United States
Environmental Protection
Agency

EPA-600/8-80-041
June 1980

Research and Development

EPA

ORD '80

The Organization

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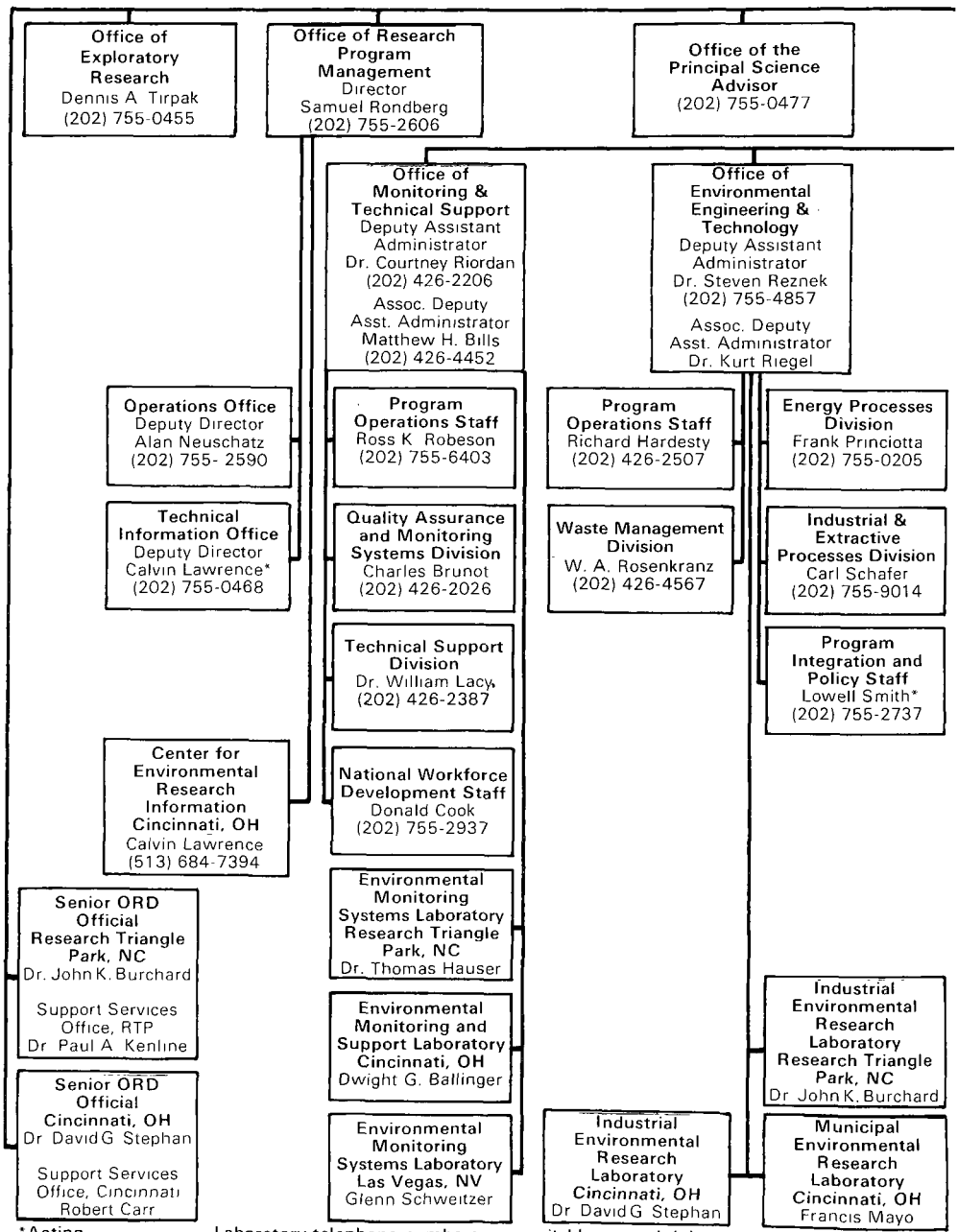
Introduction

ORD's Mission and Functions

The Environmental Protection Agency's Office of Research and Development supports the Agency's mission of protecting the environment and human health by providing a wide range of research and development support to the regulatory standard setting and enforcement functions of the agency.

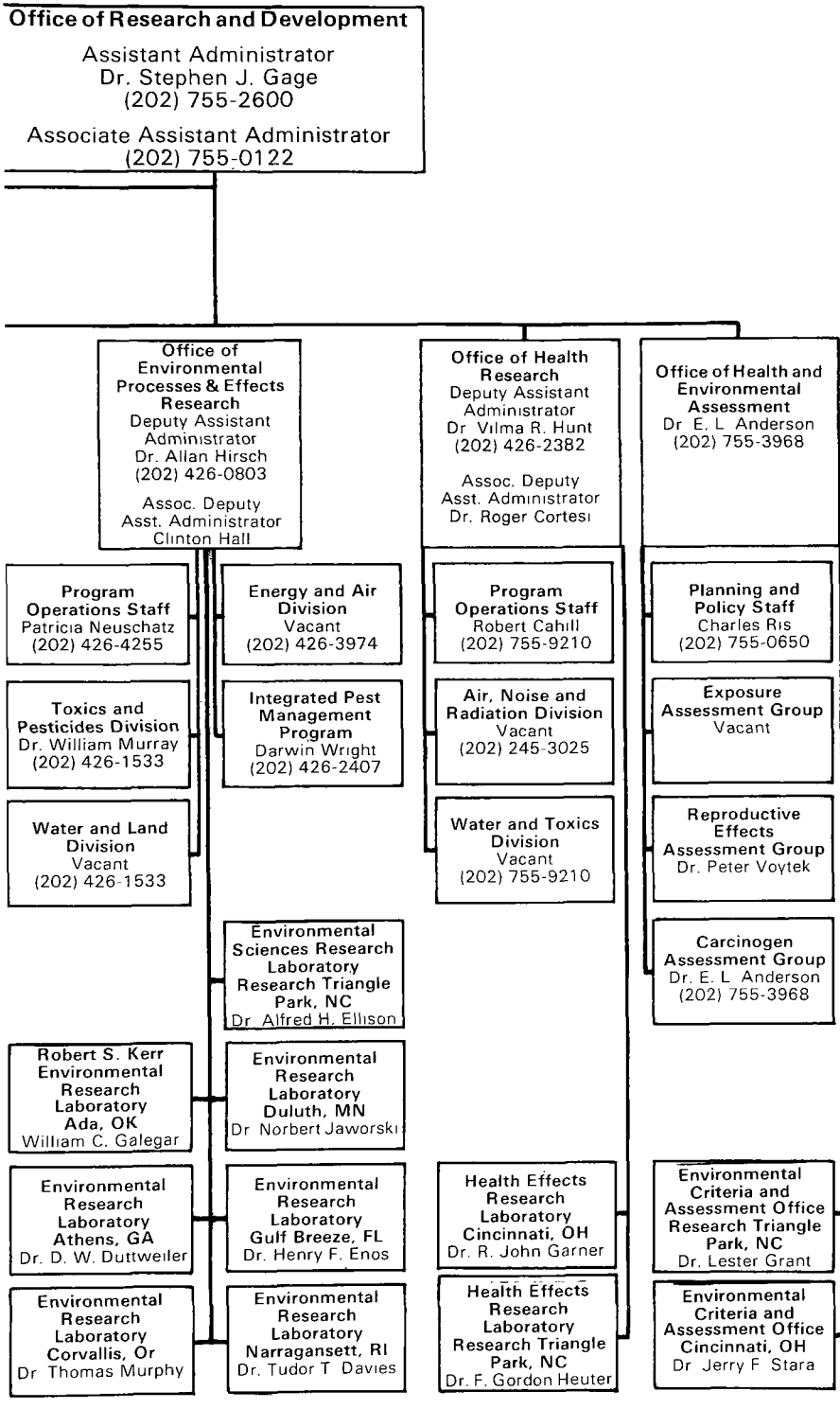
The research and development program provides:

- The scientific data and information needed to determine health and environmental criteria.
- The technological basis required to develop environmental control standards.
- Measurement methods and agency-wide quality assurance techniques for accurate and reliable quantification of environmental conditions for assessments, implementation and standards enforcement.
- Cost-effective pollution control technology alternatives and incentives for choosing environmentally sound options.
- Scientific, technical, socioeconomic and institutional approaches to balancing environmental management options in the context of competing national needs.



*Acting

Laboratory telephone numbers are available on each laboratory's organization chart.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Office of Environmental Processes & Effects Research
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Dr. William Murray
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Water and Land Division
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Energy and Air Division
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Charles Ris
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Reproductive Effects Assessment Group
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Dr Alfred H. Ellison
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Athens, GA
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Environmental Research Laboratory
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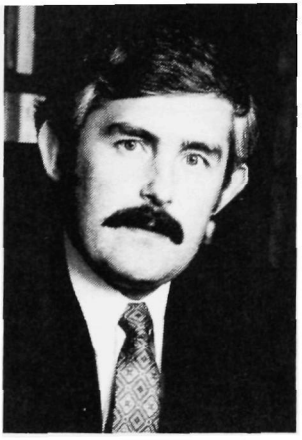


Stephen J. Gage — **Assistant Administrator for Research and Development—Washington, D.C.**

Education:
University of Nebraska, B.S., 1962
Purdue University, M.S., 1964
Purdue University, Ph.D. (Nuclear Engineering), 1966

Professional Experience:
Assistant Administrator for Research and Development, EPA, 1978-Present
Acting Assistant Administrator for Research and Development, EPA, 1977
Deputy Assistant Administrator for Energy, Minerals, and Industry, EPA, 1975-1977
Acting Director, Office of Energy Research, EPA, 1974-1975
Senior Staff Member for Energy Programs, Council on Environmental Quality, 1972-1974
White House Fellow, White House Office of Science and Technology, 1971-1973
Associate Professor, University of Texas, 1970-1971
Director, University Nuclear Reactor Laboratory, University of Texas, 1966-1970
Faculty, Engineering Department, University of Texas, 1965-1966

Professional Affiliations:
American Nuclear Society
American Society of Mechanical Engineers
American Association for the Advancement of Science

Honors:
Distinguished Engineering Alumnus, Purdue University, 1975
Outstanding Faculty Awards, Engineering Foundation, University of Texas, 1966, 1967, 1970

Key Participants in ORD Planning and Management

The management processes of the Office of Research and Development are designed to encourage the participation of many individuals. In this section the key participants in the ORD planning and management system are briefly introduced. The section moves from ORD itself to consider other participants and their influence on ORD planning and management.

Organization Structure

The Office of Research and Development is headed by the Assistant Administrator, whose function is to direct and coordinate all of the research activities of the office. This includes developing and implementing policy guidance and targets for planning, budgeting and controlling resources and activities. The Assistant Administrator reports directly to the EPA Administrator. He interprets the needs of ORD's clients and sets broad program goals and objectives to meet them, supporting these decisions with appropriate resource allocation and management control of operations. The Assistant Administrator receives technical guidance from the Office of the Principal Science Advisor and guidance on the administering of EPA's anticipatory and extramural grant research from the Office of Exploratory Research.

The Assistant Administrator is also supported by staff from the Office of Research Program Management (ORPM). The Operations Office of ORPM is responsible for coordinating long-range planning, the Budget, and the development of the Operating Plan, in addition to providing administrative services. The Regional Services staff acts as a link between ORD and the Agency's regional offices. The Technical Information Office serves as the communications policy and management information center for ORD.

The Assistant Administrator delegates more detailed objective setting, resource allocation and day-to-day control of operations both in headquarters and the field laboratories to the Deputy Assistant Administrators. They make recommendations to the Assistant Administrator on the long-range planning for their organizations, represent the Assistant Administrator in planning and resource allocation discussions for their organizations with their clients in other parts of the

Agency, provide planning and operating guidance to the laboratories, and make daily management decisions for their organization.

The field laboratories which conduct the research report to the Deputy Assistant Administrators. The Laboratory Directors represent the Deputy Assistant Administrators in day-to-day management of research programs, prepare budgets and operating plans for their laboratory, employ their technical knowledge in the various planning committees, and are responsible for the quality and timeliness of ORD's research products.

Agency Participation

Because the ORD program is designed primarily to support the EPA regulatory functions, ORD planning and management is influenced primarily by the planning and management of the rest of the Agency. ORD also plays a major role in conducting long-range research to look beyond the immediate concerns of the regulatory programs and to anticipate important future information needs.

At the top management level, the Assistant Administrator for ORD reports directly to the EPA Administrator. The Administrator is repsonsible for the development of Agency strategy, defining Agency policy, balancing the needs for increased emphasis in one program area versus another, and determining the appropriate allocation of abatement and control, enforcement, and research and development resources to each program area.

Reporting to the Administrator are five other Assistant Administrators, four of whom head the organizations charged with overall coordination of environmental regulatory development and enforcement of existing regulations in a specific area. These are: the Office of Water and Waste Management, the Office of Toxic Substances, the Office of Air, Noise, and Radiation, and the Office of Enforcement. Each of these Offices is further divided by broad program area, or *media* as they are known in EPA, such as Air, Solid Waste, etc. The Office of Air, Noise and Radiation thus has an organization corresponding to each of these media. The Office of Enforcement contains organizations corresponding to all the media. These organizations are known as Program Offices, and they are ORD's principal clients, playing a major role in defining the ORD research program to support their scientific and technical information requirements. The fifth Office reporting to the Administrator is the Office of Planning and Management (OPM), which is responsible for

coordinating all Agency planning, budgeting and reporting efforts and for maintaining an analytic capacity to undertake program reviews of all aspects of the Agency's performance. OPM also manages the Agency reporting system, which tracks the actual versus planned performance of all the principal Agency programs. The system includes planned ORD outputs and milestones.

Ten Regional Offices implement EPA policies on a local level and keep in close touch with local environmental conditions and governmental agencies. The Regional Offices participate in Agency planning both in the preparation of their own plans and budget and by reviewing Program Office and ORD budget proposals and in representation on various Agency planning committees. The Regions are EPA's front line. By monitoring the environments in their areas they help identify new research needs and opportunities. They are also the principal users of ORD technical support and work closely with the states in defining research needs.

The final Agency organization influencing research planning and management is the Science Advisory Board (SAB). Although formally a part of the Agency's organization, the SAB Committees are staffed primarily by outside consultants (academicians, researchers, industry representatives and environmentalists) whose function is to provide the Administrator with independent advice on issues relating to the scientific and technical approaches devised to address these problems and recommendations on the relative priorities among them.

Some 60 percent of the SAB's work is directly related to ORD. In some cases the SAB makes recommendations on specific aspects of the policies (for example, criteria documents) which affect the research program, while in others the SAB makes direct recommendations on aspects of ORD management.

Research Committees

The previous description has focused on the Agency's organization and ORD's participation in the Agency planning and management system. While that system has a substantial impact on research planning and management it does not define client needs or ORD responses in enough detail to form a controllable planning agreement between ORD and its clients. This is achieved by the Research Committee.

ORD is organized functionally to promote the internal operating efficiencies. The client's research needs,

however, are frequently multi-disciplinary, so that different parts of ORD may all be working on separate aspects of a research program for a particular Program Office. This requires considerable internal coordination. At the same time other Program Offices and ORD must make decisions on the mix of long-term anticipatory research and short-term research to meet regulatory needs of each program area, so that ORD can be responsive and provide a balanced research program. The research committee system was developed to address these needs for coordination and responsiveness and to create a stable environment for the conduct of research.

EPA Research Committees

Oxidants

This section describes the research and development program which falls within the purview of the Oxidants Research Committee. The Clean Air Act Amendments of 1977 mandated that EPA review and, where appropriate, revise the National Ambient Air Quality Standards and the criteria upon which they are based. The major goal of the Oxidants research program is to provide an updated data base to support the maintenance or revision of the Ambient Air Quality Standards for ozone, photochemical oxidants, nitrogen oxides, and carbon monoxide. To improve the data base for these pollutants, the Office of Research and Development's research activities in this area can be placed in the following categories:

1. animal toxicological, clinical and epidemiological studies to determine the health effects of these pollutants;

2. studies to detect, understand and predict the impact of these pollutants on terrestrial and aquatic biota;

3. studies on the transport and fate of these pollutants in the atmosphere;

4. research on the development of new instruments and methodologies;

5. research on hydrocarbon and nitrogen oxide control technologies.

