United States
Environmental Protection
Agency

Office of Research and
Development
Washington DC 20460

EPA/600/R-96/064
May 1996

Report to Congress

The Science To Achieve Results (STAR) Program

EPA/600/R-96/064
May 1996

Report to Congress

The Science To Achieve Results (STAR) Program

Office of Research and Development
U.S. Environmental Protection Agency
Washington, D.C. 20460

Preface

The Office of Research and Development (ORD) has transformed itself during the past two years to provide better science specifically targeted to meet the needs of decisionmakers in the Environmental Protection Agency. As a part of that transformation, ORD has started the Science To Achieve Results (STAR) program - the focus of this Report to Congress. This Report reflects the progress that we have made in constructing a new foundation for science and research in EPA that is: 1) based on risk and our on ability to improve our risk assessments by reducing uncertainty, and 2) based on our ability to contribute to better, and more cost-effective risk reduction.

As a part of this transformation, ORD has prepared a risk-based Strategic Plan. In preparing this plan ORD has developed and applied human health and ecological criteria to establish priorities for research and for scientific and technical support to the Agency.

To further enhance this risk-based research approach, ORD has consolidated a large number of laboratories and HQ offices and has organized itself around the risk assessment paradigm. ORD has established an Effects Laboratory that integrates research on human health and ecological effects, an Exposure Laboratory that integrates research on stressors that affect both people and ecosystems, and a Risk Management Laboratory that looks to develop better, more cost-effective methods for preventing pollution, as well as for controlling and mitigating pollution when necessary. In addition, a newly created Risk Assessment Center will bring together the data from our laboratories and the published scientific literature to develop credible, peer reviewed, state-of-the-art risk assessments for the Agency, and will do research on improving risk assessment methods.

In addition to consolidating the research laboratories, ORD has created an in-house, intramural research and technical support program that allocates resources and assigns ORD scientists to areas of highest risk and greatest importance to the Agency.

Finally, ORD has made a major commitment to include the best scientists from this country’s universities and non-profit centers in our research program to ensure the highest possible quality of science. Applicants for STAR grants must propose relevant research based on excellent science, as determined through external peer review by experts drawn from throughout the national scientific community. Through a grants program that is targeted to issues of importance to the Agency, ORD’s goal is to meet the specific science needs of the EPA, building on the scientific creativity of the country’s foremost research scientists.

Contents

Introduction

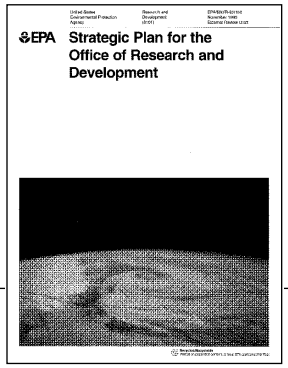
In recent years, a number of groups have reviewed the issue of science at the EPA and have come to remarkably similar conclusions. The Agency's independent Science Advisory Board, two expert blue-ribbon panels convened by the National Academy of Sciences and the National Academy of Public Administration, and several other independent groups all have emphasized the importance of science at EPA and made many recommendations concerning its role and direction. (Appendix 1) As these groups affirmed, science provides the foundation for credible environmental decision-making.

In response, during the past two years there have been many organizational and operational changes in ORD. These changes represent a significant departure from the past. They are based on a set of strategic principles that draw upon the many recommendations that we have received from outside groups in recent years. The most important of these principles is the explicit use of risk to shape and focus our organizational structure and research agenda.

ORD's Strategic Principles

1. Focus research and development on the greatest risks to people and the environment, taking into account their potential severity, magnitude, and uncertainty.
2. Focus research on reducing uncertainty in risk assessment and on cost effective approaches for preventing and managing risks.
3. Balance human health and ecological research.
4. Give priority to maintaining the strong and viable scientific and engineering core capabilities that allow us to conduct an intramural research and technical support program in areas of highest risk and greatest importance to the Agency.
5. Through an innovative and effective human resources development program, nurture and support the development of outstanding scientists and engineers at EPA.
6. Take advantage of the creativity of the nation's best research institutions by increasing competitively awarded research grants to further EPA's critical environmental research mission.
7. Ensure the quality of the science that underlies our risk assessment and risk reduction efforts by requiring the very highest level of independent peer review and quality assurance for all our science products and programs.
8. Provide the infrastructure required for ORD to achieve and maintain environmental science.

The first major change in ORD was to reorganize ORD so that its new structure mirrors the risk paradigm. This new structure is illustrated in Appendix 2. ORD's Strategic Plan is the second major step. This plan, published for external and internal peer review in November 1995, defines new strategic directions (including ORD's vision, mission and goals) for ORD research, establishes a risk-based process that will be used to determine future research priorities, describes how the Strategic Plan is to be translated into a specific research program (including research plans, operating plans, and laboratory implementation plans), presents approaches to measuring success, and describes ORD's commitment to the intramural and human resources essential to implementing the Strategic Plan. This plan has been used to develop the near-term priorities for ORD research in FY 1997 - 1999, and to ensure that current research (FY1996) is consistent with the goals and objectives that are described.



ORD's Long-Term Goals

1. Develop scientifically sound approaches to assessing and characterizing risks to human health and the environment.

2. Integrate human health and ecological assessment methods into a comprehensive multimedia assessment methodology.

3. Provide common sense and cost-effective approaches for preventing and managing risks.

4. Provide credible, state-of-the-art risk assessments, methods, models and guidance.

5. Provide reliable scientific, engineering, and risk assessment/risk management information to private and public stakeholders.

6. Provide national leadership and encourage others to participate in identifying emerging environmental issues, characterizing the risks associated with these issues, and developing ways of preventing or reducing these risks.

One very important part of these changes was to ensure that ORD laboratories had a consistent base to support a stronger and better intramural research program. A second part was to recruit and engage the participation of the nation's best scientists in the implementation of ORD's new research program in order to add the creativity that leading researchers would bring. This infusion of expertise is to be accomplished by the new STAR (Science To Achieve Results) Program.

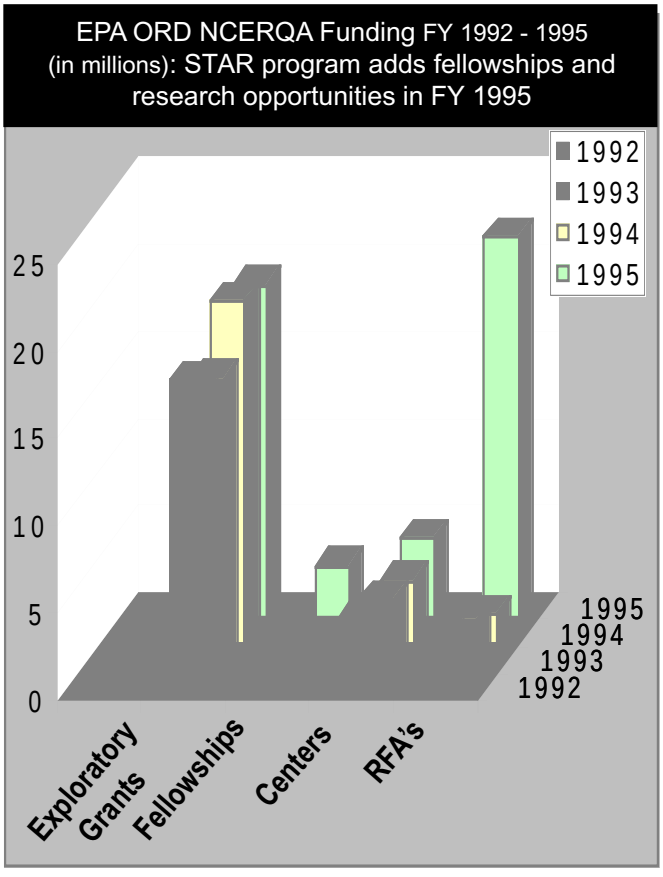
Science To Achieve Results (STAR) Program

A three component program:

1. **Focused Requests for Applications** (RFAs) which are targeted at specific research topics defined by the ORD Strategic Plan and that 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 agencies.

2. **The Exploratory Research Grants Program**, has two parts. The first provides support for investigator initiated grants in broad areas such as environmental chemistry and physics, health and ecological effects of pollution, that are not covered by the RFAs, and the second, Early Career Research Awards supports outstanding scientists and engineers at the onset of their research careers.

3. **The Graduate Fellowship Program**, provides support for master's and doctoral students in environmental sciences and engineering. This program supports the development of the Nation's environmental science and technology base for addressing environmental concerns into the next century. This program is announced nationally, providing broad opportunities to apply. Applicants are judged by external peer reviewers and are selected based on their record and their potential for the future. It is meant to recruit the "best and brightest" into environmental science and technology to serve the full range of national workforce needs - national, state and local governments, EPA laboratories, as well as industry, universities, and others.



The STAR program complements other competitive opportunities for research funding. Within ORD, the National Center for Environmental Research and Quality Assurance (NCERQA), responsible for STAR, also manages the Environmental Research Centers Program which supports competitively selected universities, or consortia of universities, that focus long-term, multi-disciplinary research on issues of broad concern to EPA (In FY97 the Environmental Research Centers will be added to the STAR program). Other Research Centers, such as the Hazardous Substances Research Centers mandated by CERCLA, and other Congressionally mandated centers are also a part of the National Center for Environmental Research and Quality Assurance.

The largest part of the STAR Program (item #1 on page three) is based on a series of Requests for Applications (RFAs) that are developed by ORD together with the EPA Program Offices and Regions. These RFAs are targeted to very specific research needs that EPA has defined that support the efforts of the entire Agency and are awarded only after very rigorous external peer review and internal relevancy review. So, for example, in 1995 ORD requested proposals in areas such as:

- Reducing Uncertainty in risk assessment and improving risk reduction approaches
  - Human Health Risk Assessment
  - Indoor Air Quality in Large Office Buildings
  - Air Pollutants(Particulate Matter, Troposheric Ozone, and Toxics)
  - Regional Hydrologic Vulnerability
- Exploratory research grant program
  - Chemistry and Physics of Air, and Water
  - Environmental Biology
  - Engineering
  - Socio-economics
  - Minority Institutions
- Incentives and impediments to pollution prevention
- National Science Foundation NSF/EPA partnership for Environmental Research
  - Water and Watersheds
  - Technology for a Sustainable Environment
  - Valuation and Environmental Policy

Appendix 3 lists the grants awarded in Fiscal Year 1995.

In 1996, ORD is requesting applications in *(See Appendix 4 for a more complete description of the 1996 RFA's):*

- Ecological Assessment, including regional ecosystem protection and restoration and global climate change
- Exposure of Children to Pesticides
- Air Quality, including tropospheric ozone, air toxics, and indoor air
- Analytical and Monitoring Methods, including field analytical methods, continuous measurement methods, and leachibility prediction
- Drinking Water, including microbial pathogens and disinfection by-products
- Environmental Fate and treatment of Toxics and Hazardous Wastes, including fate and mobility of contaminants in soils and groundwater and the assessment of risks of contaminated soils and treatment residuals
- Environmental Statistics
- High Performance Computing
- Risk-based Decisions for Contaminated Sediments
- Endocrine Disruptors
- Role of Interindividual Variability in Human Susceptibility to Cancer.

In addition, as in 1995, ORD has announced several RFAs together with the National Science Foundation in:

- Water and Watersheds
- Technology for a Sustainable Environment, including Green Chemistry
- Decision-making and Valuation for Environmental Policy

Also, in 1996, ORD, in cooperation with the National Science Foundation, the Department of Energy, and the Office of Naval Research, has requested applications for research in Bioremediation.

STAR invites investigator-initiated proposals on these topics from scientists in all eligible institutions across the Nation. Competitions for these grants are announced widely through the Federal Register, Internet, university and scientific organizations, and by direct mail, among other mechanisms. This enables the STAR program to draw research ideas from virtually the entire scientific community. Applicants for STAR grants must propose relevant research based on excellent science, as determined through peer review by experts drawn from throughout the national scientific community.

Relation of the STAR Program to the ORD Strategic Plan

The STAR Program is an important component of the new directions described in the Strategic Plan for ORD. It is important to recognize, therefore, that the STAR Program represents a mechanism for accomplishing the research objectives in the plan and is not an independent, stand-alone program. The STAR Program is derived from, and is a part of, the topic-specific research plans that are currently being developed from the ORD Strategic Plan. Each such research plan, such as for particulates in air or for disinfection byproducts in drinking water, describes the specific research that must be done to provide the information that EPA policy makers need in order to make decisions. These research plans are written by Agency-wide work groups and undergo independent peer review. When the plans are final, ORD then decides which work can best be accomplished with the skills and expertise of the intramural staff, and which research is best accomplished through grants or other mechanisms. The specific Requests for Applications in the STAR Program are thus written to be consistent with the ORD Strategic Plan and research plans, and also to be complementary to the work done intramurally.

The ORD Strategic Plan lists the six highest priority areas for research for the next few years:

- Drinking water disinfection
- Particulate matter in the air
- Human health protection
- Ecosystem protection
- Endocrine disruptors
- Pollution prevention and new technologies

In each of these areas ORD is developing an extensive intramural research program and a complementary extramural program.

Relationship of Requests for Applications (RFA's) to ORD Strategic Plan Priorities

	Drinking water disinfection	*Particulate matter in the air*	*Human health protection*	*Ecosystem protection*	*Endocrine disruptors*	*Pollution prevention and new technologies*
Ecological Assessment, including regional ecosystem protection and restoration and global climate change			●	●		
Exposure of Children to Pesticides			●		●	
Air Quality, including tropospheric ozone, air toxics, and indoor air		●	●			
Analytical and Monitoring Methods, including field analytical methods, continuous measurement methods, and leachibility prediction	●		●	●		
Drinking Water, including microbial pathogens and disinfection by-products	●		●			
Environmental Fate and treatment of Toxics and Hazardous Wastes, including fate and mobility of contaminants in soils and groundwater and the assessment of risks of contaminated soils and treatment residuals	●		●	●		
Environmental Statistics	●		●	●		
High Performance Computing		●	●	●		
Risk-based Decisions for Contaminated Sediments			●	●	●	
Endocrine Disruptors			●	●	●	
Role of Interindividual Variability in Human Susceptibility to Cancer.			●			
Water and Watersheds	●			●		
Technology for a Sustainable Environment, including green chemistry			●	●		●
Decision-making and Valuation for Environmental Policy						●
Bioremediation				●		●

Relation of the STAR Program to EPA science needs

Agency-wide Research Coordinating Teams composed of people from ORD, the Program Offices, and Regions develop topic-specific research plans. These Teams use the EPA risk-based criteria in the ORD Strategic Plan to select the most important research that is needed by the EPA. These decisions, reflected in the topic-specific research plans, constitute the science needs of the Agency coupled with an assessment of the likelihood that research can significantly reduce the uncertainty in an Agency risk assessment, or that research could materially improve the way that significant environmental risks are controlled or managed. The RFAs are then written to cover a portion of the topic-specific plan. Proposals that are received in response to an RFA undergo external peer review by independent scientists. The reviews look only at the scientific and technical merit of the proposals and how well they relate to the subject of the RFA. The highest ranked proposals are then brought forward for consideration for EPA funding. An Agency-wide group selects the proposals that best fulfill the Agency's science needs, and that also complement the work being done intramurally in ORD laboratories.

