-- Federal Agricultural Improvement and Reform Act

FHWA-- Federal Highway Administration

FIA-- EPA Forest Inventory Analysis

FRA-- USDA Fund for Rural America

FTA-- Federal Transit Administration

FY-- Fiscal Year

GCM-- General Circulation Model

GEM-- NSF Geospace Environmental Monitoring

GEO-- NSF Directorate for Geosciences

GEODATA-- NSF Geosystems Databases

GEWEX-- Global Energy and Water Cycle Experiment

GHG-- Greenhouse Gases

GIS-- Geographic Information System

GLOBEC-- NSF Global Ocean Ecosystems Dynamics

GOALS-- Global Ocean-Atmosphere-Land System

GOM-- Gulf of Mexico

GTCP --NSF Global Tropospheric Chemistry Program

IAI-- InterAmerican Institute for Global Change Research

INT-- NSF Division of International Programs

IPM-- Integrated Pest Management

ISE-- NSF Informal Science Education

JGOFS-- NSF Joint Global Ocean Flux Study

LTER-- Long-Term Ecological Research

MEP-- DOT Marine Environmental Protection

MMS-- DOI Minerals Management Service

MPS-- NSF Directorate for Mathematics and Physical Sciences

MTPE-- NASA Mission to Planet Earth

NABIR-- DOE Natural and Accelerated Bioremediation Research

NASA-- National Aeronautics and Space Administration

NBII-- National Biological Information Infrastructure

NCAR-- National Center for Atmospheric Research

NCERQA-- National Center for Environmental Research and Quality Assurance

NCGMP-- USGS National Cooperative Geologic Mapping Program

NEHRP-- National Earthquake Hazards Reduction Program

NEPA-- National Environmental Policy Act

NERRS-- National Estuarine Research Reserve System

NICHD-- National Institute of Child Health and Human Development

NIEHS-- National Institute of Environmental Health Sciences

NIGEC-- National Institute for Global Environmental Change

NIH-- National Institutes of Health

NIST-- National Institute of Standards and Technology

NMFS-- National Marine Fisheries Service

NOAA-- National Oceanic and Atmospheric Administration

NORM-- Naturally Occurring Radioactive Materials

NOS-- National Ocean Service

NRA-- NASA Research Announcement

NRI-- USDA National Research Initiative

NRICGP-- USDA National Research Initiative Competitive Grants Program

NSDI-- National Spatial Data Infrastructure

NSF--National Science Foundation

NSTC-- National Science and Technology Council

NURP-- National Undersea Research Program

OACES-- Ocean-Atmosphere Carbon Exchange Study

OCS-- Outer Continental Shelf

OER-- DOE Office of Energy Research

OGP-- NOAA Office of Global Programs

OIT-- DOE Office of Industrial Technologies

OMB-- Office of Management and Budget

ONR-- Office of Naval Research

OPP-- NSF Office of Polar Programs

ORD-- EPA Office of Research and Development

OSTP-- Office of Science and Technology Policy

PER-- DOE Program on Ecosystem Research

PM-- Particulate Matter

PNCERS-- NOAA Pacific Northwest Coastal Ecosystem Regional Study

R&D-- Research and Development

REE-- USDA Research, Education, and Economics

RFA-- Request For Applications

RFP-- Request for Proposals

RIDGE-- NSF Ridge Interdisciplinary Global Experiments

RSPA-- DOT Research and Special Programs Administration

SAR-- USGS Species at Risk Initiative

SBE-- NSF Directorate for Social, Behavioral, and Economic Sciences

SEBSCC-- NOAA Southeast Bering Sea Carrying Capacity Study

SERDP-- DOD Strategic Environmental Research and Development Program

SHEBA-- NSF Surface Heat Budget of the Arctic Ocean

S-K-- NMFS Saltonstall-Kennedy Program

SRD-- NOS Sanctuaries and Reserves Division

STAR-- EPA Science to Achieve Results

STATEMAP-- USGS State Geological Survey Mapping

SunRISE-- NSF Radiative Inputs of Sun to Earth

TARP-- MMS Technology Assessment and Research Program

TCP--Terrestrial Carbon Processes

TECO-- Joint Program on Terrestrial Ecology and Global Change

TOPEX-- Ocean Topography Experiment

USCG-- U.S. Coast Guard

USDA-- U.S. Department of Agriculture

USGCRP-- U.S. Global Change Research Program

USGS-- U.S. Geological Survey

URL-- Uniform Resource Locator

UV-- Ultraviolet

WOCE-- NSF World Ocean Circulation Experiment

WCRP-- World Climate Research Program