Hazardous Air Pollutants

This section describes the research and development program which falls within the purview of the Hazardous Air Pollutants Research Committee. Thus far, ORD's research on hazardous air pollutants has focused on vinylchloride, benzene, mercury, cadmium, asbestos, and beryllium. However, EPA has recently developed and implemented an Airborne Carcinogen policy in an effort to systematically regulate and control hazardous air pollutants. Therefore, emphasis will be shifting from research on heavy metals to more research on organic chemicals that are suspected of being carcinogens.

The following represents ORD's major categories of research needs for hazardous air pollutants:

1. identification and characterization of potential carcinogens in the ambient air;

2. development of quantitative risk assessments;

3. development of control technology techniques;

4. characterization of non-carcinogenic health effects;

5. animal toxicological studies to determine the effects and pathways of exposure to hazardous air pollutants from fossil fuel facilities;

6. research to develop and validate field measurement technologies for hazardous air pollutants; and

7. research on the effects of indoor air pollutants.

Mobile Sources

The research program in the purview of the Mobile Sources Research Committee is described in this section. The goals of the program are to:

1. provide a health data base on effects from exposure to air pollutants from diesel vehicles;

2. assess the environmental impacts of advanced automotive power systems and pollution control devices; and

3. validate and standardize measurement systems for automotive pollutants.

Gases and Particles

This section describes the activities under the purview of the Gases and Particles Research Committee (GAPRC). The goals of the GAPRC research program are to:

1. provide a health data base on the effects of exposure to sulfur dioxide, lead, and particles in the inhalable size range;

2. provide information on the transport, fate, and environmental impacts of gaseous and particulate air pollutants;

3. develop improved technologies for the control of sulfur dioxide and particulate emissions;

4. develop, validate and standardize measurement systems for these pollutants;

5. provide an improved health data base on the effects of exposure to energy-related criteria and non-criteria pollutants;

6. describe the rate and character of primary emissions from fossil fuel production and their transport, transformation, deposition, and ecological effects;

7. develop measurement technology for routine monitoring of source and ambient levels of energy-related air pollution; and

8. develop and evaluate technologies to control aerosol and sulfur oxide emissions.

Water Quality

This section describes the research and development program for the Water Quality Research Committee. The goal of this research program is to provide sound scientific information and assessment methods necessary to support the development of water quality criteria and standards and cost-effective water quality management strategies, and to provide the health and environmental implications of increased development of water quality. The program also identifies impacts of oil and gas drilling and exploration operations on marine estuarine ecosystems.

The program focuses in particular on:

1. the development of a toxic substances data base and scientific assessments on which to set water quality criteria;

2. an evaluation of the impacts of non-point source pollution;

3. the development of watershed management tools;

4. a determination of the impacts of dredged material disposal, especially pertaining to wetlands;

5. an evaluation of lake control techniques; and

6. the development of the necessary monitoring methods and quality assurance to support these program areas. It also supports two regional ecosystem studies—i.e., an indepth assessment of pollutant stress on Chesapeake Bay and a

definition of optimum water quality management strategies for the Bay, as well as a characterization of pollution problems in the Great Lakes and the development of control strategies.

Municipal Wastewater and Spill Prevention

This section describes a portion of the research and development program which relates to the Municipal Wastewater and Spill Prevention Research Committee and is also of interest to the Solid Waste Research Committee. The goals of this program are to:

1. provide technical information on the design, operation, cost and performance relationships of municipal pollution control technology alternatives; and

2. provide technical information needed to prevent the accidental release of oil and hazardous materials to the environment and to mitigate the environmental effects of such a release.

The program focuses on:

1. municipal wastewater treatment, including innovative and alternative methods;

2. sludge processing, use and disposal;

3. control of toxics in Publicly Owned Treatment Works (POTW's);

4. control of oil and hazardous materials discharged to the environment.

5. control of wet weather pollution from combined sewers and urban stormwaters; and

6. improvement in the operation and reliability of POTW's.

Industrial Wastewater

This section describes the research and development programs for the Industrial Wastewater Research Committee. The goal of this research program is to provide sound technical information on cost-effective controls of industrial pollutant discharges.

Major areas of activity include:

1. characterization and assessment of industrial sources;

2. development, evaluation and demonstration of control methods;

3. development and demonstration of recycle/reuse systems; and

4. research pertaining to power plant effluents and mining activities.

Drinking Water

This section describes the research and development program in the purview of the Drinking Water Research Committee. The overall goal of the program focuses on providing safe supplies of drinking water in the U.S. More specifically, the program is aimed at identifying contaminants, determining the nature and extent of their health risks, insuring the development of treatment processes to minimize contaminants posing health risks, and insuring that reliable and accurate analytical methods are available for research, regulation development and compliance.

Subject areas of concern to the Drinking Water Research Committee are: organic contaminants; inorganic contaminants; microbiological contaminants; quality assurance; and groundwater, a major source of drinking water in this country.

Solid Waste

This section describes the research and development program for the Solid Waste Research Committee. The goal of the program is to provide the technical information needed to support sound solid and hazardous waste management strategies—from reduction in the generation of waste through recovery and/or disposal.

The program includes:

1. the characterization of hazardous wastes, including monitoring and quality assurance;

2. the development and testing of technologies to treat and contain hazardous wastes;

3. the assessment of risks associated with hazardous wastes; and

4. the development of a balanced program to manage non-hazardous wastes.

Pesticides

This section describes the research and development program within the purview of the Pesticides Research

Committee. The main goal of this portion of the program is to develop scientifically sound, legally defensible data required to support Agency Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) decisions and litigations on pesticides. These data are required on the major classes of pesticides now registered by EPA and in common use, as well as on chemicals considered as possible substitutes for cancelled pesticides.

The pesticides research program provides scientific data to support FIFRA activities by means of the Health Research, Environmental Processes and Effects Research, and Monitoring and Quality Assurance programs. In addition, this program provides resources for investigating biological methods for controlling pests, to be used as alternatives to or to be integrated with chemical pesticides for management of agricultural and urban pests (Integrated Pest Management), and Quality Assurance methods for tests and other protocols required for risk assessment. The program places emphasis on three basic elements necessary to evaluate overall human health and environmental hazards from pesticides:

1. identification of populations at risk;

2. assessment of exposures; and

3. determination of adverse effects.

Radiation

This section describes the research and development program which corresponds to the Radiation Research Committee. The major goal of EPA's multidisciplinary radiation research program is to provide data on the health effects of nonionizing radiation. This information is needed to support the development of an environmental radiofrequency radiation exposure guidance package to be issued by the Office of Radiation Programs. ORD's radiation program can be broken down into the following major research categories:

1. research on the health effects of nonionizing radiation;

2. off-site radiation safety and surveillance services for the Department of Energy (DOE) at and around the Nevada Test Site and at other test sites around the country; and

3. quality assurance for the radiation research program; and

4. technical assistance and support during nuclear emergency episodes.

Testing and Assessment

This section describes the research and development program within the purview of the Chemical Testing and Assessment Research Committee. The aim of this portion of the program is to provide accurate, scientifically rigorous, timely information to support decisions to regulate and control man-made toxic materials in the environment. The four overall goals which provide the framework for ORD's toxic substances research program are:

1. to provide specialized technical assistance to resolve complex problems;

2. to develop research capabilities to meet implementation timeframes for the Toxic Substances Control Act (TSCA);

3. to develop a comprehensive, long-range program to continuously refine test methods and assessment schemes; and

4. to build continuity and stability into the program to meet future challenges.

The research program supports TSCA activities by means of programs in Environmental Processes and Effects Research, Control Technology, Health Research, Monitoring Systems and Quality Assurance work, Stratospheric Modification Research, and a program at the National Center for Toxicological Research. Through these research programs, the toxic substances research program provides techniques for evaluating the human health and environmental hazards of toxic substances in support of sections 4, 5, and 10 of TSCA.

Energy

The major goal of EPA's Energy Research Committee is to provide information necessary to develop scientifically defensible policies that strike a balance between domestic energy production, reasonable cost and environmental quality. To achieve this objective EPA's energy program is divided into two major areas:

1. research on the health and environmental effects stemming from energy processes, and

2. research to develop cost-effective pollution control technologies. Over the next five years the

energy program will be responsible for developing information that supports the establishment and implementation of technology-based environmental guidelines and standards for pollutants associated with the commercialization of synthetic fuel facilities. Therefore, this program addresses multi-media environmental problems associated with the rapidly expanding synthetic fuels industry. It also contains EPA's research program on acid precipitation.

Office of Exploratory Research

Washington, D.C.

Mission

The Office of Exploratory Research (OER) is being established to improve ORD's overall capability to perform long-range research and analysis of emerging problems. The formation of OER will also result in an improvement in the quality of research and research results. Specifically, OER will:

- Serve as an organizational focal point for long-range research, the identification of emerging problems and environmental concerns, and for planning and program development of research in response to these concerns.

- Develop and implement a peer panel review system for all ORD grant applications to ensure those funded are of high scientific quality.

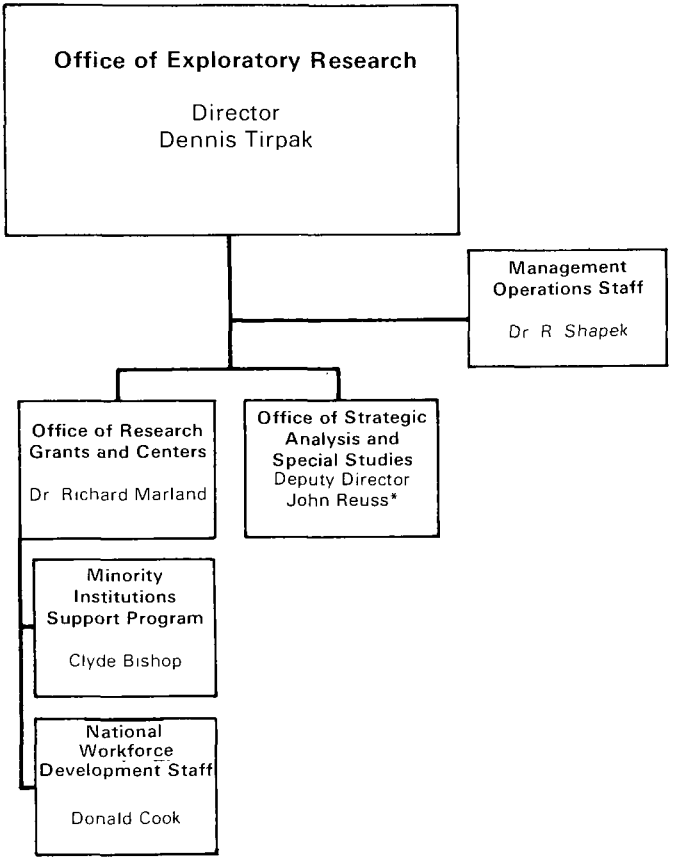
Dennis A. Tirpak — **Acting Director, Office of Exploratory Research, Office of Research and Development**

Education:
Catholic University, Washington, D.C., B.E., 1963
Catholic University, Washington, D.C., M.S., 1965
American University, Washington, D.C., 1971

Professional Experience:
Acting Director, Office of Exploratory Research, Environmental Protection Agency, 1979-Present
Director, Anticipatory Research Program, Environmental Protection Agency, 1978-1979
Special Assistant for Anticipatory Research to the Assistant Administrator for Research and Development, Environmental Protection Agency, 1977-1978
Presidential Interchange Executive, Aluminum Company of America, Pittsburgh, Pennsylvania, 1976-1977
Deputy Director for Planning and Review, Office of Research and Development, Environmental Protection Agency, 1975-1976
Program Manager/Senior Technical Advisor, Environmental Protection Agency, 1971-1975
Business Development Specialist, EG&G, Inc., Arlington, Virginia, 1969-1971
Program Manager, Hydrospace Research Corporation, Rockville, Maryland, 1965-1969

Professional Affiliations:
Sigma Xi
Water Pollution Control Federation
American Association for Advancement of Science

Honors:
Dean's List, Catholic University, Washington, D.C.
EPA Outstanding Performance Award (two times)



*Acting

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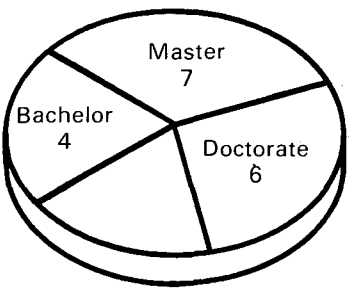
Commercial Telephone No. (202) 755-0455

Research Program Resources Summary ($1,000's)	FY 1979		FY 1980	
	In-House	Extramural	In-House	Extramural
	$937	$2,373	$1,222	$5,622

Personnel



Full-time EPA Personnel = 20

Recent Accomplishments

- *Exploratory Research Centers*—Three were established in FY 1979 and four more are being established in 1980.
- *Solicitation of Grant Applications*—Four peer review panels have been established and have met to review applications from throughout the country.
- *Minority Research Apprenticeship Program*—To be initiated by ORD laboratories in the summer of 1980. This program provides minority high school students attracted to science an opportunity to work in a laboratory with a scientific/technical mentor.
- *Acid Rain Program*—Published a joint US-Canada report on the long-range transport of air pollutants. The report indicated the effects of acid rain were more widespread than thought, and that Canadian sources were responsible for more than half the sulfur deposits within Canada's border. EPA is assisting the State Department in trying to negotiate an air pollution agreement with Canada.
- *Expansion of Monitoring Stations*—In conjunction with NOAA and the Department of Agriculture, EPA is providing quality assurance support and has developed a data management system.

- *Published Benefits Research*—An Interim report on the national health benefits of reduced air pollution and the overall benefits of such reductions in the Los Angeles Basin. This report suggests that the health benefits from cleaning up air pollution particles appear to be substantially greater than the costs of controlling all air pollutants from stationary sources, that aesthetic benefits (such as improved visibility) and reduced illness dominate air pollution benefits as opposed to previous emphasis on reduced mortality, and that many such economic benefits previously thought non-measurable can now be measured.

- *Environmental Outlook 1980*—Released in June 1980. The 1980 report is the first attempt to produce a comprehensive environmental overview. The report provides historical trends information on public opinion about environmental policy and forecasts future trends for a number of pollutants. The environmental implications of these trends are also discussed. In addition to societal trends, coverage includes chapters on air pollutants, drinking water, water resources, ocean pollution, solid and hazardous wastes, toxic substances, radiation, noise and energy and the environment.

Research Program

1. Office of Research Grants and Centers

- Center Support

  In fiscal year 1979, ORD initiated an Exploratory Research Centers Program which utilizes the expertise and resources of institutions and organizations, generally universities, to conduct long-term research. Research at these centers is directed toward anticipated future environmental problems and toward problems requiring further exploratory research.

- Grants Program

  In 1980, ORD is initiating a centralized exploratory grants program, characterized by nationwide solicitation for grant proposals and a subsequent peer review panel process. This new grants program responds to several studies and reports, raising concerns about the quality of EPA's research and development activities. EPA is soliciting nationally for proposals to encourage applications from an increased number of experienced researchers, especially those who have not previously

received EPA extramural research funding assistance. All applications are being evaluated by Peer Review Panels composed primarily of non-EPA scientists acknowledged as experts in their fields.

- Minority Institution Research Support (MIRS)

  The MIRS program promotes environmental research at minority institutions by identifying existing and potential environmental research capability within minority institutions and assisting these institutions in participating in EPA's research activities. The MIRS program awards contracts and grants to minority institutions in support of ORD research objectives.

- National Environmental Workforce

  The national workforce development program provides agency-wide coordination and management overview of the agency's environmental workforce development policies, program, and activities with other Federal agencies (Department of Labor, Department of Education, National Science Foundation and the Tennessee Valley Authority). Training and educational assistance programs have been developed to aid State and local environmental agencies in meeting their workforce needs.

2. Office of Strategic Analysis and Special Studies

The strategic analysis and special studies program consists of six major components: environmental forecasting and assessment; environmental benefits research; environmental indicators research; innovative research; acid rain research and cancer research.

- The environmental forecasting and assessment component is designed to identify potentially significant future environmental trends and contingencies and assess their public health, public welfare, and environmental policy implications.