To further ensure close coordination with the EPA Program Offices and Regions, ORD has created the Research Coordinating Council composed of senior managers and scientists from around the Agency to recommend and review topics selected for research and RFAs.

Relation of the STAR Program to the EPA Laboratories

The STAR program has largely resulted in a realignment of the ORD investment in the academic scientific community, whereby more emphasis is placed on competitively awarded, peer reviewed grants administered by the National Center for Environmental Research and Quality Assurance, and less on cooperative agreements funded through the laboratories. This realignment allows ORD scientists to spend more time at the bench building a stronger in-house program. The STAR program and the in-house program are thus complementary, finding their direction in ORD's Strategic Plan.

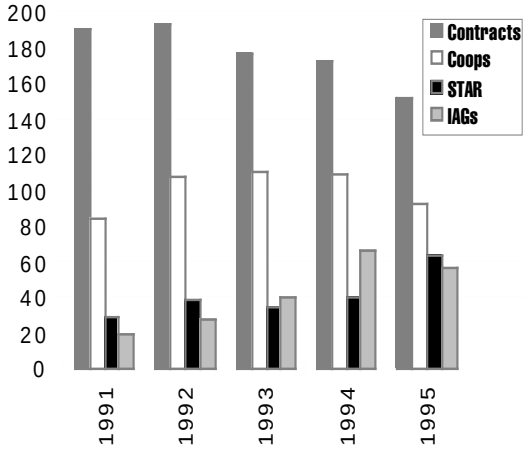
The ORD Strategic Plan and the topic-specific Research Plans define the long-term directions of the ORD research program, as well as the immediate research that will be carried out during the next few years. The ORD laboratories then prepare implementation plans that describe the intramural component of the research, and complementary STAR program RFAs are prepared with laboratory assistance.

The largest share of the ORD research dollars goes to support the staffing and in-house research support needs of the ORD laboratories and centers. These

intramural programs are supplemented by research and other services funded through cooperative agreements and contracts by the laboratories.

The STAR Program has had little effect on contracts or on staffing in ORD. For many years, ORD used Level-of-Effort contracts to support its intramural research program. About five years ago, the EPA Inspector General, the General Accounting Office, and the Congress questioned the extensive use of these types of contracts in ORD. Consequently, ORD decided to scale back the use of these types of contracts and to more fully support the intramural research program with EPA staff. Since the decision to reduce Level-of-Effort contracts was made, ORD has gone through a "one-time contractor conversion" to convert some of the contract staff positions to EPA staff through an open and competitive process. This change is reflected in the decrease in contracts from FY94 to FY95. In essence, the growth of the STAR program has been accomplished largely through the re-direction of cooperative agreements and inter-agency agreements.

Cumulative Changes in Contracts, Cooperative Agreements, STAR, and InterAgency Agreements (1991 Base)



Actual Expenditures in Contracts, Cooperative Agreements, STAR, and InterAgency Agreements ($s shown in thousands)

	Contracts	Coops	STAR	IAGs
1991	191	84	29	20
1992	193	108	39	27
1993	176	101	35	40
1994	172	109	40	66
1995	152	93	63	56

Relation of the STAR Program to other Federal Agencies

In addition to meeting the specific mission needs of the EPA, ORD has found that it can significantly enhance the STAR program by funding research jointly with other federal Agencies. This process allows very detailed integration of research across a number of federal agencies, avoids duplication, and results in a more cost-effective approach to meeting Agency goals by leveraging resources across agencies. In 1995, ORD published three RFAs together with the National Science Foundation, and after joint peer review and selection, the two agencies funded research in several areas of common interest. In FY 1996, RFAs were once again published together with the NSF, but in addition, RFAs were published together with the Department of Energy, and the Office of Naval Research.

Topics for requests for assistance under STAR are chosen so as to avoid duplicating the work of other Agencies such as the National Science Foundation and the National Institutes of Health. During Fiscal Year 1995, almost half of the STAR research grants activity was conducted jointly with the NSF --- guaranteeing closely coordinated and non-overlapping use of resources in both Agencies. The other half of the activity focused on environmental topics that fell outside the mission of the NSF and otherwise did not receive substantial attention from NIH or other Agencies. In FY 1996, EPA is increasing its partnerships and is broadening its interactions with other agencies to ensure that STAR funds are leveraged to meet the unique needs of EPA policymakers.

Finally, it must be recognized that the STAR Program also allows EPA to capitalize on people, facilities and funding already in place in outside institutions, thus leveraging past and current investments by others. Rarely does a research grant cover the full cost of a project. In addition, Requests for Applications can be focused quickly on newly identified needs, and grants selected via competitive peer review can be in place within 6-9 months. This meets the spirit of ORD's flexible, streamlined, responsive research approach.

Conclusion

ORD has embarked on a remarkable series of changes that are meant to upgrade the quality of its research and include the broad academic science community in an enhanced extramural program. These changes are being implemented in accord with the Strategic Plan for ORD. As a part of this plan, ORD has for the first time developed a set of risk-based criteria to use for making decisions about research to be done and the resources to be allocated to such research.

Through the STAR program ORD is committing itself to including the best scientists from the country's universities and non-profit research centers in our research. Through the STAR Program ORD aims to ensure the highest possible science quality in support of EPA decisions. In that part of the STAR Program that is targeted to specific research areas, applicants must propose research in response to specific Requests for Proposals that are developed to provide support to the EPA mission, and that are based on the goals and criteria in the ORD Strategic Plan. Proposals must be of the highest quality, as determined through external peer review by outstanding scientists drawn from throughout the national scientific community.

These changes will, it is hoped, provide a much sounder science base for EPA decisions, and a broad base of science and technology for states, local governments, and others who implement EPA decisions.

Appendices

1. ORD Response to Blue-Ribbon Panel Recommendations

2. New Risk-Based Organization

3. ORD's New Grant and Fellowship Awards by State
    - 1995 Fellowship Awards by University
    - 1995 Research Grant Awards by RFA Topic

4. ORD's 1996 Research Opportunities

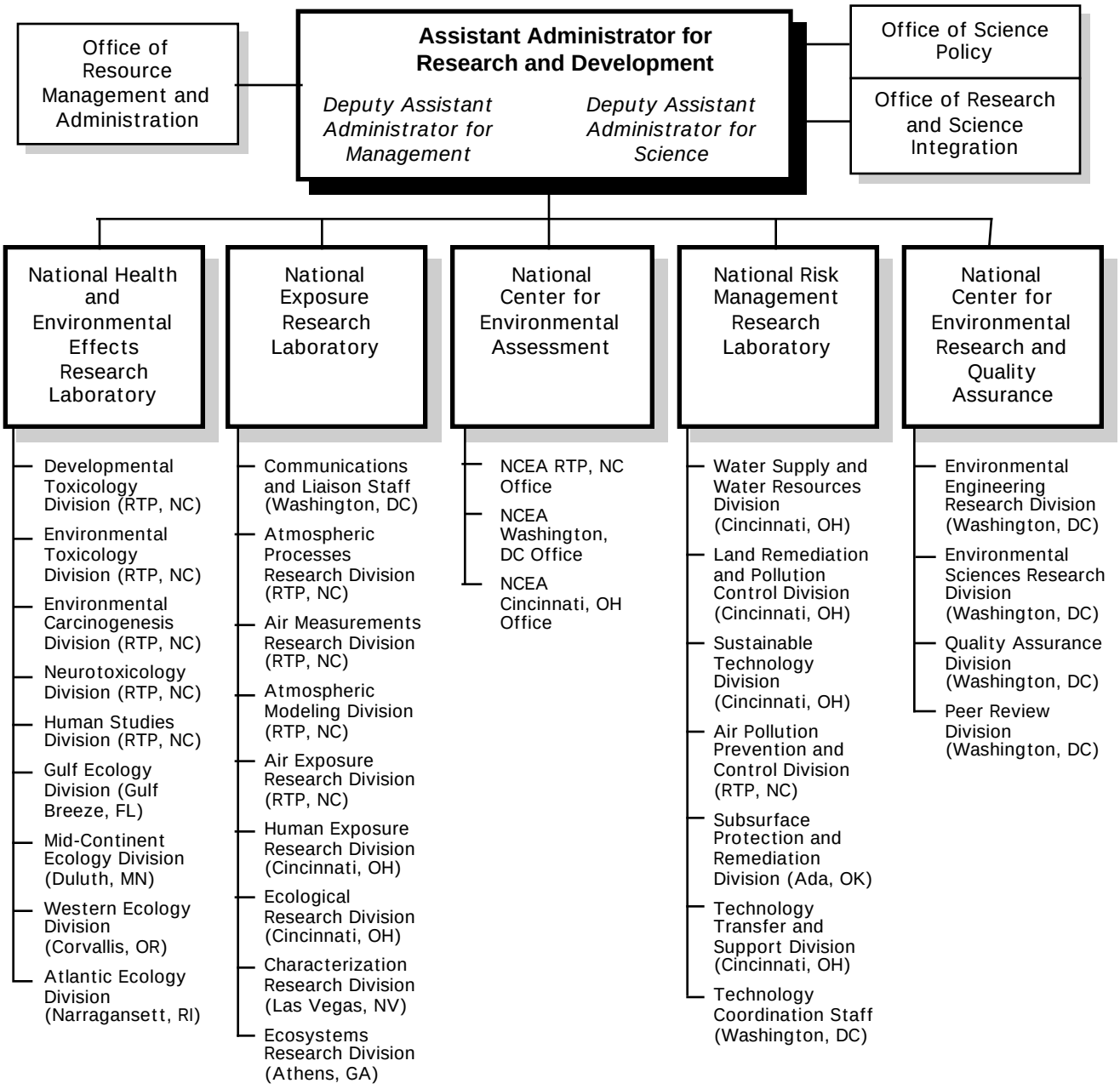
ORD Response to Blue-Ribbon Panel Recommendations

Recommended Action	ORD Response
EPA should take steps to improve science quality and enhance peer review.[c,i]	We instituted standard operating procedures for peer review in 1994.
	To engage the nation's best research institutions, we expanded our program for extramural research grants selected from competitive, peer-reviewed proposals.
	We created a Peer Review Division in our National Center for Environmental Research and Quality Assurance.
ORD needs a coherent research-planning process, a robust mission statement, and a vision statement.[c,d,i,j]	We developed the ORD Strategic Plan (this document) and distributed it for comment in November 1995.
	We implemented a risk-based research planning process.
	We realigned ORD's organizational structure to use risk assessment and risk management as principal priority-setting criteria.
ORD should enhance environmental education programs for training the next generation of scientists.[a,d,e]	We initiated an expanded graduate fellowship program, with 100 awards in 1995.
ORD should streamline its existing laboratory organization by collapsing the twelve laboratories into four national laboratories.[d,f,h]	We consolidated ORD laboratories into three national laboratories and two centers in 1995 to align laboratories according to risk assessment and risk management components.
ORD should improve its management systems to track planning resources and accomplishments.[g,h]	We are developing the ORD Management Information System to track resources and projects on an ORD-wide basis.
	We established a Management Council, a Science Council, and (together with the program offices and regions) a Research Coordination Council (see Appendix C of this Strategic Plan).
	We will conduct annual research program reviews to evaluate the status and accomplishments of our research.
	We are developing research plans to inform internal and external audiences about the policy relevance, specific objectives, technical approaches, and expected products of our research.
ORD should balance short-term and long-term research.[a,e,g,j]	In 1995, we created the Science To Achieve Results (STAR) Program of peer-reviewed investigator-initiated grants relevant to ORD's mission.
	As described in this Strategic Plan, we give equal consideration to short- and long-term research needs in our priority-setting process.
ORD should balance health and ecological research.[a,c]	We have adopted a balance between ecological risks and human health risks as a major strategic principle (see Table 1 of this Strategic Plan).
	We appointed Laboratory Associate Directors for Health and Ecology for each national laboratory.
EPA should designate ORD's Assistant Administrator (AA/ORD) as the Agency's Chief Scientific Officer.[j]	The EPA Deputy Administrator appointed the AA/ORD as EPA's Scientific and Technical Activities Planner in March 1995.
EPA must improve its capability to anticipate environmental problems.[a-c]	EPA signed an agreement in 1995 with the National Research Council to establish a group to review environmental issues for the next decade and recommend necessary research.

[a] *Future Risk: Research Strategies for the 1990s.* U.S. EPA, Science Advisory Board. 1988.
[b] *Reducing Risks: Setting Priorities and Strategies for Environmental Protection.* U.S. EPA, Science Advisory Board. 1990.
[c] *Safeguarding the Future: Credible Science, Credible Decisions.* Report of the Expert Panel on the Role of Science at EPA. U.S. EPA. 1992.
[d] *Environmental Research and Development: Strengthen the Federal Infrastructure.* The Carnegie Commission. 1992.
[e] *Research to Protect, Restore, and Manage the Environment.* National Research Council. 1993.
[f] *Assessment of the Scientific and Technical Laboratories and Facilities of the U.S. EPA.* MITRE Corporation. May 1994.
[g] *An SAB Report: Review of the MITRE Corp. Draft Report on the EPA Laboratory Study.* U.S. EPA Science Advisory Board/Research Strategy Advisory Council. May 1994.
[h] *A Review, Evaluation and Critique of a Study of EPA Laboratories by the MITRE Corporation and Additional Commentary on EPA Science and Technology Programs.* National Academy of Public Administration. June 1994.
[i] *Setting Priorities, Getting Results: A New Direction for EPA.* National Academy of Public Administration. April 1995.
[j] *Interim Report of the Committee on Research and Peer Review in EPA.* National Research Council. March 1995.