- The environmental benefits research component develops and tests improved methods for determining the benefits of national and regional programs and representative regulations.

- The research on environmental indicators is directed toward development of bio-monitoring and other indicators for identifying and assessing trends, including trends in particular pollutants.

- The innovative research component is a competitive awards program which provides support for new ideas at the forefront of environmental research and analysis.

- Acid rain research is focused in the areas of monitoring, atmospheric processes, and effects, including: aquatic, terrestrial, drinking water and materials effects.

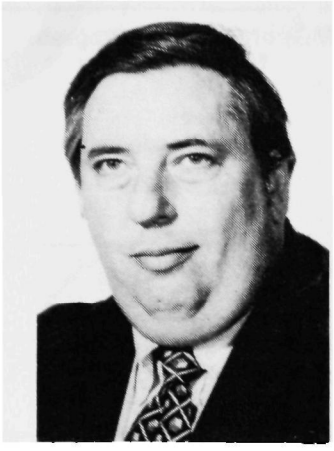
- The cancer research component is directed toward identifying and characterizing the ways in which human beings are exposed to carcinogens in the environment.

Office of Research Program Management

Washington, D.C.

Mission

Principal staff office to the Assistant Administrator on matters relating to budgeting, program planning/review/integration/coordination, technical information transfer, resource management, policy development and administrative operations; ORD focal point for the coordination and management of matters relating to the Agency Steering Committee and Science Advisory Board.

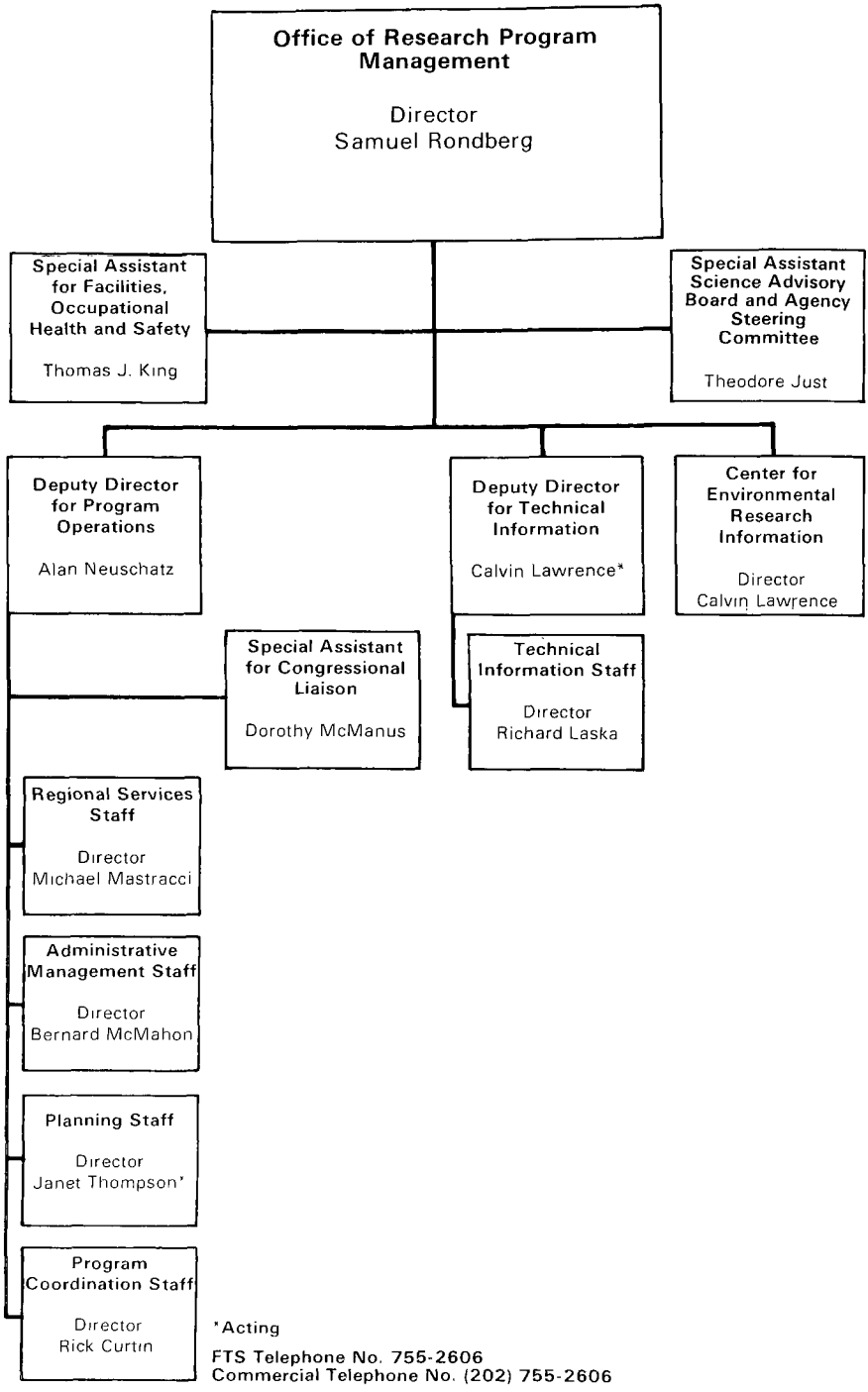


Samuel R. Rondberg **Director, Office of Research Program Management—Washington, D.C.**

Education:
Washington University, A.B., 1959
Washington University, Graduate School of Arts and Sciences, 1959-1963
Stanford University, Certificate in Systematic Analysis, 1968

Professional Experience:
Director, Office of Research Program Management, Office of Research and Development, EPA, April 1978-Present
Acting Director, Office of Planning and Review, Office of Research and Development, EPA, 1977-1978
Program Manager for Research and Development Review, Office of Planning and Management, EPA, 1974-1977
Project Manager, Office of Research and Development, Urban Mass Transportation Administration, Department of Transportation, 1970-1974
Assistant Director for Special Studies, Planning Service, Department of Medicine and Surgery, U.S. Veterans Administration, 1965-1970
Captain, U.S. Army (Commanding Officer, USAEFIS), Raleigh NC, 1963-1965
Research Associate, Washington University, 1962-1963
Intern, Washington University, School of Medicine, 1961-1962
Teaching Assistant, Washington University, 1960-1961

Honors:
EPA Commendation and Award, 1978
DOT Commendation and Award, 1972
Fellow in Systematic Analysis, Stanford University, 1967-1968

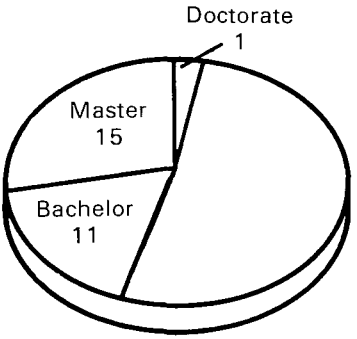


*Acting

FTS Telephone No. 755-2606
Commercial Telephone No. (202) 755-2606

Research Program Resources Summary ($1,000's)	FY 1979		FY 1980	
	In-House	Extramural	In-House	Extramural
	$1,872	$613	$2,756	

Personnel



Full-time EPA Personnel = 55

Program Areas

1. *Administrative Management Staff*—Provide adminstrative and financial-support services to the ORD Headquarters components; coordinate administrative matters for ORD field components. Establish administrative policies and procedures for ORD in amplification of, or in addition to Agency policies. Provide analyses of new or proposed legislation, Agency issuances, and other documents for impact on ORD and its program responsibilities. Coordinate administrative aspects of ORD foreign activities.

2. *Planning Staff*—Develop and administer the formal ORD planning, budgeting, reporting and review system. Included is the development of recommendations on ORD programs, e.g., identify and develop alternative program goals, priorities, objectives, and research plans Recommend resource targets and major objectives for the operating components of ORD. Allocate resources and develop and operate internal ORD fiscal and staffing controls. Serve as focal point in the annual Agency-wide ZBB activity.

3. *Program Coordination Staff*—Through the research committee systems coordinates preparation of ORD program plans and budgets within ORD and with other Agency, Program, and Regional Offices and external scientific and users' groups. Recommend and conduct reviews and evaluations of programs to determine

responsiveness to Agency strategies and ORD plans, including the development of appropriate criteria to measure program performance.

4. *Regional Services Staff*—Coordinate and review a comprehensive program to provide inter-communication and assistance on all matters of mutual interest and responsibility of the Agency's Regional Offices and ORD. These matters include: assistance to identify and develop Regional requirements for research, development and demonstration; assistance to obtain Regional needs for information on ORD programs and results; assurance of communication to each Region on on-going and proposed ORD activities in the Region; obtaining Regional assistance for ORD activities.

5. *Technical Information Office*—Plan, coordinate, and review a comprehensive program to:

   - disseminate and exchange scientific and technical information, including the transfer of technology;

   - provide technical expertise and management assistance in the foregoing area. Develop broad, long-range policy guidelines. Coordinate ORD information activities with other Agency components, the Federal Government, and the private sector. Review program plans and operations to assure compliance with information policies. Supervise development of plans for and track the usage of ADP resources throughout ORD. Develop and implement management information system within ORD.

6. *Center for Environmental Research Information*—See Section on Center for Environmental Research Information.

Office of Monitoring and Technical Support

Washington, D.C.

Mission

Provide ongoing support functions to the Agency's Program and Regional Offices. Specific activities are:

- Provide techniques, equipment and systems for the measurement and monitoring of environmental pollutants at sources, in ambients and in receptors.
- Develop methods, systems and materials for an Agency-wide monitoring data quality assurance program. Operate this program to quantitatively determine the confidence level of all monitoring data used by EPA to support its functions.
- Develop methods and devices for quantifying and monitoring the total exposure of receptors to environmental pollutants.
- Provide technical support for solving problems of the Agency Program and Regional offices.
- Promote development of a national environmental workforce in assisting states, localities and other employers to become self-sufficient in manpower for nationally mandated environmental programs.
- Operate the Agency's Minority Institutions Research Program to promote the participation of the Nation's minority institutions in environmental research and development.
- Coordinate the Agency-wide Mandatory Quality Assurance Program to assure known accuracy of environmental monitoring data.

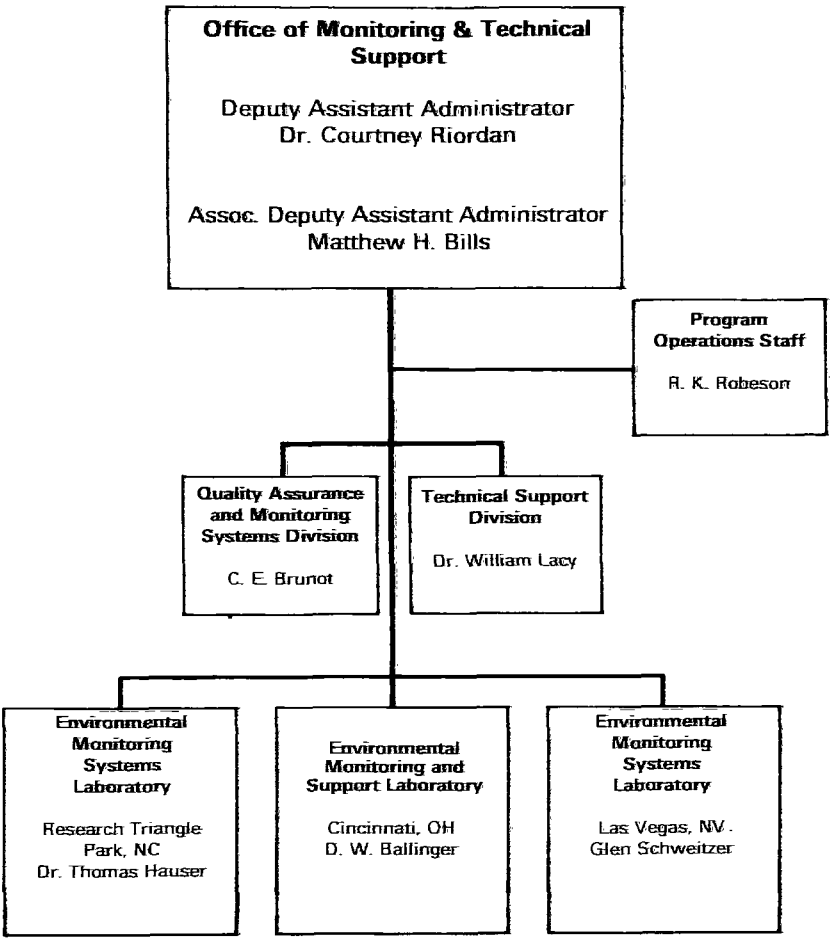
Courtney Riordan — **Deputy Assistant Administrator for Monitoring and Technical Support, Office of Research and Development—Washington, D.C.**

Education:
Northeastern University, BSCE, 1963
Cornell University, Ph.D., 1969
George Washington University, J.D., 1979

Professional Experience:
Deputy Assistant Administrator for Monitoring and Technical Support, ORD, EPA, 1979-Present
Associate Deputy Assistant Administrator for Environmental Processes and Effects Research, ORD, EPA, 1978-1979
Director, Media Quality Management Division, Office of Air, Land and Water Use, ORD, EPA, 1976-1978
Chief, Economic Evaluation Branch, Office of Radiation Programs, EPA, 1974-1976
Staff Engineer, Office of Technical Analysis, Office of Enforcement and General Counsel, EPA, 1973-1974; 1971-1972
Assistant Professor, Policy Planning and Regional Analysis, 1969-1971; 1972-1973
Instructor, Policy Planning and Regional Analysis, 1967-1969
Specialist Third Class, U.S. Army, 1955-1958

Professional Affiliations:
Water Pollution Control Federation
American Association for the Advancement of Science

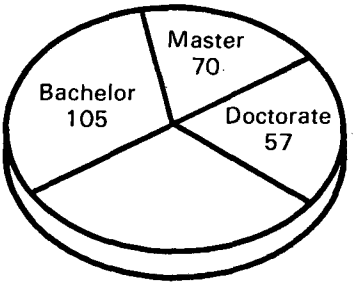
Honors: Tau Beta Pi, Phi Kappa Phi



FTS Telephone No. 426-2202
Commercial Telephone No. (202) 426-2202

Research Program Resources Summary ($1,000's)	FY 1979		FY 1980	
	In-House	Extramural	In-House	Extramural
	$16,464	$15,828	$15,830	$21,124

Personnel



Full-time EPA Personnel = 341

Research Program

The OMTS research program is implemented by the Environmental Monitoring and Support Laboratory located in Cincinnati, Ohio, and the Environmental Monitoring Systems Laboratories located in Research Triangle Park, North Carolina and Las Vegas, Nevada.

1. *Research*
   - *Development of Monitoring Measurement Systems*—Achieve total monitoring systems that are accurate, simple, standardized and cost-effective and that fulfill the operational environmental monitoring requirements of Federal, State and local governments and the private sector. Review monitoring methods and instruments. Evaluate performance of research prototypes, literature methods and commercial developments; adapt such methods and devices to field operating requirements. Conduct improvement research, development and engineering on deficient new concepts and advanced methods of pollutant measurement and monitoring for research and field applications. Specific activities include:

     — Improve criteria air pollutant standard reference methods and continuous air analyzers.

     — Develop field methods for monitoring non-criteria, hazardous air pollutants.

— Develop and demonstrate a national fine particulate monitoring network.

— Develop and demonstrate systems to support air health epidemiological studies.

— Develop, test and demonstrate methods for priority-list toxic pollutants in water, sediments and sludges.

— Develop methods for biological and microbiological monitoring, and for concentration and measurement of viruses in water.

— Develop automated laboratory management systems, computerized instrument operation and data handling.

— Design and optimize monitoring networks and systems.

— Develop aerial and remote pollutant sensing techniques.

— Develop methods and devices to quantify and monitor total exposure of receptors to pollutants, singly and in combination, in each media and integrated over all exposure transport pathways.

- *Quality Assurance Program*—Provide accurate and cost-effective total monitoring systems to include sampling techniques, analytical methods, and data management procedures; provide materials, guidelines and services to ensure that all environmental data based upon these techniques and procedures are statistically valid and legally defensible; and provide continuous review and evaluation of monitoring activities and programs. Specific activities are:

— Statistically validate and standardize total measurement systems (development of site selection criteria, auxiliary data taking, sample collection, and transport analysis of samples and data evaluation).

— Test, evaluate and certify equivalency of alternates to standard methods.

— Develop and distribute standard reference materials; prepare and distribute quality control guidelines and procedures.

— Evaluate monitoring activities (evaluation of facilities, equipment, operators, procedures and performance).

— Develop automated quality assurance systems (application of minicomputers to laboratory instruments, data screening, and statistical quality control).

— Develop and participate in Regional quality control workshops, conferences and seminars.

2. *Technical Support*

- *Technical Services to Agency Operating Programs*—Provide technical assistance, ORD expertise, facilities and equipment to ORD Agency Program and Regional Offices. Such assistance includes:

— Special capabilities in operating complex measurement and monitoring systems and analytical methods to obtain data for regulation development and enforcement.

— Assistance in monitoring system design and data analysis; conduct of field operations and instrument calibration.

— Expert testimony at hearings and legal proceedings.

— Development of criteria documents.

— Participation in standard setting and regulation development.

— Technical consultation and problem solving.

— Emergency services for evaluation and control actions regarding pollution emergencies and episodes; special aerial monitoring assistance for the oil spill prevention, compliance and control program.

— Demonstrate new technology or systems such as the ENVIRO-POD for an aerial monitoring capability at the regional, state and local level.

- *Operate the Agency Minority Institutions Research Support Program*—Promote enhancement of minority institutions capabilities for participation in National environmental research programs.

  — Identify special capabilities in minority institutions in disciplinary areas of EPA research interest.

  — Encourage and assist minority institutions in preparing research proposals.

  — Obtain shared support of proposals from ORD Offices and Laboratories.

  — Award research grants.

3. *Workforce Development and University Relations*

- National Workforce Development—Promote education, curriculum development, workforce planning, on-the-job training, employee licensing and certification, and related services to meet the needs of the non-federal workforce related to EPA programs. Specific activities include:

  — Establish, through a consensus process, Agency policies on workforce development.

  — Serve as liaison office for other Federal Agencies to sponsor environmental training.

  — Stimulate, encourage, and support greater cooperation at the state level between environmental agencies and institutions of higher education in developing the professional and technical environmental workforce.

4. *Mandatory Agency-Wide Quality Assurance*

- Coordinate an Agency-wide effort to assure accuracy and reproducibility of all environmental monitoring data.

  — Effect the establishment and use of reliable, cost-effective system for monitoring and measurements to obtain data of known quality.

— Provide quantitative estimates of the quality of all data supported or required by the Agency.

— Improve data quality where necessary and document the progress in achieving data quality.

Office of Environmental Engineering and Technology

Washington, D.C.

Mission

- Development and demonstration of cost-effective methods for control and management of operations with environmental impacts associated with the extraction, processing, conversion, and transportation of energy, minerals, and other resources; and with industrial processing and manufacturing facilities.

- Development and demonstration of cost-effective methods for the prevention or management of pollutant discharge or waste disposal into the environment from public sector activities, including publicly-owned wastewater and solid waste facilities.

- Improvement of drinking water supply and system operations including improved understanding of water supply technology and water supply criteria.

- Analysis of the relative environmental and socioeconomic impacts of energy, minerals, and other resource extraction, transportation, processing, conversion, and utilization systems, and of other industrial operations.

- Serve as the focal point within the Office of Research and Development for providing liaison with the rest of the Agency and with the Department of Energy on issues associated with energy development (excluding issues of research planning and implementation on the measurement, fate and effects of energy pollutants).

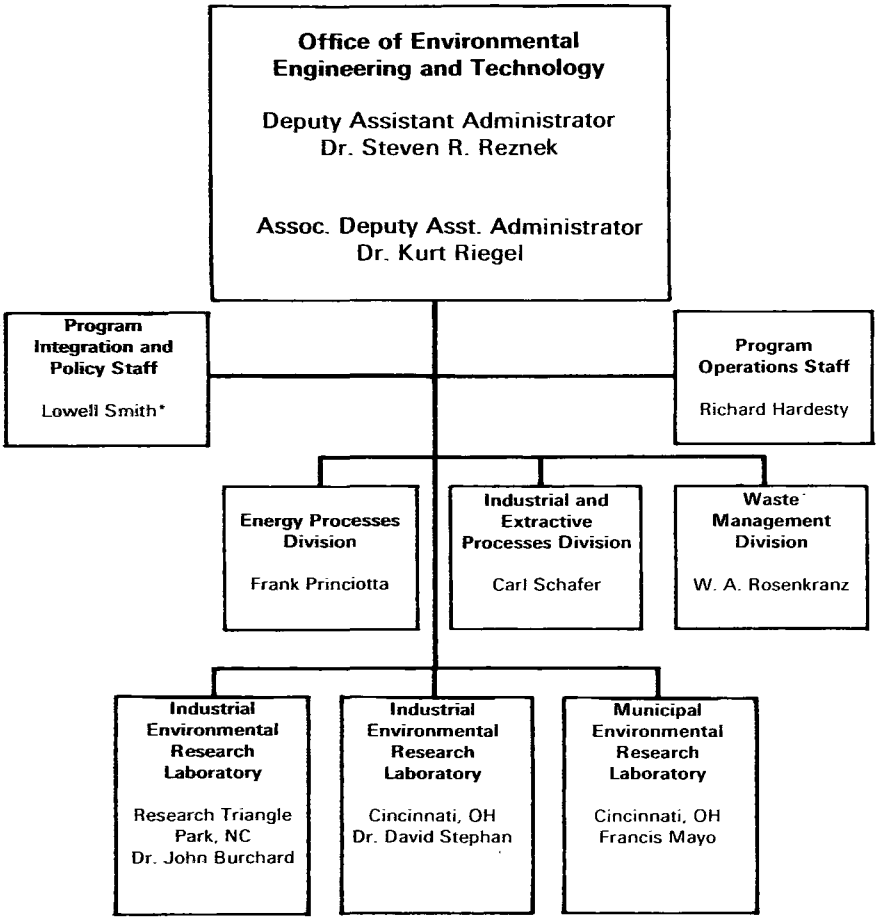
- Provide a focal point within the Office of Research and Development for liaison with the rest of the Agency on issues related to controlling pollution discharges.

Steven R. Reznek — **Deputy Assistant Administrator for Environmental Engineering and Technology**

Education:
Massachusetts Institute of Technology, B.S.
Massachusetts Institute of Technology, Ph.D. (Physics/Mathematics), 1967

Professional Experience:
Deputy Assistant Administrator for Environmental Engineering and Technology, Office of Research and Development, 1977-Present
Associate Deputy Assistant Administrator for Energy, Minerals, and Industry, Office of Research and Development, 1976-1977
Director, Program Coordination and Regional Studies, National Commission on Water Quality, 1974-1976
Researcher and Lecturer, Center for Environmental Studies, Princeton University, 1973-1974
Physicist, Environmental Protection Agency, 1971-1973
Research Assistant, University of Bristol, Bristol, England, 1969-1970
Technical University of Denmark Amanuensis with Professor Saermark, 1968-1969
Research Associate, MIT, Cambridge, Massachusetts, 1967-1968

Professional Affiliations:
Sigma Xi

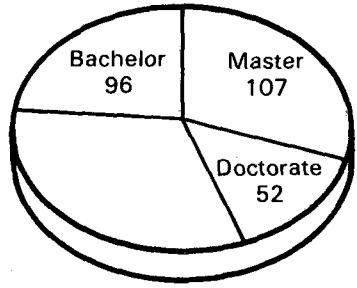


*Acting

FTS Telephone No. 755-4857
Commercial Telephone No. (202) 755-4857

Research Program Resources Summary ($1,000's)	FY 1979		FY 1980	
	In-House	Extramural	In-House	Extramural
	$18,304	$85,362	$18,951	$78,859

Personnel



Full-time EPA Personnel = 363

Recent Accomplishments

1. *Ohio River Basin Energy Study (ORBES)*—Completed power plant inventory, *Electrical Generating Inventory, 1976-1986: Illinois, Indiana, Kentucky, Ohio, Pennsylvania, and West Virginia,* to provide baseline information on electrical generating capacity in the region necessary in making plausible projections of energy facility development. Conducted a three-day symposium on the health effects of electric power generation covering general occupational health problems in coal and uranium mining, methodology; health problems in fossil-fuel power plants, transportation, transmission and nuclear development.

2. *Integrated Technology Assessment of Electric Utility Energy Systems*—Developed significant improvements in ability to analyze long-range transport of atmospheric pollutants across regional boundaries. Developed model for evaluating environmental and economic impacts of the growth of the electric utility industry (on both a national and a regional scale) as it would develop under alternative combinations of regulatory, economic and technological conditions.

3. *Non-Nuclear Energy R&D Review*—In late 1977, EPA was charged with the additional role of

conducting the Section 11 Public Hearing Review of the nation's non-nuclear energy R&D efforts. Named after Section 11 of the non-nuclear Energy R&D Act of 1974 (P.L. 93-577), responsibility for this review was transferred to EPA from the White House Council on Environmental Quality (CEQ) as a result of the President's Reorganization Plan in January of 1977.

In carrying out the Section 11 process, EPA conducts continuing reviews of the Federal non-nuclear energy R&D efforts to assure adequacy of attention to energy conservation and the environmental consequences of emerging energy technologies. A report of the 1979 review was published in December 1979.

Public participation in this process is included through a series of regional workshops and an annual hearing where a wide spectrum of interested parties—industry, environmental, public interest and private citizen—are welcome to testify and offer advice to federal energy research policy makers.

4. *Sewer System Evaluation, Rehabilitation and New Construction—A Manual of Practice*—Completed and published this manual, which has been proclaimed by professional societies and trade associations to be "...a significant contribution to the state-of-the-art and will become an invaluable reference for the operator or designer of sanitary sewer systems." Its benefits will be in cost reduction of construction and rehabilitation of sewers. This is of significance when it is considered that a given sewer system cost is usually several fold the cost of the associated treatment works.

5. *Landfill Leachate Pollutant Study*—Determined the nature and magnitude of landfill leachate pollutant attenuation by a variety of soils and clay minerals. Knowledge of the ability of natural soil and earth minerals to retard or prevent the movement of such substances as lead, cadmium, mercury and cyanide into groundwater is essential to the understanding of design and practice of

environmentally acceptable land disposal of solid wastes.

6. *Water Treatment Package Plants Cost-Effectiveness Field Study*—Results indicate that, with proper operation, package treatment plants can remove a wide range of contaminants. Two reports are being prepared. One deals with the results from the field data and is centered upon removal efficiency. The other is a detailed examination of the economics of the small utilities, their package plant system, and cost performance relationships.

7. *Interim Treatment Guide for Controlling Organic Contaminants in Drinking Water Using Granular Activated Carbon*—Distributed to Regional Offices and the water supply industry to assist in consideration of the proposed organics regulations.

8. *An Assessment of Ozone and Chlorine Dioxide Technologies for Treatment of Municipal Water Supplies*—Describes the state-of-the-art in Europe, Canada, and the United States.

9. *Alternative Fuels Group*—Established a series of working groups under this committee which is responsible for collecting and maintaining an information base upon which permits may be written for the emerging synthetic fuels industry.

10. *Background Information Documents*—Prepared a series of these documents which serve as the basis for the designation of waste streams as hazardous under RCRA regulations.

Research Program

The Program is implemented primarily by the Industrial Environmental Research Laboratories located in Research Triangle Park, North Carolina and Cincinnati, Ohio, by the Municipal Environmental Research Laboratory, Cincinnati, and by support from other ORD Laboratories.

1. *Energy—Extraction and Processing*

- *Fuel Processing.* Develop advanced fuel processing technologies by developing environmental assessments and technology as deemed necessary from an environmental point of view. Synthetic fuels (liquids and/or gases), coal cleaning, and fluidized bed combustion are three major fuel processes categories.

- *Extraction and Handling: Solid Fossil Fuels.* Assess potential impact from active and abandoned mining operations and fuel transportation. Develop control technology for extraction operations by demonstrating technical and economic feasibility of environmental control options. Provide environmental control criteria and manuals for use by regulators and industry.

- *Extraction and Handling: Oil and Gas.* Assess environmental impacts from active and potential production activities. Develop pollution control technology by demonstrating technical and economic feasibility of control options. Provide environmental control guidelines and manuals for use by regulators and industry.

2. *Energy—Conservation, Utilization and Technology Assessment*

- *Utility and Industrial Power.* Identify, characterize and assess pollutants; develop control technology for pollutants associated with electric utility and industrial stationary combustion sources. Provide technical basis for establishing environmental standards and guidelines for these sources.

- *Conservation and Advanced Systems.* Assess environmental impacts of energy conservation and advanced energy (solar, geothermal, etc.) technologies to assure consideration of environmental factors in their development.

- *Integrated Technology Assessment.* Identify alternatives acceptable for meeting national energy supply objectives, which assist in the selection of *optimum* policies for associated environmental quality goals. Integrate results of the environmental and energy research

programs and identify research gaps which must be addressed.

- *Environmental Assessment Interface.* Determine acceptability of environmental control systems and processes and whether additional economical control is necessary. Identify what pollutants are especially important to control. Make comparative assessments of systems/processes to determine which ones are environmentally preferable.

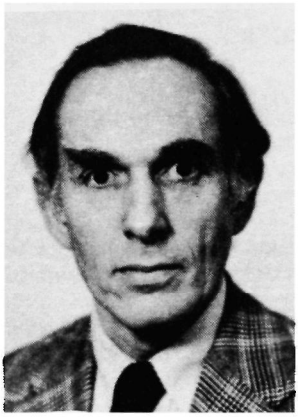
Office of Environmental Processes and Effects Research

Washington, D.C.

Mission

Develop the scientific and technological methods and data necessary to understand, predict, and manage the entry, movement, fate of pollutants into the environment and the food chain and their effects upon nonhuman organisms and ecosystems. Activities of this comprehensive program are to:

- Develop ecological data for establishing standards and criteria or guidelines for enviromental components in which specific pollutants or activities, including energy, may require control;
- Develop methods to determine and predict the fate, transport, and exposures resulting from the discharge of pollutants singly or in combination to the air, land, surface, marine, and groundwaters.
- Develop and demonstrate cost-effective methods and practices for the prevention or management of pollutant discharges or waste disposal activities which might impair the quality of the Nation's groundwaters;
- Develop statistical and mathematical models to describe the role of physical, chemical, and biological processes in linking source emissions to exposure.
- Develop new methods, equipment, and procedures for detecting, identifying, and measuring pollutants.
- Develop laboratory and field scale screening tests to provide data to predict the behavior of pollutants in terms of movement and effects in the environment and the food chain.
- Coordinate intra- and interagency research activities associated with the environmental aspects of energy extraction, processing, conversion and utilization.