New Risk-Based Organization

The Office of Research and Development Organization

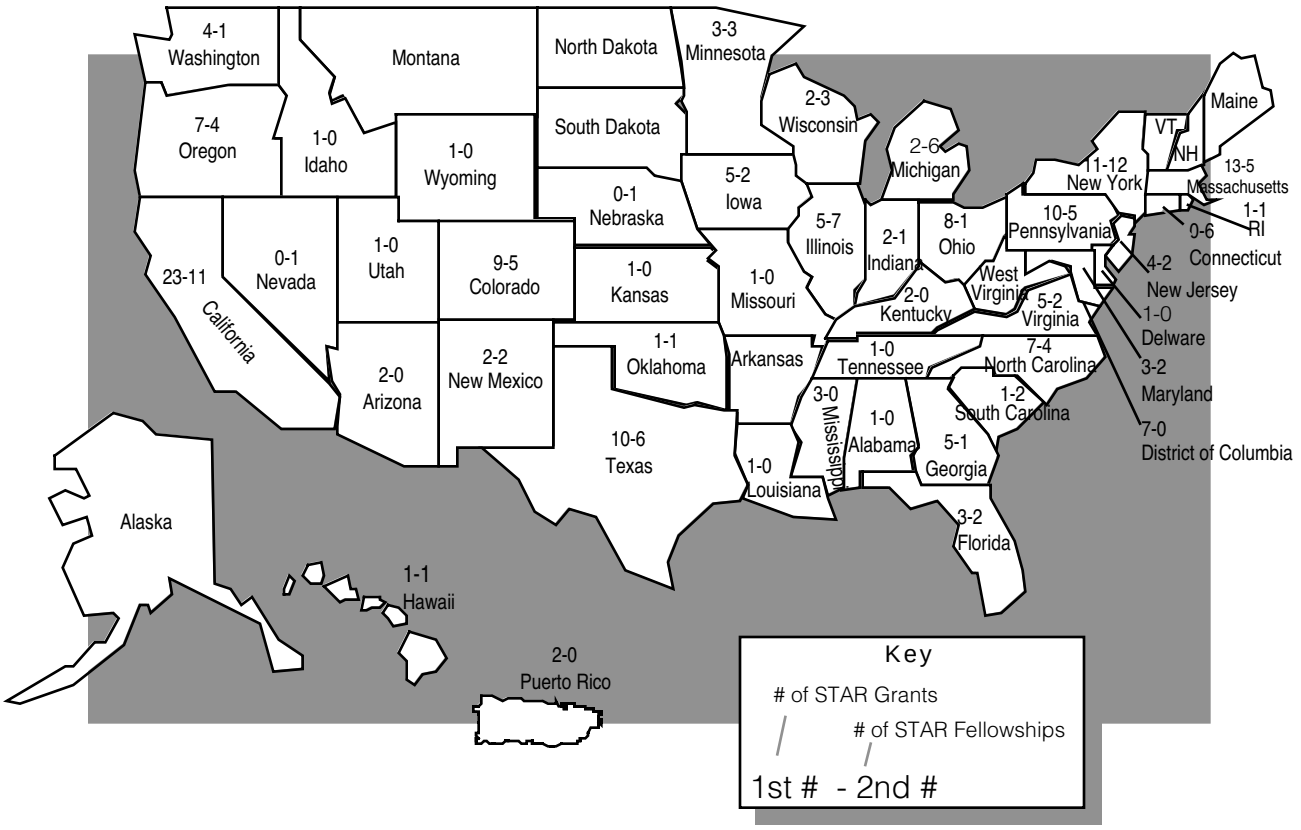


ORD's New Grant* and Fellowship Awards by State

FY95 STAR Program

Office of Research and Development

National Center for Environmental Research and Quality Assurance



STAR grant awards for FY95, 172 (new), $33,022,847 million

STAR fellowship awards FY95, 100 (new), $2,993,071 million

*New awards refer to grant applications awarded for the first time in this fiscal year, FY 95.
The numbers shown above do not include awarded grants now in their second or third year.

US EPA Graduate Fellowship Awards for the 1995-1996 Academic Year

National Center for Environmental Research and Quality Assurance

OFFICE OF RESEARCH AND DEVELOPMENT - WASHINGTON D.C. 20460

UNIVERSITY	EPA FELLOW	DEPARTMENT	DISCIPLINE	DEGREE SOUGHT
Buffalo, U. of	DiTommaso, Jill E.	Department of Civil Engineering	Engineering	MS
California State University	Ellison, Homer 0.	Department of Biological Sciences	Ecology	MS
California, U. of, Berkeley	Schuher, Andrew J.	Department of Civil Engineering	Engineering	Ph.D.
California, U. of, Berkeley	Holzberg, Steven P.	Department of Environmental Science, Policy and Mgmt.	Health	Ph.D.
California, U. of, Berkeley	Boyd, William C.	Energy and Resources Group	Social Sciences	Ph.D.
California, U. of, Davis	Loge, lll, Frank J.	Department of Civil and Environmental Engineering	Engineering	Ph.D.
California, U. of, Irvine	Pearson, Alison C.	Department of Community and Environmental Medicine	Health	Ph.D.
California, U. of, Riverside	Dobo, Krista L.	Environmental Toxicology Graduate Program	Health	Ph.D.
California, U. of, San Diego	Francis, Christopher A.	Scripps Institute of Oceanography	Ecology	Ph.D.
California, U. of, Santa Barbara	Evens, Terence J.	Department of Biology	Ecology	Ph.D.
Carnegie Mellon University	Chess, Karen L.	Department of Mechanical Engineering	Engineering	Ph.D.
Carnegie Mellon University	Welch, Edward S.	Department of Social and Decision Sciences	Social Sciences	Ph.D.
Chicago, U. of	Myers, Tanya L.	Department of Chemistry	Chemistry	Ph.D.
Chicago, U. of	Shonle, Irene K.	Department of Ecology and Evolution	Ecology	Ph.D.
Chicago, U. of	Mendelsohn, Betsy T.	Department of History	Social Sciences	Ph.D.
Cincinnati, U. of	Blasio, Christopher J.	Department of Environmental Health	Earth	MS
Clarkson University	Marsteiner ll, Edward L.	Depanment of Civil and Environmental Engineering	Engineering	MS
Clarkson University	Payne, Tamara H.	Department of Mathematical Sciences	Mathematics	MS
Colorado State University	Brechtel, Fredrick J.	Department of Atmosphere Science	Earth	Ph.D.
Colorado State University	Champlin, Tory L.	Department of Civil Engineering	Engineering	Ph.D.
Colorado, U. of	Carson, Katherine S.	Department of Economics	Social Sciences	MA
Colorado, U. of	Miller, John B.	Department of Chemistry	Chemistry	Ph.D.
Colorado, U. of	Bowling, David R.	Dept. of Environ., Population, and Organismic Biology	Earth	Ph.D.
Connecticut, U. of	Goldstein, Paul Z.	Department of Ecology and Evolutionary Biology	Ecology	Ph.D.
Connecticut, U. of	Rolfhus, Kristofer R.	Department of Marine Science	Earth	Ph.D.
Connecticut, U. of	Craddock, Cheryl L.	Department of Ecology and Evolutionary Biology	Ecology	Ph.D.
Cornell University	Carpi, Anthony	Field of Environmental Toxicology	Chemistry	MS
Cornell University	Brown, Geoffrey A.	Department of Soil, Crop, and Atmospheric Science	Chemistry	Ph.D.
Cornell University	Glueck, Susan B.	Department of Entomology	Ecology	Ph.D.
Cornell University	Sobozak, William V.	Department of Ecology and Systematics	Ecology	Ph.D.
Cornell Univer ity	Nelson, Yarrow M.	School of Civil and Environmental Engineering	Engineering	Ph.D.
Cornell University	VanderGheynst, Jean S.	Department of Agricultural and Biological Engineering	Engineering	Ph.D.
Cornell University	Bayer, Lorna E.	Department of Psychology	Social Sciences	Ph.D.
Duke University	Andrews, Jeffrey A.	Department of Botany	Ecology	Ph.D.
Duke University Medical Center	Reuther, Gary W.	Department of Pharmacology	Health	Ph.D.
Florida State University	Byrd, Tracy C.	Department of Geology	Earth	MS
Florida, U. of	Crain, David A.	Department of Zoology	Ecology	Ph.D.
Georgia, U. of	Schoeffner, Daniel J.	Department of Pharmacology and Toxicology	Health	Ph.D.
Illinois, U. of, Chicago	Kenski, Donna M.	Environmental and Occupational Health Sciences	Chemistry	Ph.D.
Illinois, U. of, Urbana	Brent, Robert N.,	Department of Civil Engineering	Ecology	MS

US EPA Graduate Fellowship Awards for the 1995-1996 Academic Year

National Center for Environmental Research and Quality Assurance

OFFICE OF RESEARCH AND DEVELOPMENT - WASHINGTON D.C. 20460

UNIVERSITY	EPA FELLOW	DEPARTMENT	DISCIPLINE	DEGREE SOUGHT
Illinois, U. of, Urbana	Dillner, Ann M.	Department of Civil Engineering	Engineering	Ph.D.
Indiana University	Schmucker, Mary B.	School of Public and Environmental Affairs	Social Sciences	MS
Iowa State University	Simmons, Carol L.	Department of Entomology	Ecology	MS
Iowa State University	Kruger, Ellen L.	Department of Entomology	Health	Ph.D.
Johns Hopkins University	Ehlers, Laura J.	Department of Geography and Environmental Engineering	Engineering	Ph.D.
Maryland, U. of, College Park	Warner, Kimberly A.	Marine, Estuarine and Environmental Sciences Program	Ecology	Ph.D.
Massachusetts Institute of Technology	Zhang, Jie	Department of Earth, Planetary and Atmospheric Sciences	Earth	Ph.D.
Massachusett Institute of Technology	Hart, Constance A.	Department of Biology	Ecology	Ph.D.
Massachusetts Institute of Technology	Adamkiewicz, Gary	Department of Chemical Engineering	Engineering	Ph.D.
Massachusetts Institute of Technobgy	Hamilton, James A.	Department of Civil and Environmental Engineering	Social Sciences	S.M.
Massachusetts, U. of	Pines, David S.	Department of Civil and Environmental Engineering	Engineering	Ph.D.
Michigan State University	Yavich, Aleander A.	Department of Civil and Environmental Engineering	Engineering	MS
Michigan State University	Tay, Eugene Michael	Program in Epidemiology	Health	MS
Michigan, U. of, Ann Arbor	Kibbey, Tohren C.	Department of Civil and Environmental Engineering	Engineering	MS
Michigan, U. of, Ann Arbor	Li, Susanna P.	Department of Civil and Environmental Engineering	Engineering	MS
Michigan, U. of, Ann Aroor	McEuen, Amy B.	School of Natural Resources and Environment	Ecology	Ph.D.
Michigan, U. of, Ann Arbor	Santoro, Nicholas	Department of Biological Chemistry	Health	Ph.D.
Minnesota, U. of	Cronlund, Sarah L.	Department of Ecology, Evolution, and Behavior	Ecology	MS
Minnesota, U. of	Reinke, Patricia H.	Department of Environmental and Occupational Health	Earth	Ph.D.
Minnesota U. of	Otterson, Julie R.	Department of Ecology Evolution and Behavior	Ecology	Ph.D.
Nebraska-Lincoln, U. of	Raschko-Mueller, Jennifer L.	Department of Mathematics and Statistics	Mathematics	Ph.D.
Nevada, U. of, Reno	Marchand, Eric A.	Department of Civil Engineering	Engineering	MS
New Mexico Highlands University	Presley, Richard W.	Department of Chemistry	Chemistry	MS
New Mexico State University	Strand, Allan E.	Department of Biology	Ecology	Ph.D.
New York University Medical Center	Matheson, Joanna M.	Program of Environmental Health Science	Health	Ph.D.
North Carolina State University	Penmetsa, Phanendrakumar V.	Department of Toxicology	Ecology	Ph.D.
North Carolina, U. of, Chapel Hill	Raynor, Peter, C.	Department of Environmental Sciences and Engineering	Engineering	Ph.D.
Northwestern University	Wade-Benzoni, Kimberly A.	Department of Organizational Behavior	Social Sciences	Ph.D:
Oklahoma, U. of	Pearce, Terri A.	Department of Pharmacology and Toxicology	Health	Ph.D.
Oregon State University	Spicer, Rachel	Department of Forest Products and Forest Science	Ecology	MS
Oregon State Universty	Hairston, Anne B.	Department of Forest Engineering	Earth	Ph.D.
Oregon State University	Scheck, Heather J.	Department of Botany and Plant Pathology	Ecology	Ph.D.
Oregon State University	Purdy, Kathleen G.	Department of Statistics	Mathematics	Ph.D.
Pennsylvania State University	Parson, Shane C.	Department of Agricultural and Biobgical Engineering	Engineering	MS
Pittsburgh, U. of	Guelcher, Scott A.	Department of Chemical Engineering	Engineering	MS
Pittsburgh, U. of	Goldman, Radoslav	Department of Environmental and Occupational Health	Health	Ph.D.
Rhode Island, U. of	Audette, Charles T.	Department of Botany	Ecology	MS
Rice University	Bradford, John H.	Department of Geology and Geophysics	Earth	MA
Rice University	Lahsen, Myanna H.	Department of Anthropology	Social Sciences	Ph.D.
Rutgers University	Dey, Markus P.	Department of Pharmacology and Toxicology	Health	Ph.D.

US EPA Graduate Fellowship Awards for the 1995-1996 Academic Year

National Center for Environmental Research and Quality Assurance

OFFICE OF RESEARCH AND DEVELOPMENT - WASHINGTON D.C. 20460

UNIVERSITY	EPA FELLOW	DEPARTMENT	DISCIPLINE	DEGREE SOUGHT
Rutgers University	Hamel, Stephanie L.	Exposure Measurement and Assessment Division	Health	Ph.D.
South Carolina, U. of	Schelkat, Christian E.	Department of Environmental Health Sciences	Ecology	Ph.D.
Stanford University	Abrams, Robert H.	Department of Geology and Environmental Science	Earth	Ph.D.
Stanford University	Ziegler, Alan D.	Department of Geological and Environmental Sciences	Earth	Ph.D.
Stanford University	Cunningham, Jeffrey A.	Department of Civil Engineering	Engineering	Ph.D.
SUNY at Buffalo	Russell, Kevin T.	Department of Civil Engineering	Engineering	MS
SUNY at Stony Brook	Griscom, Sarah B.	Marine Sciences Research Center	Ecology	Ph.D.
Texas A&M University	Wells, Mona C.	Department of Chemistry	Chemistry	Ph.D.
Texas, U. of, Austin	Boughton, David A.	Department of Zoology	Ecology	Ph.D.
Texas, U. of, Austin	Williamson, Derek G.	Department of Civil Engineering	Engineering	Ph.D.
Texas, U. of, Dallas	Gamble, Janet L.	School of Social Sciences	Health	Ph.D.
Virginia Poly. Tech. Institute	Diz, Harry R.	Department of Civil Engineering	Engineering	Ph.D.
Washington State University	Call, Douglas R.	Department of Zoology	Ecology	Ph.D.
William and Mary, College of	Chasey, Michael L.	Department of Physical Sciences	Chemistry	MS
Wisconsin, U. of, Madison	Holloway, Susan A.	Water Chemistry Program	Chemistry	Ph.D.
Wisconsin, U. of, Madison	Fisher, Janet M.	Department of Zoology	Ecology	Ph.D.
Wisconsin, U. of, Madison	Ripp, Sharon L.	Environmental Toxicology Center	Health	Ph.D.
Yale University	Beard, Karen H.	School of Forestry and Environmental Sciences	Ecology	MS
Yale University	Kull, Christian A.	School of Forestry and Environmental Studies	Earth	Ph.D.
Yale University	Meyerson, Frederick A.	Schod of Forestry and Environmental Studies	Ecology	Ph.D.