Allan Hirsch **Deputy Assistant Administrator for Environmental Processes and Effects Research, Office of Research and Development—Washington, D.C.**

Education:
Michigan State University, B.S. (Zoology), 1950
Michigan State University, M.S. (Zoology), 1951
Canterbury University, New Zealand (Fulbright Scholar), 1956

Professional Experience:
Deputy Assistant Administrator for Environmental Processes and Effects Research, EPA, 1979-Present
Senior Ecologist and Chief, Office of Biological Services, U.S. Fish and Wildlife Service, 1974-1979
Director, Marine Environmental Protection Office, National Oceanic and Atmospheric Administration, 1972-1974
Director, Division of Program Development, and Division of Policy Planning, Office of Planning and Evaluation, EPA, 1971-1972
Assistant Commissioner, Federal Water Quality Administration, 1966-1971
Deputy Program Officer and Program Offices, Division of Water Supply and Pollution Control, U.S. Public Health Service, Washington, D.C., 1963-1966
Chief, Planning Branch, Division of Water Supply and Pollution Control, U.S. Public Health Service, Portland, Oregon, 1960-1963
Executive Secretary, Huron River Watershed Intergovernmental Committee, Ann Arbor, Michigan, 1959-1960
Lecturer, School of Natural Resources, University of Michigan, 1959-1960
Pollution Biologist, New Zealand Marine Department, 1957-1958

Aquatic Biologist, U.S. Public Health Service, Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio, 1951-1956

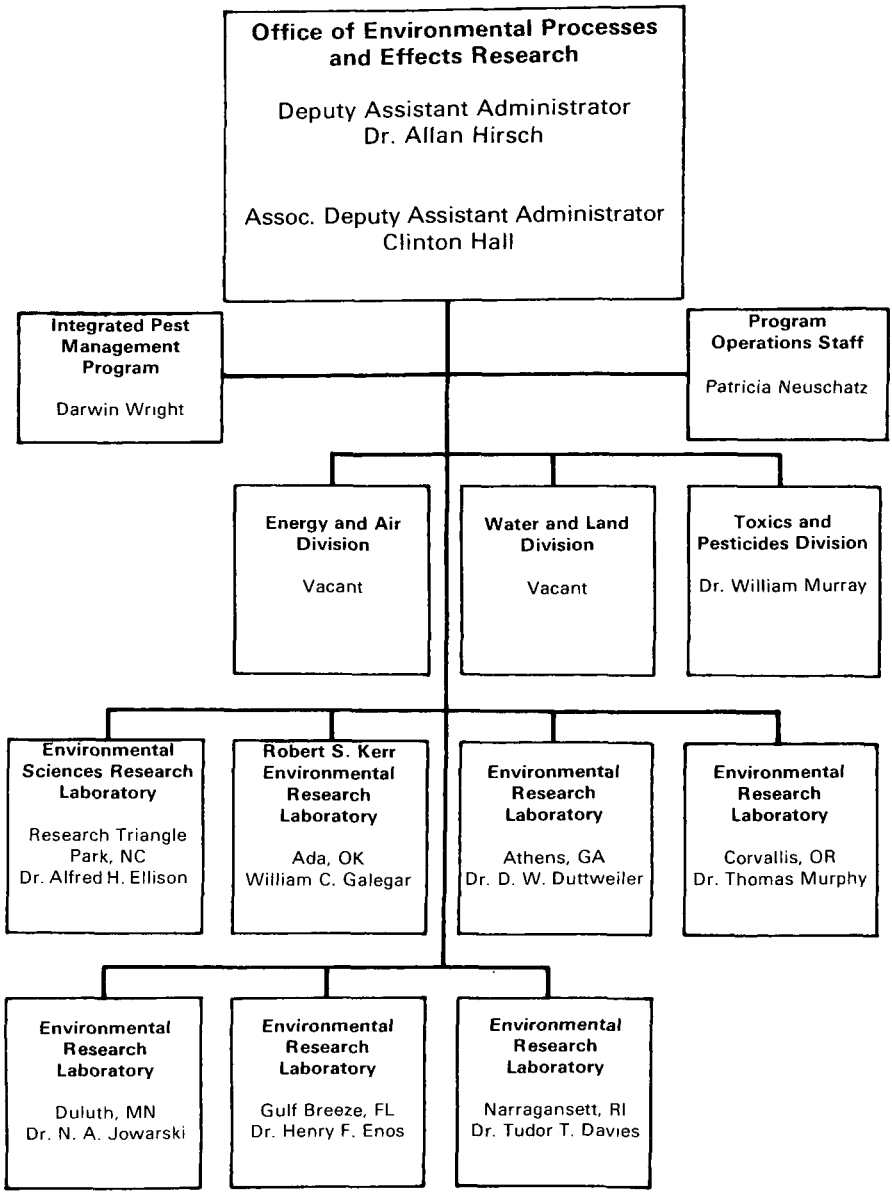
Honors: Presidential Commendation (for work in negotiating U.S. - Canada Great Lakes Water Quality Agreement), 1972

Department of the Interior Distinguished Service Award, 1968

Department of the Interior Meritorious Service Award, 1967

Phi Beta Kappa, Phi Kappa Phi, Sigma Xi, University of Michigan, 1960

Samuel Trask Dana Award in Conservation, University of Michigan, 1960

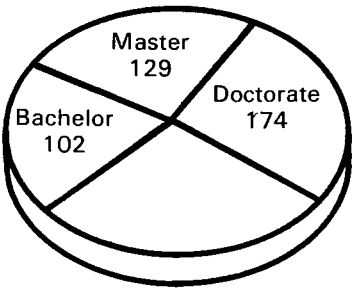


FTS Telephone No. 426-0803
Commercial Telephone No. (202) 426-0803

Research Program Resources Summary ($1,000's)

FY 1979		FY 1980	
In-House	Extramural	In-House	Extramural
$31,195	$78,864	$34,591	$82,962

Personnel



Full-time EPA Personnel = 557

Recent Accomplishments

1. *Conducted Smog Chamber Studies to Simulate Atmospheric Oxidation of Sulfur Dioxide to Sulfates*—Results from these studies suggest that the control of sulfur dioxide emissions will be more effective than the control of oxidant precursors (e.g., hydrocarbons) for ultimately controlling ambient sulfate levels.

2. *Conducted Field Studies on Sulfate Measurement Methodology*—Indicate good agreement between several wet chemical techniques and x-ray fluoresence analysis. This will encourage greater utilization of the x-ray fluoresence technique for more real time analysis of ambient particulate matter.

3. *Documented Evidence to Support More Restrictive SO_2 Secondary Air Quality Standards*—Research results show:

   - From naturally varying SO_2 exposures, significant losses in yield or death of onion and radish at median levels from 0.08 to 0.15 ppm SO_2.

   - From low level SO_2 exposures, threshold for significant effects on growth and symbiotic nitrogen fixation to be 0.02 ppm; at 0.06ppm they were reduced 50% and 40%, respectively.

- From typical rainfall acidities occurring and expected in the United States, significant effects on soil litter decomposition, nutrient cycling and plant growth of tulip poplar, radish and snap beans.

4. *Evaluated Advanced Thermal-Chemical Concepts for Improving the Value of Fuels and Other Products Derived from the Organic Fraction of Refuse*—A major accomplishment was the identification and laboratory verification of chemical embrittlement techniques for producing a fine-powered fuel from cellulose in refuse.

5. *Developed Formal Guidelines for Deriving Water Quality Criteria for Toxic Chemicals*—Published in the Federal Register as proposed Agency procedure.

6. *Established Functional Meso-Scale Ecological Effects Testing Facility*—Being used in studies of impact of petroleum hydrocarbons.

7. *Developed the First Linked Continuous Simulation Model for Stream-River-Lake Systems*—Incorporates both point and non-point sources and in-stream transport and transformation of pollutants.

8. *Developed Prototype Environmental Exposure Analysis Models and Laboratory Procedures*—For Predicting the pathways of potentially harmful chemicals in freshwater environments. Applied these procedures to 9 chemcials associated with fossil fuel combustion and to 2 agricultural pesticides.

Research Program

The OEPER Research Program is implemented by the OEPER Laboratories located at Research Triangle Park, North Carolina; Ada, Oklahoma; Athens, Georgia; Narragansett, Rhode Island; Gulf Breeze, Florida; Duluth, Minnesota; and Corvallis, Oregon.

1. *Air Quality*—Develop qualitative and quantitative methods for predicting and describing air quality from emission sources; determine atmospheric effects due to air pollutants as well as effects on the structure and function of ecosystems, such as forests and crops; determine exhaust products from mobile sources; develop methods for gaseous and particulate pollutants in ambient air and stationary and mobile source emissions.

2. *Drinking Water*—Develop techniques for evaluating water quality and the movement of pollutants in the underground environment, and determine impacts on ground water from specific pollutant source categories.

3. *Water Quality*—Identify, characterize and quantify pollutants, including development of measurement techniques; research the transport and transformation of pollutants in water; and determine the toxicological effects of water pollutants on aquatic organisms, both fresh and marine.

4. *Pesticides*—Develop and demonstrate integrated pest management strategies to reduce usage and runoff of agricultural chemical pesticides. Study the ecological effects of pesticides to aid in the registration of pest control agents and in the formulation of policies involving the registration process.

5. *Toxic Substances*—Develop test methods and evaluate models to assess the transport, transformation and fate of toxic substances released into the environment; develop systematic procedures to identify and quantify new substances introduced into the environment; analyze products for contaminants, conformity with labeling and other TSCA requirements; develop rapid, reliable and economic procedures for screening chemical substances and mixtures for predicting adverse effects of the exposure of animal species to toxicants.

6. *Energy*—Determine qualitative and quantitative effects of energy-related agents on human health; determine toxicological effects on freshwater and terrestrial organisms and resultant ecosystem impacts from pollutants released from energy extraction, conversion, and use; determine origins, loads, transport pathways, transfer rates, and fates for pollutants released to the aquatic environment; develop monitoring techniques and methods to determine on a regional basis significant levels and cause/effect relationships between energy-related pollution and media quality; and provide measurement methods and analytical techniques for known and anticipated environmental pollutants from expanding and emerging energy technologies.

Office of Health Research

Washington, D.C.

Mission

Provide the planning, implementation and evaluation of a comprehensive, integrated human health research program to determine human exposure to and effects of combinations of pollutants derived from various environmental pathways. Primary objective of the program is to predict, measure and determine the significance of human exposures to pollutants in order to prevent or reduce adverse effects.

Activities seek to:

- Develop information on acute and chronic adverse effects to humans from environmental exposure to pollutants.
- Determine those environmental exposures which have a potentially adverse effect on humans.
- Coordinate the development of test systems and associated methods and protocols, such as predictive models to determine similarities and differences among test organisms and humans.
- Develop methodology for, and conduct of, laboratory research and field population effects research studies.
- Coordinate ORD human carcinogen, mutagen, and teratogen research.
- Develop interagency programs which effectively use existing capabilities to address the public health impact of environmental pollutants.

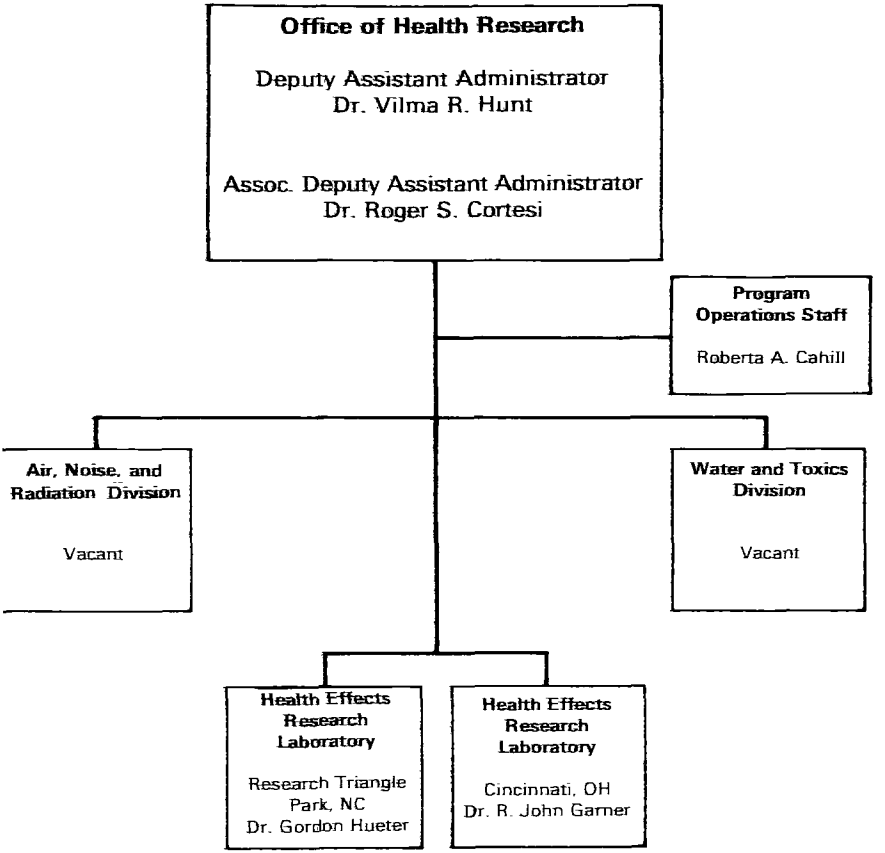
Vilma R. Hunt — **Deputy Assistant Administrator for Health Research, Office of Research and Development—Washington, D.C.**

Education:
University of Sydney, Australia, B.D.S., 1950
Radcliffe College, Harvard University, A.M., 1956
Argonne National Laboratory, 1963

Professional Experience:
Deputy Assistant Administrator for Health Research, 1979-Present
Environmental Scientist, Science Advisory Board, EPA (on leave from Pennsylvania State University), 1978-1979
Associate Professor of Environmental Health, Pennsylvania State University, 1972-1979
Assistant Professor of Environmental Health, Pennsylvania State University, 1969-1972
Assistant Professor of Environmental Health, Yale University School of Medicine, Department of Epidemiology and Public Health, 1967-1969
Assistant Fellow (Physiology), John B. Pierce Foundation Laboratory, 1966-1967
Research Associate (Physiology), Harvard School of Public Health, 1963-1966
Research Fellow (Physiology), Harvard School of Public Health, 1962-1963
Scholar, Radcliffe Institute for Independent Study, 1961-1963
Instructor, Endicott Junior College, Beverly, Massachusetts, 1955-1956
Intern, Forsyth Dental Infirmary, Boston, Massachusetts, 1952-1953
Junior Dental Officer, Department of Health, New Zealand, Private Practice of Dentistry, 1951-1952

Professional Affiliations: American Association of Physical Anthropologists
Radiation Research Society
American Public Health Association
Health Physics Society
Sigma Xi

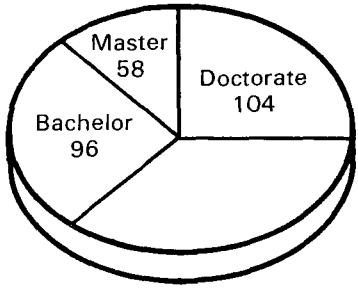
Honors: Phi Beta Kappa (honoris causa) - 50th Anniversary of Iota Chapter, Radcliffe College (1964)



FTS Telephone No. 426-2382
Commercial Telephone No. (202) 426-2382

Research Program Resources Summary ($1,000's)	FY 1979		FY 1980	
	In-House	Extramural	In-House	Extramural
	$20,167	$25,533	$28,129	$43,133

Personnel



Full-time EPA Personnel - 407

Recent Accomplishments

- *Second Annual Report to Congress on Environmental Pollution and Cancer and Heart and Lung Diseases*—Prepared under the guidance of an interagency task force for the purpose of recommending and coordinating federal programs concerned with the reduction of such diseases.

- Toxicity Appraisal of Chemicals in the Kin-Buc Landfill, *Edison, New Jersey*—For use by EPA and the Department of Justice in preparing the complaint which was filed.

- *Public Health Initiative—1980*—Documented the history, purpose, content, expected outputs and resources associated with the Public Health Initiative implemented in FY 1980.

- *Published a Summary of a Two-Day Workshop on Environmental Needs of Health Professionals*—Conducted to identify and develop strategies for improving the capability of health professionals to assist in effective prevention of environmentally related diseases.

- *Environmental and Public Health Problems Seminar*—Co-sponsored with Region II and the American Medical Association to focus attention on these problems and to encourage cooperative efforts to respond to these problems on Federal, State and local levels.

Research Program

The OHR Research Program is implemented by the environmental health laboratories located in Research Triangle Park, North Carolina, and Cincinnati, Ohio. The research focuses on the potential adverse health effects arising from: pollutants emitted into the atmosphere; pollutants discharged into water which effect water quality in general and drinking water specifically; from pesticides and other toxic substances; from non-ionizing electromagnetic (microwave) radiation; from energy-related operations; and from emerging interdisciplinary problems. In Fiscal Year 1980 the health-related air, drinking water, toxic substances and radiation programs were expanded to include a public health initiative. The overall theme of the initiative is the systematic, integrated approach to bridge the several media through which human beings are exposed to pollutants. The approach employs the full range of environmental disciplines to predict, measure and assay exposure; to determine the impact and significance of true exposures on human health; and to develop strategies which prevent, interdict or reduce the detrimental effects.

1. *Air*

Program consists of three components:

- Transportation Sources—The research in this program element is planned with guidance from the Mobile Sources Research Committee. Emissions are analyzed from mobile sources to provide health effects information for decisions on certification of gasoline and diesel vehicles. Emphasis is on diesel engines with studies underway to determine the extent to which exhaust is carcinogenic. A series of studies is investigating total diesel emissions, single identified diesel emission components and emission products from new catalyst control systems. These studies include whole animal inhalation studies that expose normal and specifically developed sensitive strains of rodents to diesel exhaust to determine whether tumors develop. Non-carcinogenicity studies with whole animals focus on the identification of chronic obstructive lung disease and neuro-behavioral effects. Epidemiological studies will determine morbidity and mortality effects of diesel emissions. *In vitro* screening tests are utilized to help characterize emissions and to identify hazardous biological activity. In conjunction with *in vivo* tests, components of diesel emissions are being analyzed and their health effects characterized.

- Criteria Pollutants—The research in this program element is planned with guidance from the Oxidants Research Committee. Conduct studies on ozone, other photochemical oxidants, nitrogen oxides, and carbon monoxide. Results of these studies provide information for evaluating the adequacy of existing Ambient Air Quality Criteria (AAQC) and provide a scientific basis for improvements to the AAQC. The 1977 Clean Air Act, as amended, requires that these standards be reviewed at five-year intervals. Animal toxicology and controlled human exposure (clinical) studies assess the adverse health responses associated with exposure to one or more pollutants. The human studies focus on effects resulting from exposure to ozone at levels near ambient (polluted) levels and sulfur dioxide. Similar studies are being performed on the effects of exposure to nitrogen oxides. The animal studies employ various combinations of these pollutants and various exposure times to identify additive or synergistic effects on the respiratory system. Clinical studies address the effects of short-term exposure to the same pollutants on health volunteers and on those in whom asthma-like respiratory airway reactivity has been simulated pharmacologically.

- Non-Criteria Pollutants—Planned under the guidance of the Gases and Particles and the Hazardous Air Pollutants Research Committees. Studies are conducted on sulfur oxides and airborne particulate species including sulfates and lead, and on other hazardous airborne substances. The research will determine how particulate pollutants should be controlled in order to protect human health. Major activities are epidemiological, *in vivo* and *in vitro* animal toxicological, and human clinical studies. This research characterizes both acute and chronic effects of exposure to the particulate air pollutants. Specifically, the studies are to determine the relationship of particulate size and composition to observed adverse health effects, and to evaluate the possible additive/synergistic effects following exposure to combinations of particulates and gases. Research is being conducted on hazardous air pollutants to determine how those pollutants should be regulated under the Agency's Carcinogen Policy as well as in

consideration of other toxic effects. Testing will consist of cellular bioassays to whole animal tests to epidemiologic studies which contribute health effects data to risk assessments and regulations for these hazardous substances.

2. *Water Quality*

Program covers three general areas of research planned under guidance of three research committees which are the Municipal Wastewater and Spill Prevention, Water Quality, and Industrial Wastewater Research Committees, respectively:

- Wastewater and Sludge—Determine the health implications of existing and innovative technology for the treatment, disposal, and agricultural utilization of wastewater and sludge. Specific activities include: epidemiologic studies to determine the health effects of aerosols from conventional wastewater treatment plants; toxicologic and epidemiologic studies to evaluate potential health effects of exposure to pathogens and metals in wastewater and sludge applied to agricultural land; and epidemiological studies to evaluate population exposure to pathogens, persistent organics, and trace metals from spraying wastewater and sludge on land.

- Recreational Waters—Provide health effects data to establish water quality criteria. Significant activities include epidemiological and microbiological studies at freshwater beaches to associate pollutant-related health effects to microbiological water quality indicators and development of recreational water quality criteria for freshwater.

- Wastewater Reuse—Develop the health effects data base to set criteria for the safe reuse of wastewaters for potable and industrial purposes. This research is coordinated with the potable reuse research in the drinking water health effects program. Related activities include several toxicological and epidemiological studies of the impact of wastewater reuse.

3. *Drinking Water*

The Drinking Water Program is planned under the guidance of the Drinking Water Research

Committee and places highest priority on organic contaminants, with the major emphasis on carcinogenic effects:

- Results from mutagenic screening tests performed in 1978 raised questions about water supply sources traditionally considered *clean*. Based on those results a series of tests are used to determine if the mutagenic effects can be eliminated through water treatment. Organic sample concentrates prepared from drinking water from representative American cities are analyzed chemically, and screened for mutagenic activity to identify potentially carcinogenic groups of compounds.

- The toxicity of reaction products resulting from chlorination and the use of proposed alternative disinfectants are being bioassayed both in whole animal and bioassay screening tests. Epidemiological studies on the effects of disinfectants, i.e., chlorine dioxide, are undertaken when found feasible after completion of toxicological studies.

- For microbiological contaminants, the health research program includes technical assistance for the investigation of waterborne diseases. Waterborne outbreaks of infectious diseases are investigated in cooperation with the Center for Disease Control with the objective of identifying the causative organisms in water, determining the route of entry, and recommending corrective action to prevent recurrence. Work also continues on improving methods to identify viruses associated with waterborne diseases.

- An expanded program is studying the feasibility of developing criteria for the potable reuse of wastewater. Toxicity screening tests of organic concentrates from different advanced wastewater treatment plant effluents are underway and inorganic constituents are being identified. More elaborate toxicity testing is being conducted on contaminants for which little health information is available.

- Scientific evidence indicates that asbestos, when inhaled, can cause cancer and asbestosis. Research on asbestos in drinking water is concerned with assessing human exposure to asbestos from the use of asbestos-

cement pipe for distribution of drinking water. Toxicological and epidemiological studies are being conducted to determine the health effects from ingestion of asbestos fibers.

4. *Toxic Substances*

This research is planned under the guidance of the Chemical Testing and Evaluation Research Committee. Major emphasis is being placed on:

- The selection and validation of known techniques for screening broad ranges of chemical types and large numbers of individual chemical substances so that functional testing protocols for carcinogenic, mutagenic, neurotoxic and other toxicological effects can be developed.

- Long-term low-dose research is correlating environmental and ambient levels of pollutants and measured routes of exposure with tumor induction and other health effects. In addition, epidemiological studies evaluate and confirm the significance of toxic effects in animals as related to health effects in human populations. Emphasis in these studies includes human reproductive effects. Research is also ascertaining effects of human activities on stratospheric ozone, the impacts of changes in stratospheric ozone content on health and welfare, and methods and costs of controlling such changes.

5. *Radiation*

This research is planned by the Radiation Research Committee:

- Investigations are continuing on the health effects of non-ionizing radiation from environmental sources such as television, radio, and radar transmissions. Emphasis is on chronic, low-level exposures using low power densities in the range of 5-10 microwatts per square centimeter. Results from these studies are for establishing protective guidelines for environmental levels of such radiation. Specific activities include: determination of the health effects on neurophysiology, behavior, teratology, immunology, and carcinogenicity after exposure to environmentally occurring electromagnetic radiation; definition of absorption frequencies

of electromagnetic radiation in biological systems; and identification of mechanisms of interaction, including frequency dependence and power densities.

6. *Pesticides*

This research is planned by the Pesticides Research Committee. It includes tests carried out under actual field conditions to estimate human exposure; and effects studies utilizing selected animal models to predict possible human health effects from pesticide chemicals:

- New methodologies are developed and validated to accumulate pesticide exposure data for use in determining pesticide registration standards. Studies are also undertaken to determine the feasibility of extrapolating human pesticide exposure data between compounds and between different exposure situations to aid in the development of regulatory testing requirements.
- Major classes of chemical pesticides now registered are retested to determine health effects. In addition, the health effects of selected biological pest control agents are evaluated with emphasis on the study of insect viruses. Animal and cell culture methods for assessing the potentially mutagenic and carcinogenic effects of pesticides are refined, developed, and validated.
- The scope of analytical chemical methods includes detecting, measuring and evaluating more pesticides in a broad variety of human tissues and environmental media. Emphasis is placed on the detection of metabolites in human and animal tissues, excreta, air and other environmental media. Analytical methods needed in exposure measurement procedures are given priority.

7. *Energy*

Research in this area is planned by the Energy Research Committee. It includes animal toxicological and human clinical and epidemiological studies; and the development and use of rapid and sensitive bioscreening methodologies to improve the ability to estimate the long-term adverse health impacts of energy-related pollutants.

- Epidemiological studies are performed where general populations are exposed to elevated levels of photochemical oxidants and other air pollutants as well as where short-term high-level exposures to SO_2 and particulates are observed. Other epidemiological studies are concerned with populations exposed to waterborne agents from fossil fuel energy production or use.

- Clinical studies with human subjects address the effects of exposures to sulfates and sulfuric acid mists, ozone, and NO_2.

- Relative health assessment studies are performed for new energy technologies such as fluidized bed combustion with reference to conventional coal combustion.

- Assay procedures which complement liver *enzyme island assay* methodologies are developed. This includes development of screening methods using various organ components and analyses of samples derived from fossil fuel production and utilization sources.

- Proposed methods for recovering and concentrating trace quantities of waterborne energy-related pollutants are evaluated for use in performing short-term *in vivo* animal tests as well as *in vitro* bioassays.

8. *Anticipatory*

Program conducts systematic studies of emerging interdisciplinary problems. Emphasis is on environmental cancer Comprehensive epidemiology studies, coupled with extensive integrated exposure monitoring in areas demonstrating high cancer incidence or known exposures to excessive levels of environmental carcinogens, are performed to establish profiles which serve to indicate whether regulation will be needed in the future.

Office of Health and Environmental Assessment

Washington, D.C.

Mission

Provides the Agency's regulatory programs with a centralized capability for evaluating information on health and ecological effects from exposure to pollutants and in some cases estimating the level of health risk involved. Insures consistency and quality among the risk assessments prepared throughout the Agency by establishing Agency-wide guidelines and reviewing completed assessments.

Typical outputs include:

- Guidelines for assessing health risk.
- Guidelines for exposure assessments.
- Reviews of all Agency assessment activities.
- Participation in the development and/or review of Agency regulations with respect to health assessment.
- Health criteria documents, aquatic effects criteria documents, and health assessment documents.
- Preliminary and full risk assessments dealing with carcinogenic and mutagenic potential as well as exposure assessments.

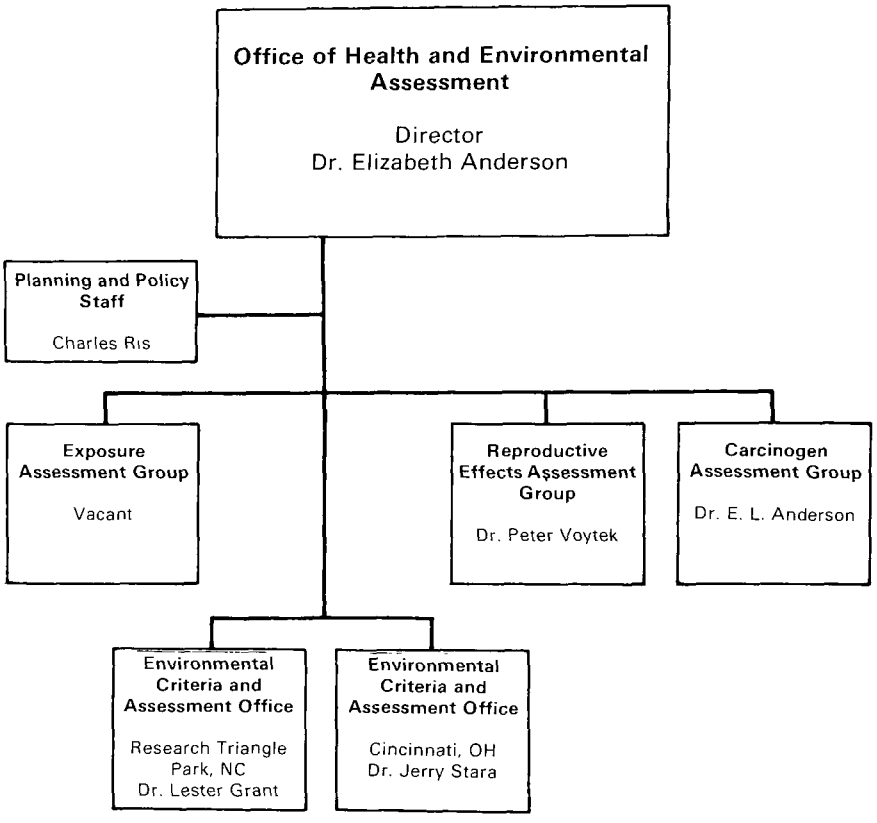
Elizabeth L. Anderson — **Director, Office of Health and Environmental Assessment—Washington, D. C.**

Education:
College of William and Mary—B.S. (Chemistry) 1962
University of Virginia—M.S. (Organic Chemistry) 1964
The American University—Ph.D. (Organic Chemistry) 1970

Professional Experience:
Director, Office of Health and Environmental Assessment, EPA, 1979-Present
Executive Director, Carcinogen Assessment Group, EPA, 1976-1979
Office of Planning and Management, EPA, 1975-1976
Assistant to the Deputy Assistant Administrator for General Enforcement, EPA, 1973-1975
Staff Chemist, Office of Technical Analysis, EPA, 1971-1973
Research Chemist, U.S. Department of Defense, Harry Diamond Laboratories, Washington, D.C., 1967-1971
Research Chemist, Atlantic Research Laboratories, Inc. Alexandria, Virginia, 1964-1967

Professional Affiliations:
American Association for Advancement of Science
American Chemical Society
Society for Environmental Geochemistry and Health

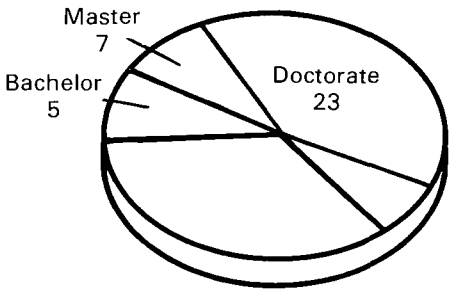
Honors:
Kappa Kappa Gamma National Achievement Award, 1974
Outstanding Woman of America Award, 1976
President's Executive Interchange Program, 1975
EPA Gold Medal for Exceptional Service, 1978



FTS Telephone No. 755-3968
Commercial Telephone No. (202) 755-3968

Research Program Resources Summary ($1,000's)	FY 1979		FY 1980	
	In-House	Extramural	In-House	Extramural
	$2,645	$2,071	$3,554	$1,463

Personnel



Full-time EPA Personnel = 67

Recent Accomplishments

1. *Carcinogen Assessment Activities*

- Participated in the development of the Air Cancer Policy.
- Developed draft methodology for assessing risk to residents of the Love Canal to be provided to the Department of Housing and Urban Development. Also prepared risk assessment to be used by the Department of Justice in the Love Canal case.
- Participated in a working group to write regulations for testing requirements and participated in hearings for Section 4 of TSCA.
- Provided a list of carcinogens as a basis for labeling under Section 6 of TSCA.
- Provided expert witnesses for Office of General Counsel for two pesticide cancellation/suspension hearings. (DBCP and 2,4,5-T).
- Completed and/or revised full risk assessments for the Office of Air Quality Planning and Standards (OAQPS) on benzene, arsenic, perchloroethylene, cadmium.
- Completed *Type I* risk assessments for OAQPS for cresols, nitrobenzene, phosgene,

benzylchloride, toluene, manganese, xylene, chlorobenzene (ortho and para), propylene oxide, methyl iodide, allyl chloride, ethylene oxide, formaldehyde, nitrosamines, beryllium, nickel, acrolein, epichlorohydrin and acetaldehyde.

- Completed pathology slide reviews for Office of General Counsel on 2,4,5-T in support of cancellation/suspension hearings.

- Completed reviews of rebuttal information for the Office of Pesticide programs (GPP) on coal tar/creosote and prepared a review on inorganic arsenic.

- Completed and/or revised full risk assessments for OPP on ethylene dibromide, EBDC, lindane, 2,4,5-T, dimethoate and diallate.

- Completed risk assessments on 31 water pollutants which together with ECAO-Cincinnati water quality criteria documents provided the scientific bases for nationwide Water Quality Criteria.

- Prepared for the Office of Solid Waste Management Program (OSWMP) a list of carcinogens to be used as a basis for identifying hazardous materials.

- Assisted two Regional Offices in support of legal action.