1995 US EPA Research Grant Awards by Request for Application (RFA) Topic

National Center for Environmental Research and Quality Assurance

OFFICE OF RESEARCH AND DEVELOPMENT - WASHINGTON D.C. 20460

AIR POLLUTANTS

EPA Contact: Deran Pashayan 202-260-2606

Principal Investigator Department/Institution	Grant Title	Funding($)/ Project Period
Harvey E. Jeffries Dept. of Environmental Sciences & Engineering *Univ. of North Carolina (NC)*	Mechanistic Studies of Isoprene and Aromatic Hydrocarbons	**450,000/3**
Lester Kobzik School of Public Health *Harvard Univ. (MA)*	Cellular Mechanisms of Pulmonary Inflammation by Environmental Particles	**546,895/3**
Beverly S. Cohen Inst. of Environmental Medicine *New York Univ. Medical Center (NY)*	Distribution of H+ and Trace Metals in Ultrafine Ambient Aerosol	**589,560/3**
Jana B. Milford Dept. of Mechanical Engineering *Univ. of Colorado-Boulder (CO)*	Quantification of Uncertainty in Air Quality Models used for Analysis of Ozone Control Strategies	**426,223/3**
Spyros N. Pandis Dept. of Chemical Engineering *Carnegie Mellon Univ. (PA)*	Development and Testing of a State-Of-The-Art PMx Particulate Module for Regional and Urban Photochemical Models	**412,041/3**
Gregory J. McRae Dept. of Chemical Engineering *Massachusetts Inst. of Technology (MA)*	Advanced Infrared Laser Remote Sensing Techniques to Monitor On-Road NOx Emissions from Motor Vehicles	**374,080/3**

HUMAN HEALTH RISK ASSESSMENT

EPA Contact: Clyde Bishop 202-260-5727

Principal Investigator Department/Institution	Grant Title	Funding($)/ Project Period
Frederic Y. Bois Lawrence Berkeley Lab. *Univ. of California (CA)*	Physiologically-Based Population Pharmacokinetic Models for Risk Assessment	**68,633/1**

Ian L. Pepper Dept. of Soil & Water Sciences *Univ. of Arizona (AZ)*	PCR Based Detection of Cyto- pathogenic and Non-cytopathogenic Viruses in Water	**227,258/3**
Louise M. Ryan School of Public Health *Harvard Univ. (MA)*	Statistical Methods for Non-Cancer Risk Assessment	**386,267/3**
Patricia M. Rodier Dept. of Obstetrics & Gynecology *Univ. of Rochester (NY)*	Role of Developmental Neurotoxicity in Austin	**629,456/3**
Hebert L. Dupont School of Public Health *Univ. of Texas, Health Science Center (TX)*	Virulence Factors of Geographically Diverse Cryptosporidium and Infective Dose in Humans	**550,323/3**
Louis J. Guillette Dept. of Zoology *Univ. of Florida (FL)*	Contaminant-Induced Changes in Hepatic Steroid Hormone Degradation	**407,679/3**
Brenda Eskenazi School of Public Health Univ. California-Berkeley (CA)	Endometriosis and Dioxin Exposure of Females of Seveso	**426,554/3**
Suresh H. Moolgavkar Public Health Sciences Division *Fred Hutchinson Cancer Research Center (WA)*	Biologically-Based Dose Response Model for Cancer Risk Assessment	**387,615/3**

INDOOR AIR QUALITY IN LARGE OFFICE BUILDINGS

EPA Contact: Deran Pashayan 202-260-2606

Principal Investigator Department/Institution	Grant Title	Funding($)/ Project Period
Stephen J. Reynolds Dept. of Preventive Medicine & Environmental Health *Univ. of Iowa (IA)*	Indoor Air Quality in Large Office Buildings in the Midwest	**635,257/3**
John D. Spengler School of Public Health *Harvard Univ. (MA)*	A Study of Ozone Concentration Gradients in Large Buildings Including an Examination of Indoor Chemistry, Ventilation, Occupant Health Effects and Effects on HVAC Systems	**425,708/3**
Harriet A. Burge School of Public Health *Harvard Univ. (MA)*	Bioaerosols, Health and Productivity in a Large Office Building	**439,035/3**

REGIONAL HYDROLOGIC VULNERABILITY TO GLOBAL CLIMATE CHANGE

EPA Contact: Barbara Levinson 202-260-5983

Principal Investigator Department/Institution	Grant Title	Funding($)/ Project Period
Heinz G. Stefan Dept. of Civil Engineering *Univ. of Minnesota (MN)*	Alteration of Water Availability, Water Quality, and Fish Habitat in Cold Regions by Climatic Change	**300,000/3**
Dennis P. Lettenmaier Dept. of Civil Engineering *Univ. of Washington (WA)*	Improved Methods for Assessment of Hydrologic Vulnerability to Climate Change	**463,762/3**
L. Ruby Leung Atmospheric Processes Group *Battelle Pacific Northwest Laboratory (WA)*	The Influence of Global Climate Change on Mountain Water Resources	**500,000/3**
J. Wayland Eheart Dept. of Civil Engineering *Univ. of Illinois-Urbana (IL)*	Vulnerability of Water Resources to Global Climatic Change in the Agricultural Mid-West -- Ecological, Economic, and Regulatory Aspects	**380,610/3**
Kris Wernstadt Quality of the Environment Division *Resource for the Future (DC)*	The Vulnerability of Low Income Households to the Hydrologic Effects of Climate Change	**440,000/3**
David R. DeWalle Environmental Resources Research Inst. *Pennsylvania State Univ. (PA)*	Regional Streamflow Sensitivity to Climate Change in an Urbanizing Environment	**120,000/3**
Brenton M. Yarnal Dept. of Geography *Pennsylvania State Univ. (PA)*	Regional Hydrologic Vulnerability and Adaptation to Climate: An Integrated Assessment of the Susquehanna River Basin	**460,000/3**

INCENTIVES AND IMPEDIMENTS TO POLLUTION PREVENTION

EPA Contact: Gregory Ondich 202-260-5747

Principal Investigator Department/Institution	Grant Title	Funding($)/ Project Period
Kathy Heller Center for Economics Research *Research Triangle Inst. (NC)*	Encouraging Innovation Through Umbrella Permitting	**239,998/2**
Robert Gottlieb Lewis Center for Regional Policy Studies *Univ. of California-Los Angeles (CA)*	Evaluation and Demonstration of Wet Cleaning Alternatives to Perchloroethylene-Based Garment Care	**75,008/2**

Joan Mahon Graduate School of Management *Rutgers Univ.-Piscataway (NJ)*	Demanufacturing Partnership Program Located at Rutgers University - Newark	**200,000/2**
Kevin Rackstraw *American Wind Energy Assoc. (DC)*	Wind Energy Assessment in China	**159,922/2**
Don Fullerton Dept. of Economics *Univ. of Texas-Austin (TX)*	A Framework to Compare Policies for Source Reduction	**88,784/2**
Sara Clement *Inst. of Advanced Manufacturing Sciences (OH)*	Pollution Prevention Technology Transfer for the Printing Industry	**259,284/2**
Craig Diamond National Sanitation *Foundation International (MI)*	Encouraging Industry Environmental Technology Innovation Through the Implementation of Environmental Management Systems	**187,802/2**
Albert C. Gray *Water Environment Federation (VA)*	Preparation of Pollution Prevention and Socio-economic Monographs Using the EPA Common Sense Initiaitive and the Design for the Environment Program	**100,000/2**
Thomas Bierma Dept. of Health Sciences *Illinois State Univ., Normal (IL)*	P2 Incentive Contracts: Enhancing Diffusion of P2 Technologies in the Metal Plating Industry	**199,964/2**
Lawrence Boyd NIST Great Lakes Manufacturing Technology Center *Cleveland Advanced Manufacturing Program (OH)*	Pollution Prevention Assistance in Automotive Supply Chain	**245,000/2**
Randall D. Forsythe Dept. of Geography & Earth Sciences *Univ. of North Carolina-Charlotte (NC)*	Development of Model Pollution Prevention Diffusion Partnership for Small Business	**180,000/1**
Mark Sharfman College of Business Administration *Univ. of Oklahoma-Norman, Norman (OK)*	Regulation, Business, and Sustainable Development: The Management of Environmentally Conscious Technological Innovation Under Alternative Market Conditions	**244,955/2**
Karen Holmes *International Inst. For Energy Conservation (DC)*	Accessing Overseas Markets: Energy Efficiency and Appliance Labelling in Asia and Latin America	**240,000/2**
Jonathan Bair Maryland Center for Environmental Training *Charles County Community College (MD)*	Provide P2 Technical Assistance Training Literature and Videos to Small and Medium-Sized Business in Key Waste Generating Sectors	**119,824/1**
Terri Goldberg *Northeast Waste Management Officials' Assoc. (MA)*	Pollution Prevention Information Dissemination Printing Project	**160,000/2**

Daryl Ditz *World Resources Inst. (DC)*	Policy Frameworks to Stimulate Environmental Technology in the Computer and Electronics Sectors	**240,000/2**
Barry Bozeman School of Public Policy *Georgia Inst. Of Technology (GA)*	Assessing Compliance Burden from Implementation of CAAA Title V Permitting Rules and Regulations	**240,000/2**
Alfred Marcus Strategic Management Research Center *Univ. of Minnesota-Minneapolis (MN)*	Advising, Monitoring, and Evaluating a Minnesota Pollution Control Agency Pilot Project for Flexible, Multi-Media Permitting	**255,000/2**

TECHNOLOGY FOR A SUSTAINABLE ENVIRONMENT

EPA Contact: Gregory Ondich 202-260-5747

Principal Investigator Department/Institution	Grant Title	Funding($)/ Project Period
Leo Paquette Dept. of Chemistry *Ohio State Univ. (OH)*	Opportunities Offered by Indium-Promoted Carbon Bond Forming Reactions in Water	**300,000/2**
Douglas C. Cameron Dept. of Chemical Engineering *Univ. of Wisconsin (WI)*	Fermentation of Sugars to 1,2 Propanediol by Clostridium thermosaccharolyticium	**160,000/2**
Mary Rezac Dept. of Chemical Engineering *Georgia Tech (GA)*	High-Yield Membrane Reactors	**269,999/3**
Robert Sievers Cooperative Inst. For Research in Environmental Sciences *Univ. of Colorado-Boulder (CO)*	Replacement of Organic Solvents by Carbon Dioxide for Forming Aerosols in Coating Processes	**200,000/2**
Bala Subramaniam Dept. of Chemical & Petroleum Engineering *Univ. of Kansas (KS)*	Coking and Activity of Solid-Acid Alkylation in Supercritical Reaction Media	**220,000/3**
Alan Russell Chemical & Petroleum Engineering Dept. *Univ. of Pittsburgh (PA)*	Biocatalyst of Polymers in Carbon Dioxide	**150,000/3**
Joan Brennecke Chemical Engineering Dept. *Univ. of Notre Dame (IN)*	Phase Equilibria of CO2-Based Reaction Systems	**100,000/2**

Yinlun Huang Dept. of Chemical Engineering & Material Science *Wayne State Univ. (MI)*	Intelligent Decision Making and System Development for Comprehensive Waste Minimization in the Electroplating Industry	**100,000/2**

VALUATION AND ENVIRONMENTAL POLICY

EPA Contact: Gregory Ondich 202-260-5747

Principal Investigator Department/Institution	Grant Title	Funding($)/ Project Period
Nicholas E. Flores Dept. of Economics *Univ. of Colorado-Boulder (CO)*	Environmental Values and National Economic Accounts: A Theoretical Inquiry	**43,395/1 1/2**
David S. Brookshire Dept. of Economics *Univ. of New Mexico (NM)*	Preference Formation and Elicitation in Valuing Non-Market Goods	**184,998/2**
Carol A. Mansfield School of the Environment *Duke Univ. (ND)*	Improving Willingness to Accept Responses Using Alternative Forms of Compensation	**51,402/1 1/2**
William Schulze Dept. of Agricultural, Resource & Managerial Economics *Cornell Univ. (NY)*	Can Contingent Valuation Measure Passive Use Values	**381,150/2**
Thomas Dietz Dept. of Sociology & Anthropology *George Mason Univ. (VA)*	Social Psychology of Stated Preference	**179,990/2**
Richard T. Carson Dept. of Economics *Univ. of California-San Diego (CA)*	Comparative Studies of Approaches Eliciting Economic Values	**265,000/2**
Clifford S. Russell Dept. of Economics *Vanderbilt Univ. (TN)*	Innovations in the Valuation of Ecosystems: A Forest Application	**139,327/2**
Graham Davis Dept. of Economics & Business *Colorado School of Mines (CO)*	Valuing the Stock and Flow of Mineral and Renewable Assets in National Income Accounting	**101,000/2**
Baruch Fischoff Dept. of Social & Decision Sciences *Carnegie Mellon Univ. (PA)*	Eliciting Environmental Values: A Constructivist Approach	**99,987/2**

Gordon Rausser Dept. of Agricultural & Resource Economics *Univ. of California-Berkeley (CA)*	Deriving Biodiversity Option Value Within a Model of Biotechnology Research and Development	**80,000/2**
James J. Opaluch Dept. of Resource Economics *Univ. of Rhode Island (RI)*	Developing Conjoint Stated Methods for Valuation of Environmental Resources Within Their Ecological Context	**125,972/2**
Ronald G. Cummings Policy Research Center *Georgia State Univ. (GA)*	Valuing Environmental Damages With Stated Preference Methods: New Approaches that Yield Demonstrably Valid Values for Non-Priced, Environmental Goods	**113,856/1**
Alan Krupnick *Resources for the Future (DC)*	Mortality Risk Evaluation and Stated Preference Methods: An Experimental Study	**114,822/1**

WATER AND WATERSHEDS

EPA Contact: Barbara Levinson 202-260-5983

Principal Investigator Department/Institution	Grant Title	Funding($)/ Project Period
Robert Costanza Chesapeake Biological Lab. *Univ. of Maryland (MD)*	Integrated Ecological Economic Modeling and Valuation of Watersheds	**1,000,000/3**
Linda A. Deegan Ecosystems Center *Marine Biological Lab. (MA)*	Tracing the Fate of Nitrogen Inputs from Watersheds to Estuaries	**230,000/2**
David L. Freyberg Dept. of Civil Engineering *Stanford Univ. (CA)*	Diffusion Rate Limitations in Heterogeneous Porous Media: Model Structure, Scale and Ecologic Characterization	**198,0003/3**
Steven I. Gordon Dept. of City and Regional Planning *Ohio State Univ. (OH)*	Integrated Planning, Forecasting, and Watershed Level Ecological Risk Assessment Techniques: A Test in the Eastern Cornbelt Plains Ecoregion of Ohio	**445,500/3**
Stanley B. Grant Dept. of Civil & Environmental Engineering *Univ. of California-Irvine (CA)*	Norwalk Virus-like Particles (VLPs) for Studying Natural Groundwater Disinfection	**627,067/3**
Nelson G. Hairston Section of Ecology & Systematics *Cornell Univ. (NY)*	The Role of Long-lived Zooplankton Diapausing Eggs Response and Recovery of Impacted Lakes	**350,000/3**

George M. Hornberger Dept. of Environmental Sciences *Univ. of Virginia (VA)*	The Role of Colloidal Particles in the Transport of Chemicals Through an Agricultural Watershed	**500,000/3**
Hiram W. Li Dept. of Fisheries & Wildlife *Oregon State Univ. (OR)*	Geomorphic, Hydrologic and Ecological Connectivity in Columbia River Watersheds: Implications for Endangered Salmonids	**754,863/3**
Patricia F. McDowell Dept of Geography *Univ. of Oregon (OR)*	Geomorphic, Hydrological and Ecological Connectivity in Columbia River Watersheds: Implications for Endangered Salmonids	**136,100/3**
Mary C. K. Estes Division of Molecular Biology *Baylor College of Medicine (TX)*	Norwalk Virus-like Particles (VLPs) for Studying Natural Groundwater Disinfection	**72,933/3**
David E. Lincoln Dept. of Biological Sciences *Univ. of South Carolina (SC)*	Resistance of Communities to Chronic Haloaromatic Contamination by Biogenic and Anthropogenic Sources	**465,300/3**
Judith L. Meyer Inst. of Ecology *Univ. of Georgia (GA)*	Influences of Watershed Land Use on Stream Ecosystem Structure and Function	**500,000/3**
Francois M. M. Morel Dept. of Geological & Geophysical Sciences *Princeton Univ. (NJ)*	The Role of Hg (II) Reduction and Chemical Speciation in Controlling the Concentration of Mercury and its Methylation in Natural Waters	**349,950/3**
Gary Parker St. Anthony Falls Hydraulic Lab. *Univ. of Minnesota (MN)*	Formation and Propagation of Large-Scale Sediment Waves in Periodically Disturbed Mountain Watersheds	**280,000/3**
Carlos E. Puente Land, Air & Water Resources Hydrologic Science Program *Univ. of California-Davis (CA)*	Modeling Temporal Rainfall Via a Fractal Geometric Approach	**198,000/3**
Edella C. Schlager School of Public Administration & Policy *Univ. of Arizona (AZ)*	A Comparative Institutional Analysis of Conjunctive Management Practices Among Three Southwestern States	**198,000/3**
Mark D. Sobsey Dept. of Environmental Sciences & Engineering *Univ. of North Carolina-Chapel Hill (NC)*	Detecting Fecal Contamination and its Sources in Water and Watersheds	**400,000/3**

Robert Jan Stevenson Dept. of Biology *Univ. of Louisville (KY)*	An Ecoregion-Specific Comparison of Stream Community Responses to Nutrient Gradients Using Both Survey and Experimental Approaches	**376,200/3**
David G. Tarboton Dept. of Civil & Environmental Engineering *Utah State Univ. (UT)*	Scaling Up Spatially Distributed Hydrologic Models of Arid Watershed	**330,000/3**
Albert J. Valocchi Dept. of Civil Engineering *Univ. of Illinois-Urbana (IL)*	Traveling Wave Behavior During Subsurface Transport of Biologically Re-active Contaminants: Implications for in situ Bioremediation	**200,000/3**
David S. White Hancock Biological Station *Murray State Univ. (KY)*	A Comparison of Agriculture vs. Forested Basins: Carbon and Nutrient Cycling within the Hyporheic Ecotone of Streams	**300,000/3**
Tadashi Yoshinari School of Public Health *SUNY-Albany (NY)*	In situ Assessment of the Transport and Microbial Consumption of Oxygen in Groundwater	**346,500/3**
Jurgen Schmandt Center for Global Studies *Houston Advanced Research Center (TX)*	Water and Sustainable Development in the Binational Lower Rio Grande/Bravo Basin	**700,00/2**

CHEMISTRY AND PHYSICS OF AIR --- Exploratory Research Grants

EPA Contact: Deran Pashayan 202-260-2606

Principal Investigator Department/Institution	Grant Title	Funding($)/ Project Period
Mark Thiemens Dept. of Chemistry *Univ. of California, San Diego (CA)*	The Measurement of the Oxygen Isotopic Composition of Tropospheric Ozone	**211,727/3**
Steven D. Gardner Dept. of Chemical Engineering *Mississippi State Univ. (MS)*	An Investigation of the Gas Sensing Properties of a Novel Managnese-Oxide Supported Gold Catalyst	**98,580/2**
Mark Jacobson Dept. of Civil Engineering *Stanford Univ. (CA)*	Proposal to Further Research, Develop, and Apply an Air Pollution Model System	**325,700/3**
Thomas Hard Dept. of Chemistry *Portland State Univ. (OR)*	Atmospheric Free-Radical Measurements Related to Photochemical Oxidants in Urban Air	**276,323/2**

Jeffrey C. Weil Cooperative Inst. for Research in Environmental Sciences *Univ. of Colorado-Boulder (CO)*	Lagrangian Modeling of Pollutant Dispersal in the Atmospheric Boundary Layer	**164,473/2**
Liaquat Husain Wadsworth Center for Labs and Research *New York State Dept. of Health (NY)*	Tracer Studies of SO2 in Clouds	**335,659/3**
Spyros N. Pandos Dept. of Chemical Engineering *Carnegie Mellon Univ. (PA)*	Formation and Physical Properties of Secondary Organic Aerosol	**382,668/3**
Jeffrey L. Collett Dept. of Atmospheric Science *Colorado State Univ. (CO)*	Effects of Non-Uniform Cloud Drop Composition of Pollutant Trans-formation and Removal in Winter Clouds	**339,273/3**
Murray Johnston Dept. of Chemistry Biochemistry *Univ. of Delaware (DE)*	Speciation of Volatile and Reacting Compounds in Particulate Matter	**334,455/3**
Bernd Simoneit College of Oceanic and Atmospheric Sciences *Oregon State Univ. (OR)*	Organic Tracers of Plant Classes in Biomass Combustion and Smoke in Aerosols	**196,244/2**
Daniel J. Jacob Dept. of Atmospheric Chemistry *Harvard Univ. (MA)*	Human Influence on Ozone in the Tropical Troposphere: An Interpretation of Observations Using a Global Three-Dimensional Model	**395,000/3**

ENVIRONMENTAL BIOLOGY --- Exploratory Research Grants

EPA Contact: Clyde Bishop 202-260-5727

Principal Investigator Department/Institution	Grant Title	Funding($)/ Project Period
Franklin R. Hall Ohio Agricultural Research & Development Center *Ohio State Univ. (OH)*	Reducing Pesticide Application Rates by Elucidating the Pesticide Dose-Transfer Process	**264,163/3**
Howard S. Ramsdell Dept. of Environmental Health *Colorado State Univ. (CO)*	Biomarkers and Effects of Estrogenic Chemicals in Frogs	**145,360/2**
Michael Plewa Inst. for Environmental Studies *Univ. of Illinois (IL)*	Isolation and Characterization of Plant-Activated Environmental Arylamines	**290,170/3**

Eva J. Pell Environmental Resources Research Inst. *Pennsylvania State Univ. (PA)*	Genetically-Engineered Potato Plants which do not Produce Ozone-Induced Ethylene	**390,984/3**
David L. Bushbee Dept. Anatomy & Public Health *Texas A&M Univ. (TX)*	Physiological Effects of Pollutants in the Bottlenose Dolphin	**412,890/3**
Francois M. M. Morel Dept. Geological Sciences *Princeton Univ. (NJ)*	Microbial Transformations of Arsenic in Anoxic Waters	**322,982/3**
Chen S. Lee Dept. of Chemistry *Iowa State Univ. (IA)*	Capillary Immunophoresis for Environmental Monitoring	**260,580/3**
David H. Hinton School of Veterinary Medicine *Univ. of California-Davis (CA)*	Linkage of Stress Proteins and Alterations: A Laboratory and Field Investigation	**388,578/3**
David A. Stahl Dept. of Civil Engineering *Northwestern Univ. (IL)*	Integrating Molecular and Bio-chemical Techiques to Characterize Adaptation Mechanisms of Anaerobic Microbes	**406,372/3**
Abdul Matin Dept. of Microbiology & Immunology *Stanford - Univ. (CA)*	Use of Pseudomonas Starvation Promoters in In-Situ Bioremediation	**401,960/3**
Ronald S. Tjeerdema Dept. of Chemistry & Biochemistry *Univ. of California-Santa Cruz (CA)*	Determination of the Relative Sensitivity of the Northern Elephant Seal and other California Pennipeds to the Toxic Effects to PCB's	**294,218/3**
Michael R. Hyman Dept. of Botany & Plant Pathology *Oregon State Univ. (OR)*	Aerobic Cometabolilsm of Ether-Bonded Compounds	**358,953/3**
Steven K. Schmidt Dept. of Environmental Population & Organismic Biology *Univ. of Colorado-Boulder (CO)*	The Effect of Anthropogenic Nitrogen on the Functioning of Alpine and Subalpine Ecosystems: Nitrogen Cycling and Trace Gas Fluxes	**329,280/3**
William H. Benson Department of Pharmacology *Univ. of Mississippi (MS)*	Environmental Xenoestrogens and Reproductive Toxicity in Fish	**198,495/2**

David B. Herbst Sierra Nevada Aquatic Research Lab. *Univ. of California-Santa Barbara (CA)*	Evaluation of Range-Land Stream Condition and Recovery Using Physical and Biological Assessment of Non-Point Source Pollution: Studies Under Different Grazing Management Practices	**236,431/3**
Dorothy E. Schumm Dept. of Medical Biochemistry *Ohio State Univ. (OH)*	Use of a Tumor Marker to Monitor Exposure to Aquatic Pollutants in the Brown Bullhead	**285,022/3**
Anne-Marie Stopm Forestry Dept. *North Carolina State Univ. (NC)*	Genetic Improvement of Duckweed (Lemna Gibba) Wastewater Treatment	**143,962/2**
Lilly R. Young AgBiotech Center *Rutgers Univ. (NJ)*	Anaerobic Biotransformation of Pesticides in Near Coastal Environments	**345,979/3**
Stanley J. Opella Dept. of Chemistry *Univ. of Pennsylvania (PA)*	NMR Structural Studies of Mercury Transport Proteins	**358,161/3**
Roger M. Nisbet Dept. of Biological Sciences *Univ. of California-Santa Barbara (CA)*	A Framework for Predicting the Effects of Environmental Change on Populations	**360,037/3**
John H. Andrews Plant Pathology Dept. *Univ. of Wisconsin (WI)*	Detection, Quantification, and Biogeography of Microbes in Ecosystems	**401,130/3**
James T. Oris Dept. of Zoology *Miami Univ. (FL)*	Ecological Assessment of the Phototoxic Polycyclic Aromatic Hydrocarbon Fluoranthene in Freshwater Systems	**450,000/3**
Harrish C. Sikka Great Lakes Lab. *SUNY-Buffalo (NY)*	Comparative Metabolism of Unsubstituted and Methylated	**400,642/3**
Charles D. Rice College of Veterinary Medicine *Mississippi State Univ. (MS)*	The Immunotoxicity of Combined TBT and Coplanar PCB Exposures in Fish	**244,456/3**
Mark E. Hahn Biology Dept. *Woods Hole Oceanographic Inst. (MA)*	Cultured Fish Cells as Model Systems for Studying Mechanisms of Dioxin Toxicity	**252,790/2**

John Stegeman Biology Dept. *Woods Hole Oceanographic Inst. (MA)*	Catalytic Function of Expressed Teleost Cytochrome P4501A	**251,946/2**
Mohamed Faisal School of Marine Science *College of William & Mary (VA)*	Effects of Metals on Detoxification, Carcinogenicity, and Immunotoxicity	**449,794/3**

ENGINEERING --- Exploratory Research Grants

EPA Contact: Bala Krishnan 202-260-2613

Principal Investigator Department/Institution	Grant Title	Funding($)/ Project Period
Carl R. F. Lund Chemistry Engineering Dept. *SUNY-Buffalo (NY)*	Using Membrane Reactors to Reduce the Generation of Waste Products	**193,389/2**
Mark M. Benjamin Dept. of Civil Engineering *Univ. of Washington (WA)*	Investigation and Optimization of Dual Coagulation Processes	**254,064/3**
Richard I. Stressel Dept. of Civil Engineering *Univ. of South Flordia (FL)*	Waste Liner Compatibility Studies Using Comprehensive Testing System for Geo-Membrane Liners	**182,621/1**
Marc A. Edwards Dept. of Civil, Environmental & Architectural Engineering *Univ. of Colorado-Boulder (CO)*	Arsenic Removal by Softening and Coagulation	**244,426/3**
Richard B. Timmons Dept. of Chemistry & Biochemistry *Univ. of Texas-Arlington (TX)*	A Novel New Approach to Detoxification of Polychlorinated Solvents a Waste-to-Useful Fuel Conversion Technology	**303,082/3**
P. Somasundaran School of Mines *Columbia Univ. (NY)*	Fundamental Studies on Management of Industrial Sludges - Enhanced Flocculation of fine Particle Suspensions by Manipulation of Polymer Conformation	**293,370/3**
Richard L. Corsi Center for Research in Water Resources *Univ. of Texas-Austin (TX)*	VOC Emissions from Sewers: Process Drains and Drop Structures	**271,896/3**
Theodore C. Crusberg Dept. of Biology & Biotechnology *Worcester Polytechnic Inst. (MA)*	Biomineralization of Heavy Metals Within Fungal Mycelia: A New Technology for Bioremediation of Hazardous Wastes	**278,295/3**

Daniel W. Armstrong Chemistry Dept. *Univ. of Missouri-Rolla (MO)*	Pollution Prevention and Enhancement of Biodegradability Via Isomer Elimination Products	**267,000/3**
Pericles Stavropoulos Dept. of Chemistry *Boston Univ. (MA)*	Biomeinetic Oxidation of Hydrocarbons Related Bioremediation Processes	**284,297/3**
Carl D. Palmer Dept. of Environmental Science & Engineering *Oregon Graduate Institute of Science & Technology (OR)*	Attenuation of Chromium in Alkaline Chromium Substitution in Etringites and C_4AH_{12} - Monosulfates	**176,630/2**
Richard L. Valentine Dept. of Civil & Environmental Engineering *Univ. of Iowa (IA)*	Characterization and Kinetics of Contaminant Oxidation and Hydrogen Peroxide Decomposition in Presence of Subsurface Material	**189,242/3**
Pedro J. Alvarez Dept. of Civil & Environmental Engineering *Univ. of California-Davis (CA)*	Biostimulation of BTX Degradation with Environmentally Benign Aromatic Substrates	**246,342/3**
Jeanie L. Darby Dept. of Civil & Environmental Engineering *Univ. of California-Davis (CA)*	Influence of Biocolloids and Biocolloidal Structure on the Dewaterability of Anearobically Digested Sludge	**132,678/2**
Charles M. King Environmental Systems Engineering *Clemson Univ. (SC)*	Catalytic Dehalogenationof PCBs and Pesticides in Supercritical Fluids	**189,104/2**
Steven S.C. Chuang Dept. of Chemical Engineering *Univ. of Akron (OH)*	Catalytic Reduction of Nitric Oxide	**280,211/3**
Ashok Mulchandani Dept. of Chemical Engineering *University of California Riverside (CA)*	Application of Surface Expressed Phosphotriesterase for Detoxification and Monitoring of Organophosphorus Pesticides	**293,794/3**
Ronald K. Hanson Dept. of Mechanical Engineering *Stanford Univ. (CA)*	Multiplexed Diode-Laser Gas Sensor System for In-Situ Multi-Species Emissions Measurements	**187,691/2**
James A. Smith Dept. of Civil Engineering & Applied Mechanics *Univ. of Virginia (VA)*	Simulation of Kinetic Sorption and Desorption of TCE and Surfactant in Groundwater at Picatinny Arsenal, NJ	**79,969/1**