2. *Reproductive Effects Assessment*

   - Developed draft guidelines for performing risk assessments on mutagenicity.

3. *Exposure Assessment*

   - Established an Agency-wide Working Group to develop exposure assessment guidelines.

Scientific Assessment Activities

1. *Carcinogen Assessment Group*

   - Assess the carcinogenic risk presented by specific agents.

- Assess emerging data to improve risk assessment methodology.

- Participate in development of regulations pertaining to carcinogenicity.

- Develop guidelines to be used in risk assessments for carcinogenicity.

2. *Reproductive Effects Assessment Group*

   - Assess the mutagenic, teratogenic, and sterility risk of specific agents.

   - Develop guidelines for mutagenicity, teratogenicity and sterility risk assessments.

   - Review reproductive risk assessments by the Agency to insure consistency and technical competence; perform exposure assessments.

3. *Exposure Assessment Group*

   - Develop and refine methodology and guidelines for conducting exposure analysis.

   - Review exposure assessments by the Agency to insure consistency and technical competence, perform exposure assessments.

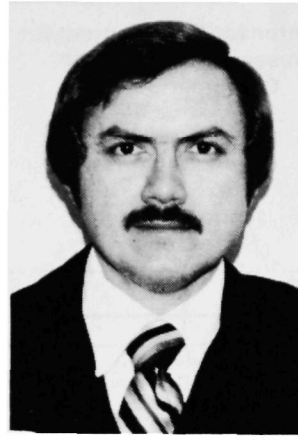
Office of Research Program Management Center for Environmental Research Information

Cincinnati, Ohio

Mission

Develop and implement coordinated, comprehensive, ORD-wide scientific and technical information dissemination program. Assure that all scientific and technical personnel have ready access to essential information and data which are required to support ORD programs. Document, disseminate and transfer findings, conclusions, and products developed through these programs to environmental decision makers and other significant groups both within the Agency and without. Specific activities are to:

- Compile information for solving municipal and industrial environmental problems through the application of control technology; make these solutions available to carefully selected target audiences through seminars and related publications.
- Acquire potential solutions to current and projected environmental problems which are not directly solvable with control technology.
- Support ORD organizational units in development and distribution of technical information products.

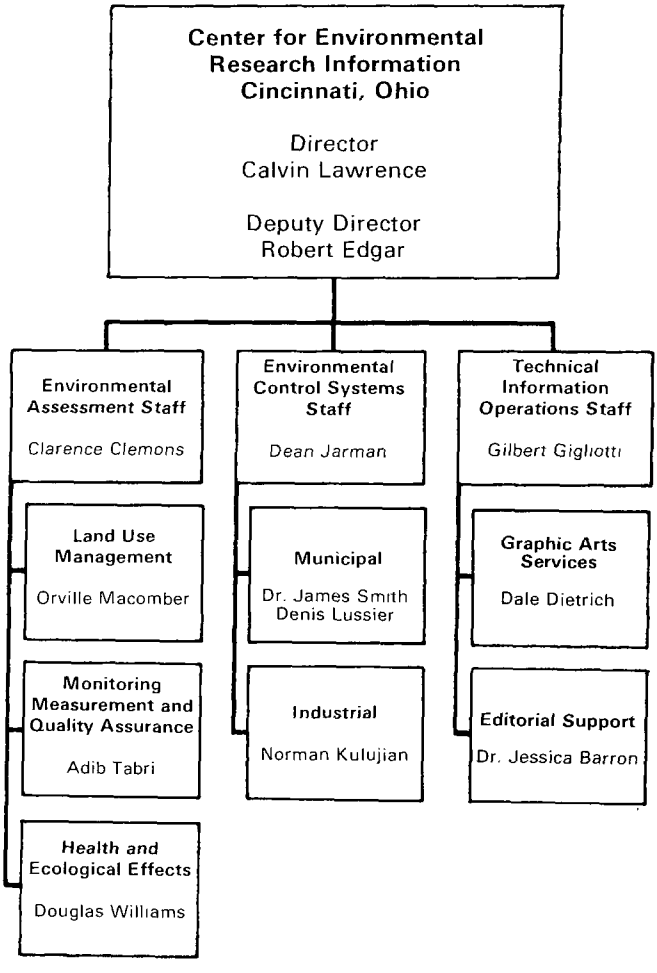


Calvin O. Lawrence **Director, Center for Environmental Research Information—Cincinnati, Ohio**

Education:
Lamar University, Beaumont, Texas
B.S. (Applied Mathematics), 1963
Johns Hopkins University, Baltimore, Maryland
M.S. (Applied Mathematics), 1972

Professional Experience:
Director, Center for Environmental Research Information (CERI), EPA, 1979-Present
Deputy Director, Center for Environmental Research Information (CERI), EPA, 1977-1979
Technical Assistant, Office of Research and Development, EPA, 1976-1977
Manager, Environmental Assessment Models, EPA, 1975-1976
Chief, Planning and Reporting Staff, EPA, 1974-1975
Chief, Management Information Staff, EPA, 1972-1974
Senior Project Engineer, Naval Ordnance Systems Command, 1971-1972
Project Engineer, Naval Ordnance Systems Command, 1968-1971
Project Engineer, Naval Ordnance Laboratory, 1963-1968

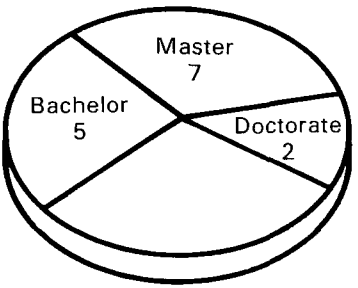
Honors:
EPA Bronze Medal for Commendable Service - 1973



FTS Telephone No. 684-7394
Commercial Telephone No. (513) 684-7394

Research Program Resources Summary ($1,000's)	FY 1979		FY 1980	
	In-House	Extramural	In-House	Extramural
	$2,128	$273	$1,545	0

Personnel



Full-time EPA Personnel = 21

Recent Accomplishments

1. *Technology Transfer*

- Seminars—Region 10 Water Quality Management (208) Conference, International Symposium on Health Effects of Diesel Engine Emissions, Seminar on Biological Monitoring and Its Use in the NPDES Permit Program, Workshop for Stream Water Quality Model Qual II, Workshop on Use of ARMY NPS Models for Environmental Planning, USA/USSR Symposium River Basin Water Quality Planning and Management, ORD Nonpoint Source Research Planning Workshop, Biological Monitoring for Wastewater Effluent, Volatile Organic Compound Control in Surface Coating Industries, Land Treatment of Municipal Wastewater Effluents, Operation and Maintenance of Air Pollution Equipment for Particulate Control.

- Conferences/Symposia—Innovative and Alternative Technology Assessment, Wastewater Treatment for Individual Residences and Small Communities, Water and Waste Management in the Arctic Environment, Water Quality Assessment Methodology for Streams, Impoundments, and Estuaries, Combined Municipal/Industrial Wastewater Treatment.

- Design Manuals/Handbooks—Sludge Treatment and Disposal, Continuous Air Pollution Source Monitoring Systems

- *Capsule Reports/Executive Briefing—Fourth* Progress Report: Forced-Oxidation Test Results at the EPA Alkali Scrubbing Test Facility, Control of Acidic Air Pollutants by Coated Baghouses, Particulate Control by Fabric Filtration on Coal-Fired Industrial Boilers, Bahco Flue Gas Desulfurization and Particulate Removal System, First Progress Report: Physical Coal Cleaning Demonstration at Homer City, PA, Acoustic Monitoring to Determine the Integrity of Hazardous Waste Dams, Short-Term Tests for Carcinogens, Mutagens and Other Genotoxic Agents, Diesel Emissions Research Report, Sulfur Oxides Control Technology Series: FGD Wellman-Lord Process, Control Technology for the Metal-Finishing Industry Series: Evaporators/Sulfide Precipitation.

2. *Technical Information*

- Review and process ORD technical reports for printing, coordinate replies to requests for technical information, provide graphics support and ORD conference needs. Quality control and processing services FY 1979:

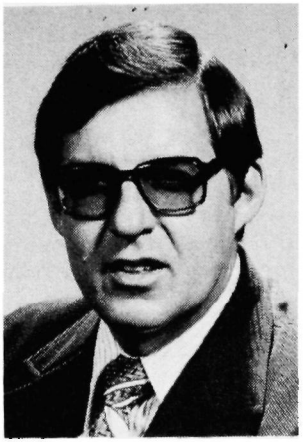
  Camera-ready reports 325
  NTIS submissions 850

Environmental Monitoring Systems Laboratory

Research Triangle Park, North Carolina

Mission

- Develop and/or improve monitoring systems for the measurements of air pollutants both in ambient air and stationary sources.
- Provide specialized air pollution monitoring and analytical support to EPA programs and other national and international organizations to meet EPA goals and objectives.
- Develop and implement the EPA air pollution quality assurance program for both ambient air and stationary source measurements. This includes a methods validation and standardization program.
- Provide special techniques and/or rapid response for collection and analysis of air samples in support of emergency episodes and enforcement.
- Develop mathematical and statistical programs to evaluate air pollutant data and report internally generated data to the user community.
- Conduct the EPA fuels and fuel additive registration program.
- Participate in the development and publication of air pollution regulations and environmental criteria assessment documents.
- Implement the ambient air monitoring equivalency regulations.
- Develop and operate special monitoring networks and studies as mandated or requested in concert with Agency policy (e.g. LACS, IPN, NFOS).
- Analyze environmental samples from environmental monitoring networks and other programs as needed or requested (e.g. NAMS, SLAMS, RO, other ORD laboratories, NFSN).
- Develop and apply monitoring techniques and systems for the assessment of human exposure to air pollutants in support of HERL/RTP research programs.

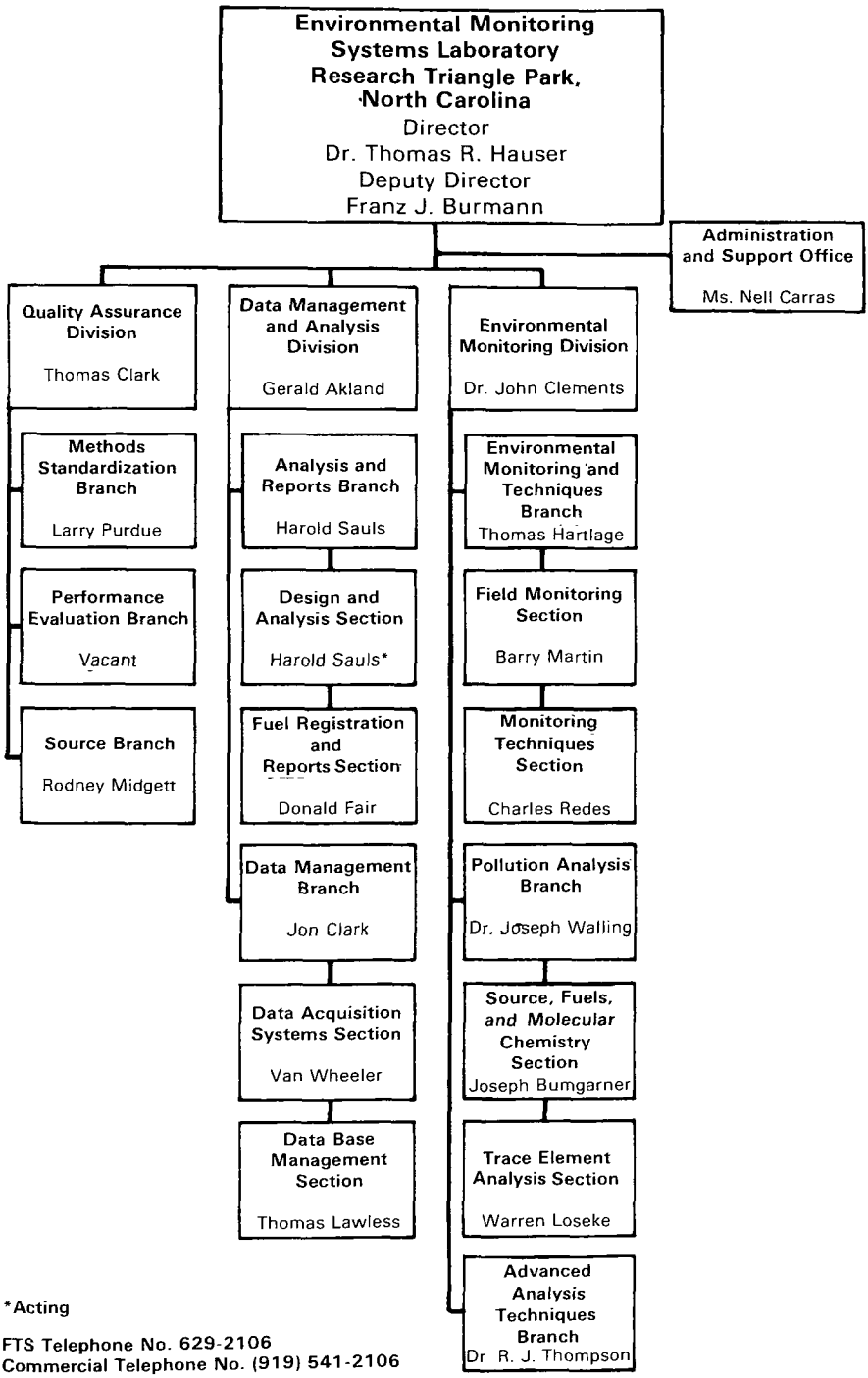


Thomas R. Hauser **Director, Environmental Monitoring Systems Laboratory—Research Triangle Park, North Carolina**

Education:
Xavier University—B.S.
Xavier University—M.S.
University of Cincinnati—Ph.D. (Environmental Engineering)

Professional Experience:
Director, Environmental Monitoring Systems Laboratory, 1977-Present
Deputy Director, Environmental Monitoring and Support Laboratory, EPA, Research Triangle Park, 1971-1977
Supervisory Research Chemist, Health Effects Research Program, National Air Pollution Control Administration, 1969-1971
Research Chemist, National Air Pollution Control Administration, 1955-1958
PHS Commissioned Corps, DHEW, 1955-1958
Instructor of Chemistry, Xavier University
Adjunct Associate Professor, North Carolina State University, 1974-Present

Professional Affiliations:
American Chemical Society
Air Pollution Control Association
American Society for Testing Materials
Sigma Xi

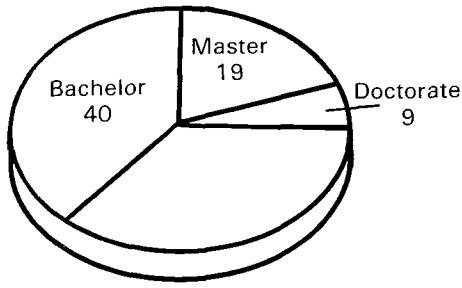


*Acting

FTS Telephone No. 629-2106
Commercial Telephone No. (919) 541-2106

Research Program Resources Summary ($1,000's)	FY 1979		FY 1980	
	In-House	Extramural	In-House	Extramural
	$35,858	$6,670	$6,697	$7,410

Personnel



Full-time EPA Personnel = 106

Recent Accomplishments

1. *Ambient Monitoring Study*—Measured downwind concentrations of NO_x, CO, and non-methane organic carbon (NMOC) during aircraft queuing and take off at National Airport in Washington, D.C. The study was for the purpose of assisting OAQPS in preparation of pollutant control strategies and regulations applicable to aircraft ground operation.

2. *Air Monitoring Program in the Love Canal Area*—Atmospheric samples were taken in the backyard, basement, and living room of each of two houses. Samples were analyzed by a contractor and EMSL using gas chromatography/mass spectroscopy. Qualitative determinations were made on all components collected. Benzene, chloroform, trichloroethylene, and tetrachloroethylene were quantitated. The sampling was repeated a second time. A total of 36 samples were analyzed.

3. *Inhalable Particulates and Quality Assurance Workshops*—Formulated recommendation for the development of a Federal Reference Method for measuring inhalable particulates and reviewed quality assurance guidelines for source emission measurements (Volume III of the Quality Assurance Handbook for Air Pollution Measurements Systems). Approximately 30 experts in aerosol technology participated in the

inhalable particulate workshop and 9 Regional Offices were represented in the QA Workshop.