MINORITY INSTITUTIONS --- Exploratory Research Grants

EPA Contact: Virginia Broadway 202-260-7664

Principal Investigator Department/Institution	Grant Title	Funding($)/ Project Period
Vladimir M. Shalaev Physics Dept. *Univ. of New Mexico (MN)*	Radition Scattering by Fractal Clusters in Aerosols	**155,609/2**
Gregory A. Ahern Dept. of Zoology *Univ. of Hawaii (HI)*	Cellular Mechanisms of Heavy Metal Detoxification in Crustaceans	**420,636/3**
Maria E. Alvarez Dept. of Biological Sciences *Univ. of Texas-El Paso (TX)*	Reversible Inactivation of Viruses in Groundwater	**144,581/2**
Rafael Arce Dept. of Chemistry *Univ. of Puerto Rico-Rio Piedras (PR)*	Product Formation and Identification in the Photo Degradation of PAH in Models of Atmospheric Particulate	**254,723/3**
Govind S. Nadathur Dept. of Marine Sciences *Univ. of Puerto Rico-Mayaguez (PR)*	Molecular Probes for Bacterial Vectors in Ciguatera Sea Food Poision	**222,569/3**
Howard G. Adams Dept. of Engineering *Univ. of Notre Dame (IN)*	Administration and Development of a Traineeship Program for Culturally Diverse Graduate Students	**3,000,000/3**
Raul G. Cuero CARC *Prairie View A&M Univ. (TX)*	Optimization of Oil Biodegradation by Mixed Bacterial and Fungal Populations	**125,035/2**

SOCIO-ECONOMICS --- Exploratory Research Grants

EPA Contact: Gregory Ondich 202-260-5747

Principal Investigator Department/Institution	Grant Title	Funding($)/ Project Period
Douglas L. Anderton Dept. of Sociology *Univ. of Massachusetts (MA)*	A National Evaluation of Equity in Hazardous Waste Sites	**263,470/2**

Stan L. Albrecht Inst. for Health Policy Research *Univ. of Florida (FL)*	Low-Level Radioactive Waste Siting- Towards the Development of More Effective Policy through Understanding Failure	**295,891/2**
David Ziberman Dept. of Agricultural & Resource Economics *Univ. of California-Berkeley (CA)*	The Microeconomy of Chemical Use on Residential Landscapes	**368,908/3**
Katherine T. McClain Dept. of Mineral Economics *Pennsylvania State Univ. (PA)*	Undesirable Facilities and Political Boundaries: Neighborhood Dynamics and House Prices	**64,381/1**
Joseph A. Herriges Dept. of Economics *Iowa State Univ. (IA)*	The Robustness of Welfare Estimates for Environmental Goods from Discrete Choice Recreational Demand Models	**87,912/2**
Anna Alberini Quality of the Environment Division *Resources for the Future (DC)*	Estimating Ownership and Use of Older Cars	**50,000/1**
Paul A. Sabatier Division of Environmental Studies *Univ. of California-Davis (CA)*	Coalition Formation and Stability in Environmental Policy: Testing a Revised Version of Advocacy Coalition Framework on San Francisco Bay/Delta Water Policy	**158,226/2**
Max A. Pfeffer Dept. of Rural Sociology Cornell Univ. (NY)	Public Opinion on Environment and Water Quality Management in the New York City Watershed	**371,317/3**

CHEMISTRY AND PHYSICS OF WATER --- Exploratory Research Grants

EPA Contact: Barbara Levinson 202-260-5983

Principal Investigator Department/Institution	Grant Title	Funding($)/ Project Period
Susan Powers Dept. of Civil & Environmental Engineering *Clarkson Univ. (NY)*	Reformulated Gasoline: Transport and Clean-up of Spills to the Subsurface	**240,479/3**
Jennifer A. Field Dept of Agricultural Chemistry *Oregon State Univ. (OR)*	Ion-Pair/Supercritical Fluid Extraction and Derivation for Polar Organic Pollutant Analysis	**364,424/3**
Mukul M. Sharma Dept. of Chemical Engineering *Univ. of Texas-Austin (TX)*	NMR Imaging of Biofilm Growth in Porous Media	**449,760/3**

Linda B. McGown Department of Chemistry *Duke Univ. (NC)*	Spectral Characterization of Humic Substances	**332,309/3**
Douglas G. Capone Chesapeake Biological Lab. *Univ. of Maryland (MD)*	Importance of Reductive Dechlorination in Chesapeake Bay Sediments: Role of Sulfate Reduction	**242,538/3**
Martin Reinhard Dept. of Civil Engineering *Stanford Univ. (CA)*	Analysis of Halogenated Organic Particle-Scale Desorption Via Column Studies and 13C Solid State NMR Spectroscopy	**274,835/3**
Ray von Wandruszka Dept. of Chemistry *University of Idaho (ID)*	The Secondary Structure of Humic Acid and its Environmental Implications	**323,920/3**
Chonmiao Zheng Dept. of Geology *Univ. of Alabama (AL)*	A Global Optimization Approach for Parameter Identification in Contaminant Transport Modeling	**118,996/2**
J. Houston Miller Dept. of Chemistry *George Washington Univ. (DC)*	Nitrogen Deposition onto Aqueous Media: Quantitative Diagnostics, Laboratory Measurements, and Model Developments	**182,227/3**
Constantinos V. Chrysikopoulos Dept. of Civil & Environmental Engineering *Univ. of California, Irvine (CA)*	Dissolution Kinetics of Single and Multicomponent NAPL Pools in Saturated Three-Dimensional Porous Media	**315,368/3**
Jean-Marc Bollag Environmental Resources Research Institute *Pennsylvania State Univ. (PA)*	Oxidative Coupling as a Cause of Substitutent Release from Aromatic Pollutants	**401,838/3**
Gamani R. Jayaweera Dept. of Land, Air & Water Resources *Univ. of California-David (CA)*	Redox Status and Degradation Kinetics of RepresentativeTriazine and Urea Herbicides in Soil-Water Systems	**364,941/3**
Dianne A. Blake Dept. of Ophthalmology *Tulane Univ. (LA)*	Quantitation of Heavy Metals by Immunoassay	**362,823/3**
Robert J. Hurtubise Dept. of Chemistry *Univ. of Wyoming (WY)*	Solid-Matrix Luminescence Analysis of B(a)P-DNA Adducts	**413,055/3**

Office of Research and Development

1996 Research Opportunities

National Center for Environmental Research and Quality Assurance

Peter W. Preuss, Center Director - Jack Puzak, Deputy Director - Melinda Mclanahan, Associate Director for Science

The Environmental Protection Agency's Office of Research and Development, during 1996, has been accepting research grant applications in the following 16 areas.

Ecological Assessment (a two-part solicitation)

Regional Ecosystem Protection and Restoration: This solicitation requests research that ultimately will reduce the uncertainty in conducting ecological assessments at multiple ecological scales - watershed scale, regional scale, and national scale assessments. The research is intended to improve the Agency's ability to: a) monitor the current and changing conditions of ecological resources from which success or failure of the ecosystem can be judged without bias; b) understand more fully the structure and function of ecosystems in order to develop improved management options; c) develop models to predict the response of ecosystems to changes resulting from human-induced stress from which possible ecosystem management strategies can be assessed; and d) assess the ecological consequences of management actions so that decisionmakers can best understand the outcomes of choosing a particular management strategy.

The second part of this solicitation, ***Global Climate Change:*** seeks research proposals that address regional scale vulnerabilities in the United States to global climate change (e.g., Southeast, Great Plains, and U.S. Caribbean or Pacific Islands) with an integrative emphasis. Proposals should be based on, and use, existing data and assessments when appropriate. Consortia of broadly-based inter-disciplinary researchers are encouraged to address areas of concern, such as (but not limited to) the following: a) development and demonstration of an integrated assessment methodology that can provide a framework and a process for organizing and interpreting diverse sets of technical, social, and economic information to support policy decision-making; b) ecological and hydrological responses in the coastal zones, lakes, and rivers due to changes in sea level and precipitation, and associated impacts on habitats, water supply, natural resources (forest/agricultural products, commercial recreational fisheries, tourism), and public health (increased incidence and areal spread of vector-and water-borne diseases) caused by climate change; c) economic assessment of impacts and relative risk of climate change versus other anthropogenic stressors.

Closing Date: 3/15/96.

Contacts: Robert Menzer, 260-5779 (menzer.robert@epamail.epa.gov); Barbara Levinson, 260-5983 (levinson.barbara@epamail.epa.gov)

Exposure of Children to Pesticides:

This solicitation seeks research on children's cumulative exposure to pesticide classes such as, but not limited to, pyrethroids, cholinesterase inhibitors, and triazine herbicides, using a method that treats children as a unique sub-population and not simply as "small adults." Grant proposals should address one or more of the following topics related to children's exposure: 1) Development of approaches for assessing children's exposure to the pesticides of interest via multiple pathways and routes (e.g., inhalation, dietary and non-dietary ingestion, and dermal contact). This research should emphasize age-related differences and characteristics of child behavior in dietary habits, hand-to-mouth activities, and contact with contaminated surfaces and objects. 2) Research that evaluates and compares children's

exposures to pesticides resulting from various sources (e.g., agricultural food application, residential lawn treatment, indoor residential uses, pet uses) and apportions the exposure and potential dose. 3) The development of methods for assessing cumulative exposures to specific classes of pesticides. This should include methods to determine the temporal nature of various sources and the resulting impact on exposure.

Closing Date: 3/1/96.

Contact: Chris Saint, 260-1093
(saint.chris@epamail.epa.gov)

Air Quality This solicitation is multi-part, covering Tropospheric Ozone, Urban Air Toxics, Great Waters Air Toxics Loadings, Ecological Effects, and Indoor Air Quality research.

***Tropospheric Ozone*:** 1) Laboratory studies to elucidate the products formed during the oxidation of biogenic VOCs and aromatic VOCs under atmospheric conditions, the reactions of olefins with 0_3 and NO_3, and the reactions of OH radicals with higher molecular weight alkanes and alkenes. 2) Laboratory studies of the kinetics and stoichiometry of reactions of high molecular weight organic peroxy radicals, and the reaction of peroxy radicals with NOX forming organic nitrogen reservoirs. 3) Smog chamber and modeling studies to develop advanced mechanistic models for atmospheric oxidant formation. 4) Laboratory investigations of the role of heterogeneous and aqueous-phase processes on gas-phase oxidant production and nitrogen oxides/nitrate chemistry.

Modeling Research: 1) Studies to explore boundary layer turbulence, vertical mixing, and cloud processes and their interactions with atmospheric chemistry. 2) Research to develop and test quantitative techniques for assessing errors or uncertainties in physical and chemical processes (e.g., meteorology, deposition, photochemistry, and emissions) that affect concentration estimates from ozone air quality modeling systems. 3) Studies to develop and test innovative techniques to evaluate the functioning of physical and chemical processes in ozone air quality modeling systems. 4) Monitoring and observations-based approaches to investigate the photochemical ozone problem and evaluating/developing emissions control strategies; use of existing SOS databases to develop/test approaches. 5) studies to develop and diagnostically evaluate emissions-based modeling which focuses on interactions of urban area and point source plumes with the surrounding regional atmosphere; use of existing SOS databases for model development and evaluation. 6) Research to develop air pollution prediction systems to provide real-time forecasting of ozone air quality.

Ambient Measurement and Analysis Methods: 1) Studies that may lead to new, more sensitive techniques for ambient measurement, on short time scales, of chemically-significant trace gases (e.g., ozone, hydrocarbons, oxides of nitrogen, carbonyls, and key radical species) participating in the photochemistry of ozone. 2) Development of innovative in-situ and remote-sensing measurement methods for using ambient concentration and meteorological measurements in assessing the potential ozone response to local changes in precursor emissions/concentrations. 3) Instrument methods development studies or development of innovative data analysis techniques applicable to PAMS (Photochemical Assessment Monitoring Stations) objectives for cost-effective and accurate monitoring.

Emissions: 1) Studies of biochemical and physiological fundamental mechanisms linking seasonal and other significant variations in biogenic VOC emissions from important genera; field studies to assess the validity of the newly proposed mechanisms. 2) Development of improved algorithms for biogenic ozone-precursor emissions estimation. 3) Research, development, and field assessments of tunable laser or other fast response techniques for remotely measuring ozone precursor emissions from fugitive emission concentration fields and from on-road, in-operation mobile source emissions. 4) Studies that explore the sub-grid scale uncertainties of representing urban and point source emissions within air quality modeling systems.

Air Toxics

The proposals submitted in response to this area will provide data valuable for both residual risk determinations and the urban area source strategy.

***Urban Air Toxics*:** There is almost no direct observational evidence (i.e., epidemiologic data) linking health effects and ambient HAPs exposures. In part, this is due to limited exposure methods and data and the expense of adequate epidemiologic studies. Recently developed epidemiologic approaches may be useful in overcoming some of the traditional difficulties in this area, e.g., biomarkers, new statistical methods. A need exists to address the risks that may be posed by toxic contributions to the effects of urban mixtures ("urban soup") and/or risks that may be posed by individual and mixtures of toxic chemicals from large sources of pollution. EPA is seeking answers to the following key questions: Are there public health risks that result from a) exposures to recurrent acute exposures from both point and area sources, b) chronic exposures from individual facilities or the combined exposures from multiple facilities, and c) mixtures which impact the same or different organ systems? Can susceptible subpopulations be identified that are at increased risk due to higher exposures or biological sensitivities? What are the emissions of air toxic pollutants from sources of concern in urban areas?

To answer these questions EPA seeks research that uses a multidisciplinary approach to investigate source identification and characterization, exposure characterization (modeling/monitoring), and characterization of health outcomes as related to exposure. Research that addresses all three topics in an integrated study is preferred; however, source characterization for air toxics and epidemiology (health and exposure) can be considered separately. No consideration will be given to proposals that address only health or exposure.

***Great Waters Air Toxics Loadings*:** Research is needed to reduce the uncertainty in estimating the contribution of atmospheric transport and deposition to overall loadings of toxic substances in the Great Lakes and the Chesapeake Bay. Work

to date has focused principally on the transport and fate of mercury compounds in their different phases. Additional work has addressed polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), and pesticides. Much of the work has centered on the Chicago and Baltimore urban areas in the Lake Michigan and Chesapeake Bay regions, respectively. The Agency is interested in proposals to reduce uncertainties in estimating the atmospheric transport and deposition of hazardous air pollutants into Great Waters regions. Specifically, proposals are requested for research devoted to different Great Waters regions or other hazardous air pollutants in the Lake Michigan and Chesapeake Bay regions.

***Ecological Effects*:** Natural ecosystems are comprised of a mix of interacting species that compete for resources as they complete their life cycles. Ecosystems are exposed to a range of atmospheric pollutants that occur both singly and in combination. Individual plant response to pollutant stress varies by species, stage of development, and the presence of other stresses (e.g., insect and fungal pathogens, nutrient stress, water stress). However, individual species response to air pollution is not always reflective of overall ecosystem response since individual species respond differently depending on their competitive environment. Therefore, ecosystem sensitivity to pollutant stress is complex and needs to be studied across broad spatial and temporal scales. Research to evaluate ecosystem response to pollutant stress is needed to address a number of questions in several areas:

1) How does vegetation respond to co-occurring natural and/or anthropogenic stresses?
2) How does intra-and interspecific competition affect individual plant response to air pollutant stress?
3) How does stage of plant development and timing of pollutant exposure affect species response to air pollutants?
4) How do long-lived species, exposed to pollutants year after year, integrate pollutant damage over time?
5) What is the response of the plant community exposed to air pollutant stress?
6) What are appropriate indicators of ecosystem response to air pollution?

Indoor Air Quality

EPA is seeking proposals targeted at techniques to reduce indoor exposures to biocontaminants. EPA is particularly interested in studies to determine the effects of environmental factors such as temperature, humidity, dust level, air velocity, and substrate materials on the deposition, amplification, and dissemination of biological contaminants including fungi and dust mites. High priority research areas include 1) factors controlling the dust mite population in the indoor environment, 2) the influence of substrate and relative humidity on colonization of toxic fungi, and 3) factors controlling dissemination of fungal contaminants.

Closing Date: 3/15/96.

Contact: Deran Pashayan, 260-2606 (pashayan.deran@epamail.epa.gov)

Analytical and Monitoring Methods

The purpose of the program is to advance measurement science by stimulating research on radically new approaches to solving environmental monitoring problems. In evaluating proposals, EPA will favor research that is likely to solve real world monitoring problems.

***Field Analytical Methods*:** Measurement technologies that can be used in the field to permit more rapid decision making, eliminate packaging and shipping samples to distant laboratories, and yield more information for less money are urgently needed. Such technologies need to be portable, yield real time (i.e., within 4 hours) data, rugged, sensitive, and suitable for the wide variety of samples that are commonly analyzed (e.g., industrial wastes, industrial waste waters, incinerator stack emissions) and, if possible, be able to measure multiple pollutants simultaneously. In addition to the aforementioned applications, rapid field tests are also needed by personnel confronted with responding to crisis situations (e.g., spills and accidents). Examples of what is meant by field-portable, rapid results monitoring methodology include the recently developed and commercialized immunochemistry-based assays and hand-held X-ray fluorescence spectrometers.

Continuous Measurement Methods: Major improvements in waste process/treatment control and environmental decision-making could be made if more accurate, less costly, more rugged techniques were available which would yield continuous, or at least intermittent, data on pollutant concentrations in environmental media. Some monitoring situations where current methodology is known to be inadequate include the following: 1) Toxic metal (particularly mercury) and/or organic compound emissions from high temperature, complex matrix sources such as incinerators. 2) Release of volatile compounds from complex point sources or area sources (e.g., tanks, pipes, valves, landfills, contaminated soils) under ambient conditions. 3) Toxic chemical concentrations in the air over a defined area such as a hazardous waste site, an industrial facility, etc. 4) Organic and inorganic toxicants in municipal and industrial waste water on a continuous basis to eliminate the need to overengineer waste treatment facilities to ensure compliance with regulatory standards. 5) Deposition or emission flux of toxic air pollutants, especially semivolatile pollutants that exist both in the gas phase and on particulate matter. 6) Continuous measurement of the mass of inhalable particulate matter (PM2.5 and PM10), semi-volatile organic toxicants, and NH_4NO_3 in the air, not including the particle-bound water in the weight of material measured. 7) Continuous mass measurements of particle-bound water in airborne particulate matter (PM2.5 and PM10).

Leachability Prediction: Current methods for determining the leaching potential of waste materials are designed for determining whether a waste poses a hazard to ground water under specific improper disposal situations. These methods are not appropriate for assessing risk under other management situations. In order to better assess the potential risk posed by wastes under real world land management conditions and, therefore,

permit the design of more cost-effective land management facilities, new methods are needed for characterizing the potential for toxic materials to migrate from waste materials that are destined for land management. One group of materials that pose a particular problem are those wastes that contain either a highly viscous or a non-newtonian liquid phase.

Closing Date: 3/1/96.

Contact: David Friedman, 260-3535
(friedman.david@epamail.epa.gov)

Drinking Water This solicitation invites research grant applications in two areas: 1) Microbial Pathogens in Drinking Water Systems, and 2) Drinking Water Disinfection By-products (DBPs). The incidence of waterborne disease in the U.S. is highly uncertain. While the health effects caused by pathogens in drinking water are generally known, limited information is available on the doses and conditions that produce effects. Also, little is known about the extent to which bacterial growth in the distribution system is a cause of waterborne illness. Research is needed in the following areas: 1) Current methods for measuring Cryptosporidium and Giardia frequently produce inaccurate and highly variable recovery data, in part due to the small volume of water that can be practically analyzed. This has contributed to considerable uncertainty about the health risks associated with exposure to drinking water containing Cryptosporidium and Giardia, as has the lack of information about the viability of cysts and oocysts found in drinking water systems. Research is needed to develop practical, low cost, accurate, and specific methods to identify and quantify viable pathogenic cysts and oocysts in raw and finished drinking water systems. 2) Dose-response models have been developed for Cryptosporidium parvum, Giardia, and several waterborne viruses; however, the validity of these models at low doses is unknown. Research is needed to evaluate the reliability of existing models at low dose exposures and whether dose response models developed with animals can be translated to the existing human models. 3) Research is needed to develop an understanding of the risks associated with exposure to primary waterborne pathogens (e.g., Giardia, Cryptosporidium, and enteric viruses) as a function of such susceptibility factors as age, nutrition, protective immunity, and behavioral patterns.

Drinking Water Disinfection By-products: Public water systems disinfect drinking water with chlorine or alternate disinfectants. While chlorine reduces microbial risk, the use of chlorine creates new potential risks from disinfection by-products formed during the water treatment process. Research is needed in the following areas: 1) Improving methods for estimating human exposures to by-products of different disinfection treatments. Proposals should address research on biochemical markers of human exposure and/or the development and validation of models of human exposure to DBPs. Please do not submit proposals for epidemiology studies. 2) Reducing uncertainty regarding appropriate markers of effects and susceptibility in both cancer and reproductive outcome epidemiology studies. Laboratory and/or field evaluations are needed of morphological, biochemical, and/or molecular alterations that may be useful as markers of effect and susceptibility. 3) Examining the feasibility of assessing the relative toxicity of DBP mixtures in drinking water (e.g., ozone/chloramines, chlorine/chloramines, and chlorine dioxide). Proposals may include such elements as: the feasibility of sample preparation; chemical analysis and assessment; and toxicological testing of mixtures. 4) Developing improved extraction procedures and advanced instrumentation to characterize the non-volatile and difficult to extract organic and inorganic DBPs. These procedures would be used in the development of methods to assess the frequency and magnitude of occurrence of by-products.

Closing Date: 3/1/96.

Contact: Sheila Rosenthal, 260-7334
(rosenthal.sheila@epamail.epa.gov)

Environmental Fate and Treatment of Toxics and Hazardous Waste

This area seeks to strengthen the scientific basis for estimating risk through improved scientific knowledge about the fate and transport processes that affect contaminants and our ability to detect and measure them. Results of this research should also improve our ability to develop new approaches to remediation. Examples of topics of interest are: 1) Research to develop the ability to better predict the formation, degradation, and bioaccumulation constants of metal/organic complexes and organometallics and to develop equilibrium and kinetic sorption models for inorganic/organic metal species on environmental surfaces, both biotic and abiotic. A major focus of the research should be on contaminants and environmental settings typical of large, complex waste sites, e.g., mining sites, multiple industrial waste sites, and disposal in a single watershed 2) Research to develop models for predicting the fate and sorption properties of dense non-aqueous phase liquids (DNAPLs) in a wide range of environmental settings. 3) Research on interactions between subsurface geochemical and biological processes to determine their influence on the mobility, fate, and bioavailability of contaminants, particularly DNAPLs, in soils and ground water to quantify the transformations taking place in the subsurface and the fluxes of materials to other ecosystem components (receptors) and to develop indicators of subsurface ecosystem status. A major focus of the research should be on indicators that can serve as markers for naturally occurring biodegradation at DNAPL sites or for identifying novel processes and mechanisms for development of innovative subsurface remediation technologies. 4) Research on geochemical and geophysical processes that have the potential to lead to the development of more effective technologies for the removal of DNAPLs from the subsurface. 5) Research to develop methods and data to determine the properties and processes associated with subsurface contaminants that could be used to develop real-time measurement methods for determining the nature and extent of subsurface contamination problems and the progress of remedial actions to correct them and to develop prototype sensors based on these processes.

***Assessment of Risks of Contaminated Soils and Treatment Residuals*:** The level of cleanup greatly affects the cost of remediation. Remediation levels must insure that human health and the environment are adequately protected. To accomplish these objectives in a cost-effective manner, data are needed about the risks of contaminated soils, treated soils and other solid matrices in the vadose zone. Techniques for cost effectively measuring these possible impacts are also needed. Therefore, the EPA is soliciting proposals on one or more of the following topics: 1) Research on methods for assessing the potential human health and ecological impacts of residual contaminants (e.g., incinerator ash or untreated mine waste tailings that remain in place). Of particular importance are techniques applicable to assessing mixtures of residuals from thermal and chemical treatment of complex, toxic organics such as PAHs and PCBs which go through multiple steps of degradation. 2) Research on the factors influencing the availability of toxic metal or inorganic contaminants common at contaminated sites (e.g., CN, Cd, Hg, Cr(VI)). Example sources are mining operations, metal finishing sites, and other industrial operations. This research requires developing an understanding of the chemical, physical, and biological processes which influence the chemical form of the metal/inorganic, its mobility in the environment, and its assimilation by, and impacts on, human and ecological receptors.

Closing Date: 3/1/96.

Contact: William Stelz, 260-5798
(stelz.william@epamail.epa.gov)

Environmental Statistics

solicits proposals to establish (by means of a five-year cooperative agreement) a National Research Center on Statistics and the Environment that will provide a national capability to identify and perform cutting-edge research in environmental statistics, thereby furthering the application of statistics to the environmental sciences and facilitating the professional development of future environmental statisticians.

Closing Date: 3/15/96.

Contact: Chris Saint, 260-1093
(saint.chris@epamail.epa.gov)

High Performance Computing

EPA is seeking proposals aimed at developing high performance computing technologies for use in environmental assessment and management. Of particular interest are proposals that target research on problem solving environments, parallel algorithms, and data access and analysis techniques. All technology advances should be demonstrated in a results-oriented testbed that specifically addresses cross-media ecosystem management capabilities to support community based environmental assessments.

Problem Solving Environments: Proposals in this category should address one or more of the following objectives: 1) Explore conceptual data models that encompass all data types required for cross-media environmental assessment and decision making. To test the robustness of the data models by developing reusable scalable input/output (I/O) class libraries to support development of interoperable cross-media environmental modeling and decision support frameworks including geospatial data for integrated visualization and geospatial analysis. 2) Explore and evaluate alternative techniques for full integration (close coupling) of geospatial analysis, environmental modeling, and object oriented databases involving very large three dimensional, time and space varying data. 3) Develop scalable parallel I/O techniques for object oriented data bases, I/O mechanisms to support data reordering, fast queries over distributed databases and archives, and I/O for binary large objects. 4) Develop reusable object-model-based class libraries for parallel numerical solvers and science processes related to cross-media modeling, uncertainty, and risk assessment.

Parallel Algorithms: Currently, issues of spatial and temporal scale and computational feasibility have limited advances in this area. EPA is requesting proposals to explore scalable parallel approaches for effective coupling among water, air, soil, terrestrial, and ecological models and research on issues of scale and resolution that affect computational feasibility. Proof of concept and research-prototype development of coupled models in a scalable parallel computing environment are important components of the research. Proposals should address one or more of the following objectives: 1) Evaluate performance characteristics of alternative domain decomposition approaches and scalable parallel algorithms for multi media (air, water, soil, terrestrial systems, etc.) environmental modeling, coupled air-water exchange processes, and/or associated uncertainty and risk computations. 2) Develop scalable parallel algorithms for adaptive grid approaches and evaluate the preservation of accuracy with the interaction of regular and irregular grid systems in the context of cross-media environmental assessments. 3) Devise methods for optimization problems involving nonlinear processes, develop scalable parallel algorithms for efficient implementation, and explore the accuracy of sampling strategies for non linear response space.

Data Access and Analysis Techniques: Intelligent and effective methods are needed to satisfy the extensive need for environmental data to support environmental management activities. Proposals should address one or more of the following objectives: 1) Develop techniques for exploring multiple-scales and cross-media environmental data including, 1) Agent facilitated data queries of distributed data sources, methods for organizing standard metadata for fast queries, capabilities to handle legacy data, dynamic analysis of very large distributed archives of diverse multi-scale data useful for environmental decision making. 2) High performance data assimilation techniques supported by scalable parallel I/O systems to enable the integration of remote sensing data into predictive models to enhance the quality of model predictions. 3) Multivariate analysis and visualization techniques over three dimensional space and time and techniques for desktop virtual environments for analysis of time sequences of three dimensional environmental data. **Closing Date: 3/15/96.**

Contact: Chris Saint, 260-1093
(saint.chris@epamail.epa.gov)

Endocrine Disruptors

The objective of EPA's Endocrine Disruptor research program is to evaluate potential effects associated with endocrine disruptors and to determine the extent of current exposures. Investigator-initiated grant proposals are sought in four broad areas: 1) human health effects, 2) ecological health effects, 3) human exposure evaluations, and 4) ecological exposure evaluations. Examples of research topics of interest to EPA include: a) Refinement of methods to monitor and characterize exposure of humans and/or wildlife to endocrine disruptors, including aspects such as exposure half-life, speciation, uptake, and phase equilibrium. b) Development and validation of models to estimate exposure to endocrine disruptors from different sources via multiple pathways. c) Development and validation of biomarkers of endocrine disruptor exposure and effect. e) Development and validation of in vitro and short-term *in vivo* test systems to screen for chemicals with specific mechanisms of action expressed via different endocrine pathways; test systems that are applicable across multiple phylogenetic levels are of particular interest. f) Development of Physiologically-Based Pharmacokinetic (PB-PK), Physiologically-Based Toxicokinetic (PB-TK), and Biologically-Based Dose-Response (BBDR) models that incorporate key species-specific parameters critical to the extrapolation of effects across phyla. g) Refinement and validation of methods and models that relate effects observed at subcellular levels to adverse impacts in individuals (both human and wildlife species) and in wildlife populations.

Closing Date: 5/1/96.

Contact: Robert Menzer, 260-5779
(menzer.robert@epamail.epa.gov)

Role of Interindividual Variation in Human Susceptibility to Cancer

EPA is interested in: 1) the identification of human genetic polymorphisms which can affect carcinogenic risk from environmental agents, 2) the quantitative relationship of these polymorphisms to the risk of cancer from environmental agents, and 3) the distribution of such polymorphisms in the general population. Proposals should address human variation in susceptibility with regard to polymorphisms and a specific chemical carcinogen of concern to the Agency.

Closing Date: 5/1/96

Contact: David Reese, 260-7342
(reese.david@epamail.epa.gov)

Risk-Based Decisions for Contaminated Sediments

Sediments have become a focus of concern for EPA because of their potential adverse impacts, the long periods of time associated with natural assimilation of many in-place contaminants, and the high costs of mitigation. The following areas of research provide the framework for the competition:

Risk-Based Assessments

Hazard Identification: All assessment techniques, either biological or chemical, need validation of their ability to predict impacts on indigenous aquatic communities. When laboratory data and test systems are being used to predict contaminated sediment impacts, there needs to be a strong lab-to-field association. Research is needed to validate these techniques using a risk-based approach. Validation efforts must consider the uncertainty associated with the assessment and the degree of protection offered to the aquatic community. The effects of contaminants associated with sediments are often manifested through aquatic food chains. Research and mathematical modeling are needed to accurately characterize the transfer of toxic substances from their source to the sediments, from sediments to organisms, and from organism to organism.

Dose-Response: Short-term sediment toxicity test methods exist to examine aquatic life effects using laboratory animals. In addition, there are some theoretical models to predict whether certain single chemical concentrations will have an adverse impact on benthic communities. Most contaminated sediments contain mixtures of chemicals; thus, mixture toxicity research and modeling both for organic substances and trace metals are needed to complement single chemical assessments. Further research is needed to expand the number and kind of species being tested.

***Exposure Assessment*:** Knowledge of the fate and bioavailability of toxic substances in sediments is sometimes highly speculative. Additional knowledge is needed on: 1) the fate of toxic substances during resuspension, especially during severe events, and biological, chemical, and physical factors controlling resuspension of sediments; 2) the spatial (horizontal and vertical) and temporal extent of sediment contamination; and 3) biogeochemical partitioning between sediments, water, and biota to better predict bioavailability of chemicals believed to have adverse impacts.

Risk Management

Sediment Treatment: Contaminated sediments requiring treatment can result from either sediment management operations (e.g., maintenance dredging) or remediation efforts. The environmental risks associated with these sediments need to be reduced. For example, better methods to predict the extent to which dredging operations resuspend and transport contaminants to less contaminated areas are needed. Research is needed to develop innovative treatment options for sites with large volumes of contaminated sediment (e.g., harbors).

Closing Date: 5/1/96

Contact: David Reese, 260-7342
(reese.david@epamail.epa.gov)

Exploratory Research

This solicitation invites applications in two areas. ***Exploratory Research:*** Applicable areas are biology, chemistry, physics, human health, socioeconomic, and engineering (that are not covered in the specific areas described in earlier sections), with a focus on aspects of pollution identification, characterization, abatement, or control of the effects of pollutants on human and biological systems.

Early Career Research Awards: This program support outstanding scientists and engineers at the onset of their careers in

U.S. colleges, universities, and not-for-profit institutions.
Closing Date: 3/15/96.
Contact: Clyde Bishop, 260-5727
(bishop.clyde@epamail.epa.gov)

In cooperation with the National Science Foundation, the U.S. Department of Energy, and the Office of Naval Research, U.S. Navy, ORD has issued a joint requests for application on the following topic of mutual interest.

Bioremediation Research proposals are solicited that aim to further our understanding of the chemical, physical, and biological processes influencing the bioavailability and release of chemicals in soil under natural conditions, as well as the role of a chemical which when released from the soil and assimilated by a living organism, results 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. The emphasis in proposed research projects should be on the behavior of mixtures of chemicals. Interdisciplinary research is particularly encouraged. While studies on chemicals that may affect ecosystem and human health are desired, toxicological studies are not eligible. Similarly, studies involving pure cultures in the laboratory or bioreactors will not be reviewed. Laboratory studies must demonstrate applicability to field studies. A number of well-instrumented, characterized, and documented sites are available for field research.
Closing Date: 5/1/96.
Contact: Robert Menzer, 260-5779
(menzer.robert@epamail.epa.gov)

Under a partnership with the National Science Foundation, ORD has issued a joint requests for applications on the following topics of mutual interest.

Water and Watersheds This competition emphasizes multidisciplinary, fundamental research on important scientific, engineering, and socioeconomic principles for understanding, protecting, and restoring water resources and watershed processes in the U.S. and other regions of the world. A systems approach and general applicability of the research to watershed-scale questions are required in each proposal. Investigators are encouraged to bring together formerly disparate, state-of-the-art approaches to address watershed-scale issues and explore new paradigms that draw widely from different disciplines. Three overarching research components related to water and watersheds provide the framework for this competition. The degree to which these three components are integrated in a systems approach will be a review criterion. The most competitive proposals will be those that help integrate multiple goals of NSF and/or EPA programs and address questions that are comprehensive in scale and transferable in scope. Appropriate and innovative statistical methodologies and modeling are encouraged. Research that explores questions of spatial and temporal scaling is appropriate in the context of all components. The three overarching components are: 1) Ecological research that links diversity and vitality of aquatic biota and ecological processes, relationships among populations and communities of organisms, and landuse or other anthropogenic factors. 2) Hydrologic, biogeochemical, and engineering research that addresses the physical, chemical, and biological processes and mechanisms which govern the interactions of nutrients, metals, toxic materials, and organisms within and among surface waters, groundwaters, sediments, soils, and the atmosphere. 3) Social science research that develops a systemic perspective on, and predictive understanding of, the impacts and spatial aspects of human behavior and social and economic systems on surface and ground water resources and watersheds.
Closing Date: 5/7/96.
Contact: Barbara Levinson, 260-5983
(levinson.barbara@epamail.epa.gov)

Technology for a Sustainable Environment

This competition seeks research in three areas of pollution prevention: Chemistry; Engineering; and Measurement, Assessment, and Feedback Techniques. Goals of this area are to develop safer commercial substances and environmentally friendly chemicals and to develop novel engineering approaches for preventing or reducing pollution. The competition addresses technological environmental issues of design, synthesis, processing, and 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.

Description of possible projects
Chemistry for Pollution Prevention: The long-range goal of this program activity is to develop safer commercial substances and environmentally friendly chemical syntheses to reduce risks posed by existing practices. Pollution prevention has become the preferred strategy for reducing the risks posed by the manufacture, use, and disposal of commercial chemicals. A fundamental approach, a "green chemistry" approach, is to prevent pollution at its source, which includes: a) Design of alternative synthetic pathways for new or existing chemicals which do not utilize toxic reagents or solvents or do not produce toxic by-products or co-products. b) Design or redesign of useful chemicals and materials such that they are less toxic to health and the environment or safer with regard to accident potential. Appropriate areas of investigation include: chemical synthesis and catalysis; analysis and detection; separation processes; and reaction mechanisms.

Examples include: 1) Use of innovative methods such as catalysis and biocatalysis; photochemistry or biomimetic synthesis; and use of alternative starting materials which are innocuous or renewable. 2) Use of creative reaction conditions, such as using solvents which have a reduced impact on health and the environment or increasing reaction selectivity, thus reduc-

ing wastes and emissions.

Engineering for Pollution Prevention: The focus of this program activity is to develop novel engineering approaches for preventing or reducing pollution from industrial manufacturing activities, both for continuous and discrete processes. The scope includes: equipment and technology modifications, reformulation or redesign of products, substitution of alternative materials, and in-process changes. Although these methods are often thought of in relation to the chemical, biochemical, and materials process industries, they can be utilized in many other industries such as semiconductor manufacturing systems. Potential areas of research include: 1) Novel, cost-effective methods for the highly efficient in-process separation of useful materials from the components of the process waste stream, for example, field-enhanced and hybrid separation processes. 2) Materials substitutions and process alternatives which prevent or reduce environmental harm, such as change of raw material or the use of less hazardous solvents, organic coatings, and metal plating systems. 3) New bulk materials and coatings with durability, long life, and other desirable engineering properties that can be manufactured with reduced environmental impact. 4) Improved reactor, catalyst, or process design in order to increase product yield. Approaches might include novel reactors such as reactor-separation combinations that provide for product separation during the reaction, alternative energy sources for reaction initiation, and integrated process design and operation. 5) Development of environmental technologies that use physical processes to alter biologically refractory pollutants both known and potential into forms that are amenable to biodegradation. 6) New or improved manufacturing processes that reduce production of hazardous effluents at the source. Examples include: machining without the use of cutting fluids that currently require disposal after they are contaminated; eliminating toxic electroplating solutions by replacing them with ion or plasma-based dry plating techniques. 7) Improved manufacturing processes that employ novel thermal or fluid and/or multiphase/particulate systems resulting in significantly lower hazardous effluent production. Examples include: novel refrigeration cycles using safe and environmentally-benign working fluids to replace halogenated hydrocarbons hazardous to upper atmosphere ozone levels; improved automobile combustion process design for reduced pollutant production. 8) Optimization of process manufacturing operations to prevent, reduce, or eliminate waste. Concepts include: increased in-process or in-plant recycling and improved and intelligent process control and sensing capabilities; in-process techniques that minimize generation of pollutants in industrial waste incineration processes.

Measurement, Assessment, and Feedback Techniques for Pollution Prevention: This competition also encourages research in physical sciences and engineering that will lead to the development of novel measurement and assessment techniques for pollution prevention. Topics in this program activity include life cycle analysis, computational simulations, and process design algorithms for product life cycle analysis, as well as the development of appropriate measurement methods to use as input for such analyses. The methods developed should provide the basis for scientifically sound and quantitative comparisons of the environmental impact of various technologies. The following examples provide some areas of investigation: 1) Innovative, full scale, quantitative methodologies for conducting life cycle analysis which permit sound quantitative comparisons of impacts of different pollutants on different media. 2) Streamlined, targeted life cycle analysis and environmental product design methodologies and systems that can provide scientifically sound comparisons with less comprehensive data inputs and computational analysis. 3) Algorithms incorporating pollution prevention into process design, intelligent control, and simulation methodologies for process and manufacturing design. 4) Process simulator modules for new technologies such as novel membrane processes. 5) Improved and intelligent sensors and control algorithms for real time, in-process multivariate control of manufacturing equipment and systems to reduce waste material and hazardous emissions.

Closing Date: 5/7/96.

Contact: Stephen Lingle, 260-5748 (lingle.stephen@epamail.epa.gov)

Decision Making and Valuation for Environmental Policy

This competition is presented to advance research to help develop practical approaches to estimating economic and social benefits and costs that are systematic and credible. This competition is intended to support research projects in four areas: 1) benefits of environmental policies and programs; 2) costs of environmental polices and programs; 3) ecosystem protection; and 4) normative behaviors and environmental decision-making. Specifically:

Benefits of Environmental Policies and Programs: Environmental policies and programs are generally intended to protect or improve the health and well being of humans and the ecosystems vital to human welfare. Policies that enhance and protect the environment provide economic value and benefits to society. Currently, there are several approaches to measuring this value, including methods that rely predominantly upon either revealed or stated preferences for health and environmental goods and services. Improvements to existing methods and the development of new methods are encouraged. Examples of areas where government agencies have significant information needs in the environmental valuation area include: 1) Methods to improve estimation of values for reductions in mortality and morbidity risks resulting from pollution and other environmental hazards. Research on methods to address non-cancer health benefits is particularly encouraged. 2) Identification and improvement of methods for measuring environmental quality influences on human welfare, including those that recognize distributional factors in addition to efficiency. 3) Methods to apply existing benefit estimates or valuation functions to assess the benefits of a distinct, but similar environmental change (i.e., benefits transfer methods). 4) Improved methods for valuing changes in the environmental quality of public resources (e.g., groundwater) regulated by multiple laws. 5) Methods to assess the benefits of providing environmental

information to consumers, investors, and/or producers of goods and services.

Costs of Environmental Policies and Programs: This component of the competition seeks to strengthen the conceptual and empirical basis for cost estimation methods. Examples of topics of interest in this area are: 1) Integrated approaches to modeling production technology that includes both desirable outputs and potential wastes or pollutants, including conceptual and methodological research that captures life-cycle or legacy factors. 2) Methodology to estimate the cost savings from using economic incentives relative to other approaches to environmental pollution control. 3) Empirical research that compares estimated and realized costs for pollution prevention and abatement at levels of the plant, market, industry, and economy. 4) Improved methods to estimate and validate aggregate and sectoral costs of environmental protection programs including, for example, empirical analyses of system-wide and dynamic effects that capture plant location, productivity, and technological change.

***Ecosystem Valuation and Protection*:** Proposals should emphasize these interdependencies in their research and focus on how comprehensive or critical ecosystem changes can be measured in terms of social welfare. Examples of the topics of interest in this component include:
1) Core concepts of comprehensive ecosystem function, including research that characterizes and quantifies the natural environment and links measures of ecosystem productivity and sustainability with economic activities and changes in human welfare. Improved understanding of the economic-ecological relationships in areas such as wetlands, timber, watersheds, minerals, wildlife/fish, and grasslands are of particular interest. 2) Methods for valuing biodiversity, populations of native species, amounts of protected areas and open space, and other critical ecosystem attributes, including research that illuminates the interactive and synergistic role of these attributes and their economic and social implications. 3) Methods for defining the scope of ecosystem restoration that reflect the cost to restore the quality and service characteristics. 4) Methods for valuation, including research that identifies ecosystem functions of value to society and addresses issues of time, scale, and natural and political boundaries.

Normative Behaviors and Environmental Decision Making
Researchers are encouraged to identify and examine behavioral and institutional factors that influence the development, implementation, and evaluation of environmental policies. Research is expected to be theoretically and methodologically sophisticated and to contain an empirical component. Psychological attitudes, socio-cultural, legal, and ethical norms, economic forces, and political and communication activities, in isolation and altogether, affect the development and use of environmental policy. Better understanding of these factors and the ways in which they can improve or interfere with social negotiations about environmental issues is needed. Potential topics include, but are not limited to: 1) Identification and characterization of communities and the values and normative behaviors that influence their responses to new environmental information, proposed development plans and regulations, and of processes to involve communities in developing and assessing criteria for decision making about environmental and economic investments and problems. 2) Identification and analysis of social, political, and ethical factors relevant to environmental problem-solving in a trans-jurisdictional context, and effective mechanisms for addressing those factors. 3) Implications of geographical and political boundaries and personal, group, and organizational characteristics, behaviors, and attitudes for environmental problem solving. 4) Comparative analysis of different models of environmental decision making that emphasizes their descriptive, predictive, and prescriptive implications.
Closing Date: 5/7/96.
Contact: Gregory G. Ondich, 260-5753
(ondich.greg@epamail.epa.gov)

The complete packages for the abstracts listed here can be found on EPA's internet Home Page under "Grants." EPA internet address on the World Wide Web is **WWW.EPA.GOV**

More information can also be obtained by writing to:

U.S. Environmental Protection Agency
NCERQA - Grants Information
Mail Code 8701
401 M Street, SW
Washington, DC 20460