4. *Minimum Quality Assurance Requirements*—Developed for State and Local Air Monitoring Stations and for Prevention of Significant Deterioration air monitoring in the interest of implementing a standardized uniform national air monitoring program for criteria pollutants.

5. *Continued Implementation of an Agency-Wide Quality Assurance Program*—Development of quality control reference materials, conduct of interlaboratory performance audits, issuance of quality assurance guideline documents, evaluation and standardization of methods for measuring pollutants in air, and emission source and promulgation of reference and equivalent methods.

6. *Technical Support to the Regional Offices, OAQPS, and Other Agency Offices in the Area of Environmental Monitoring*—Monitoring of asbestos in Maryland, Hg in New Jersey, ozone in National Forests, and polynuclear organic matter in Pennsylvania; analysis of lead, phosphorus and manganese in fuel; providing high quality glass-fiber filters for national use; analysis of filter samples for inorganics and trace elements; and characterization of diesel particulates.

7. *Implemented Regulations on Reference and Equivalent Methods and Fuels and Fuel Additives*—Fifteen methods have been designated as reference methods and 17 as equivalent methods. Registered as of January 31, 1980 were 2,019 fuel additives, 558 brands of motor vehicle gasoline and 276 brands of motor vehicle diesel fuel.

Research Program

1. *Quality Assurance*

- Conduct single-laboratory and multi-laboratory (collaborative testing) evaluation of candidate reference methods—for use in determining compliance to regulations on ambient air quality and emission standards. These studies establish the precision and accuracy of reference methods necessary for legal defensibility. Prepare detailed methods and procedures for publication in the regulations.

- Establish procedures for designating

equivalent methods for use in compliance monitoring, review equivalency applications, and promulgate equivalent methods. Evaluate proposed modifications to reference and equivalent methods as need arises and make appropriate revisions and notifications to the regulations.

- Conduct interlaboratory performance surveys to determine proficiency of State/Local, Federal, industrial laboratories involved in compliance or research monitoring; aid in detection and correction of problems in methodology or laboratory performance.

- Prepare and distribute quality assurance guideline documents and handbooks for use by performing laboratories in developing and implementing quality assurance programs.

- Develop protocols for establishing the traceability of calibration gases and materials to higher order standards such as NBS Standard Reference Material (SRM). Identify the need for development of SRM's.

- Maintain a repository of quality control reference samples for use in interlaboratory performance surveys and for correction of quality control problems.

- Develop and maintain EPA standards laboratory for certification of cylinder gases, permeation tubes, calibration and auditing devices and flow measuring equipment.

2. *Technical Support*

- Provide analytical capability to support EMSL projects, other ORD Laboratories, Regional programs and other EPA programs. Analytical capability exists in the areas of neutron activation, spark source mass spectrometry, optical emission spectrometry, atomic absorption, and gas chromatography/mass spectrometry.

- Operate special monitoring networks such as the National Air Surveillance Network (NASN), National Forest Ozone Network, and Precipitation Network to chart trends in contaminant levels. Analyze samples collected by the NASN for non-criteria pollutants.

- Conduct field monitoring for the Office of Air Quality Planning and Standards in support of implementation plans and control strategy developments; ethylene dichloride and benzene monitoring at suspected major sources of emissions, perchloroethylene in urban areas.

- Conduct special OAQPS studies to support Regional Office air pollution investigations; e.g., BaP determination around a coke oven in Pennsylvania; asbestos monitoring in Maryland; Hg monitoring in New Jersey.

- Perform for Office of Enforcement compliance monitoring on phosphorus content of gasoline and confirmatory analysis of lead in gasoline.

3. *Health Effects/Transportation/Air*

- Conduct field studies to determine impact of catalyst-equipped cars on ambient air quality especially relating to S-bearing compounds. Determine temperal, diurnal and spatial variation in resulting air quality.

- Collect condensates from roofing tar, coke ovens, diesel exhaust, and cigarettes, fractionate, and provide samples for bioassay. Collect air samples at a bus terminal for purpose of extraction fractionation, and bioassay.

4. *Measurement Techniques and Equipment Development*

- Register and maintain production estimates of fuel and fuel additives in accordance with Federal regulations. Selectively analyze fuel and fuel additives to verify composition.

- Establish a nationwide sampling network to determine inhaled particulate levels in ambient air to support health studies and control strategy development.

- Determine extent of intrusion of carbon monoxide in sustained use vehicles. Evaluate and improve methods for collection of organic vapors in air. Evaluate and improve methods for collection and analysis of trace elements in air.

5. *Energy*

- Provide quality assurance support to the Western Energy Programs.

6. *Toxic Substances*

- Qualitatively screen organic compounds present in air samples collected at the fenceline of certain chemical industries. Quantitate selected compounds. Improve spectral search capability.

7. *Health Effects/Non-Criteria Pollutants/Air*

- Conduct air monitoring associated with exposure assessment epidemiological research programs of HERL/RTP Provide external quality assurance support to human exposure studies at HERL/RTP (Chapel Hill) and animal exposure studies at HERL/Cincinnati.

8. *Anticipatory Research*

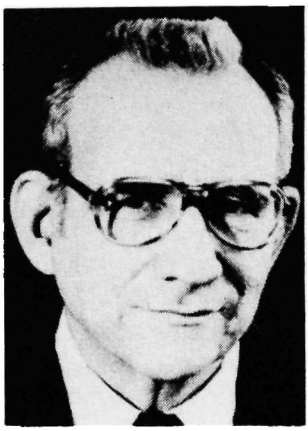
- Provide analytical, quality assurance and data processing support to acid precipitation networks.

Environmental Monitoring and Support Laboratory

Cincinnati, Ohio

Mission

- Develop analytical test procedures to identify and measure major pollutants and quality characteristics in drinking water, ambient receiving waters, municipal and industrial effluents.
- Develop monitoring techniques to identify and enumerate microorganisms of health significance in drinking water, ambient waters, and municipal wastes.
- Devise laboratory procedures to detect, identify and measure viruses in water, municipal wastes, and sludges.
- Devise field and laboratory procedures to determine the biological effect of waste discharges on receiving waters.
- Prepare and publish official Agency test methods for the monitoring of drinking water, municipal and industrial effluents, and ambient waters.
- Provide quality assurance guidelines, reference materials, quality control samples, and performance audit samples for evaluating and maintaining the quality of monitoring data provided by EPA, State, municipal, and industrial laboratories.
- Provide Technical Support, including consultation, research reports, and analytical services, to Regional Offices, States, and Program Offices in support of water and waste monitoring programs.



Dwight G. Ballinger — **Director, Environmental Monitoring Support Laboratory—Cincinnati, Ohio**

Education: University of Cincinnati, B.Ph. (Chemistry) 1956

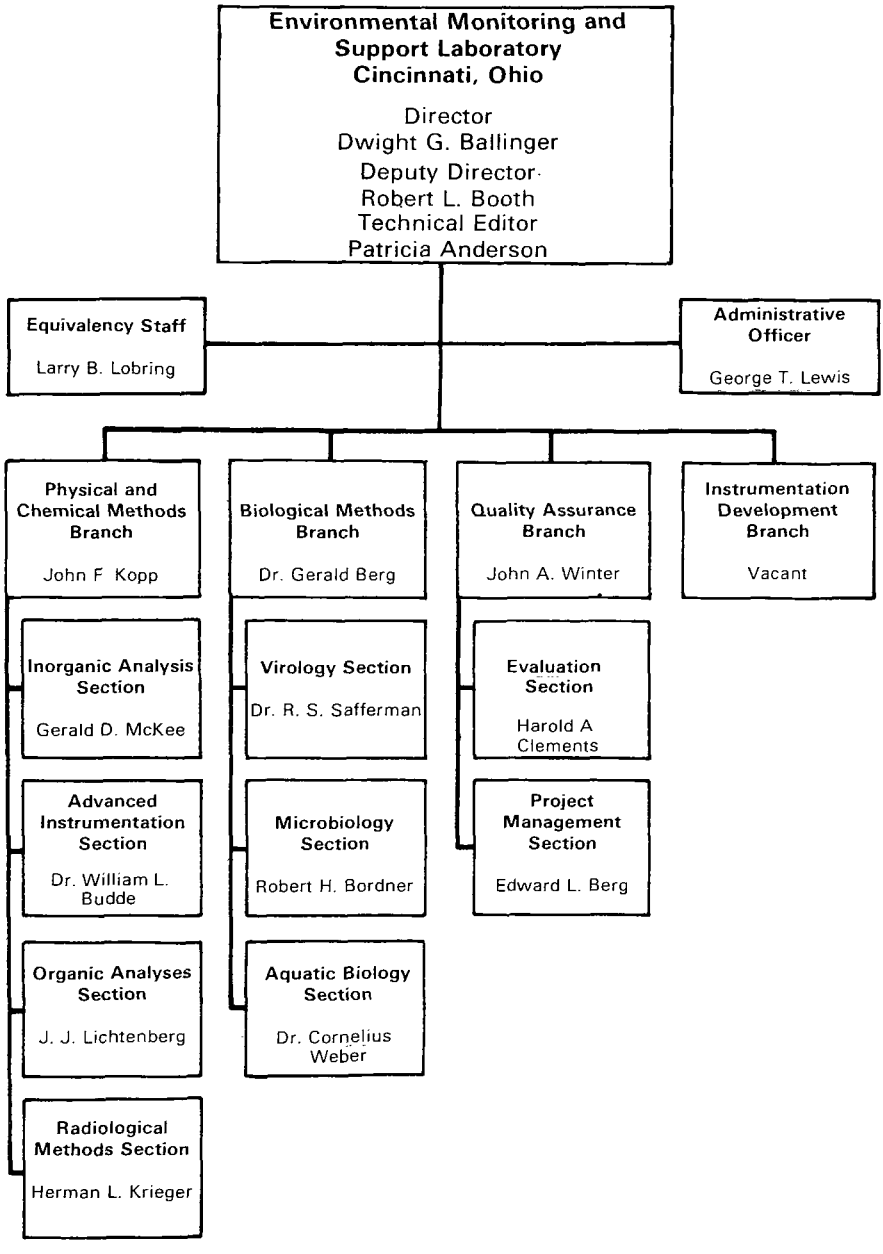
Professional Experience:

Director, Environmental Monitoring Support Laboratory, 1967-Present
Supervisory Chemist, U.S. Public Health Service Technical Advisory and Investigations Branch, 1960-1967
Training Specialist, U.S. Public Health Service, 1949-1967
Laboratory Technician, U.S. Public Health Service, 1940-1948

Professional Affiliations:

American Chemical Society
American Water Works Association
Water Pollution Control Federation
Sigma Xi

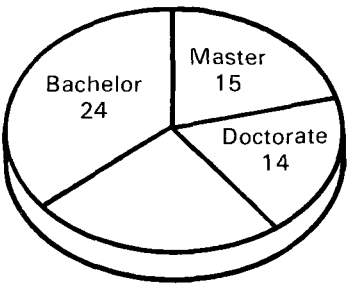
Honors: EPA Silver Medal for Development of the Agency's Analytical Quality Control Program, 1972



FTS Telephone No. 684-7301
Commercial Telephone No. (513) 684-7301

Research Program Resources Summary ($1,000's)	FY 1979		FY 1980	
	In-House	Extramural	In-House	Extramural
	$3,553	$6,726	$3,829	$4,773

Personnel



Full-time EPA Personnel = 79

Recent Accomplishments

1. *Development of Testing Procedures*—Prepared and published test procedures for the analysis of 228 pollutants in municipal and industrial waste discharges. Developed and published new test procedures for the analysis of trihalomethanes in drinking water.

2. *Laboratory Evaluations and Services*—Conducted performance evaluation studies of 528 laboratories analyzing public water supply samples. Conducted on-site evaluations of three regional laboratories analyzing drinking water, ambient waters, and industrial and municipal wastes. Prepared and distributed 1200 quality control samples to public and private laboratories performing drinking water, ambient waters, and industrial and municipal wastewater analyses.

3. *Publications*—Published a series of guides on the automation of laboratory instruments for water and wastewater analyses. Published revised annotated bibliography on Virus in Waste, Renovated and Other Waters. Published a series of reports on commercially-available automatic sampling systems.

Research Program

1. *Monitoring Systems*

   - Develop proposed reference methods and correct deficiencies in existing reference

methods for toxic and hazardous substances in drinking water, wastewater, ambient water, sludge and ocean disposed waste (PL 92-500). The methods are used in determining compliance to limits set by the National Pollutant Discharge Elimination System (NPDES) and the National Interim Primary Drinking Water Regulations. Develop protocols for sampling and analysis for priority pollutants in industrial effluents, fish, sediment, sludge, leachates, and other environmental samples.

- Conduct laboratory and field investigations of automatic sampling instrumentation; extend this activity to assure enforcement and surveillance teams of acquiring representative samples.

- Develop and identify standardized methodology by which waters may be sampled for small numbers of viruses. Devise test systems for determining the extent to which enteroviruses reversibly bind to sludges, feces, and other solids in water; develop standard methodology needed to monitor for the presence of these viruses. Develop immunoassay techniques and other accurate methods for the rapid identification of viruses recovered from waters and solids.

- Evaluate and standardize methods for measuring the toxicity of effluents to aquatic life and the effects of effluents on aquatic ecosystems.

- Develop and evaluate improved microbiological methods to enforce and monitor standards and criteria established for: (a) potable waters, (b) municipal and industrial wastewaters, and (c) ambient fresh and marine waters; and establish the precision and accuracy of these procedures for legal defensibility. Prepare EPA microbiological methods manuals to assure the uniform application of methods by Federal, State, private, and environmental programs.

- Administer the EPA program for the approval of alternative test procedures for use in environmental monitoring required under the Federal Water Pollution Control Act and the Safe Drinking Water Act.

2. *Quality Assurance—Water Quality*

- Develop and distribute quality control check samples and materials needed to support the Consent Decree, water quality NPDES toxic substances, ambient monitoring, research and energy programs. Develop and distribute manuals and guidelines for quality assurance sampling and sample preservation, and analytical methodology. Develop EPA's computerized interlaboratory test systems for NPDES program laboratories.

- Evaluate performance of laboratories making waste measurements under NPDES, ambient water monitoring and advise EPA Program Offices on reliability of monitoring data.

- Develop a computerized laboratory operations system including sample file control and quality control summaries. Following development extend the system to EPA Regional Laboratories and make available to other Federal, State, and private laboratories. Expand and improve the system as needs and requirements are identified.

- Conduct collaborative studies to validate EPA's chemical, biological and microbiological methods for waste discharges, ambient monitoring, drinking water and energy-related research.

3. *Quality Assurance—Drinking Water*

- Develop and distribute quality control samples and materials to support the monitoring of public water supplies. As new regulations are planned, conduct research leading to the development of new quality control samples for the expanded list of required measurements.

- Evaluate performance of laboratories analyzing drinking water by conducting interlaboratory studies to establish the reliability of public water supply data. Provide information to State and regional authorities on laboratory performance capabilities.

- Evaluate EPA Regional Laboratories by on-site inspections and performance samples to certify for drinking water examination.

- Maintain a computerized system for cataloging information on the performance of water supply laboratories and establishing acceptable levels of accuracy and precision.

4. *Energy—Measurement Methods*

- Provide test procedures for the analysis of hazardous materials in support of waste site investigations. Develop and distribute standard reference materials for the hazardous waste monitoring program.

Environmental Monitoring Systems Laboratory

Las Vegas, Nevada

Mission

Develop and optimize methods, systems, and strategies for monitoring the environment to assess the exposure of man and other receptors to pollutants in the environment. Characterize and quantify movement and fate of environmental pollutants. Specific activities of the Laboratory are to:

- Develop and maintain sophisticated monitoring and analytical capabilities for laboratory and field studies. Conduct EPA programs for monitoring data quality assurance, including radiation and biological quality assurance.

- As the Agency aerial support facility, develop and provide capability for overhead monitoring, including both contact and remote sensing. Provide a quick-response capability for synoptic monitoring of pollution situations or accidental releases.

- Under a Memorandum of Understanding with the U.S. Department of Energy, collect radiological surveillance data and perform pathways research to determine radiation exposure to man and his environment from past and present testing of nuclear devices.

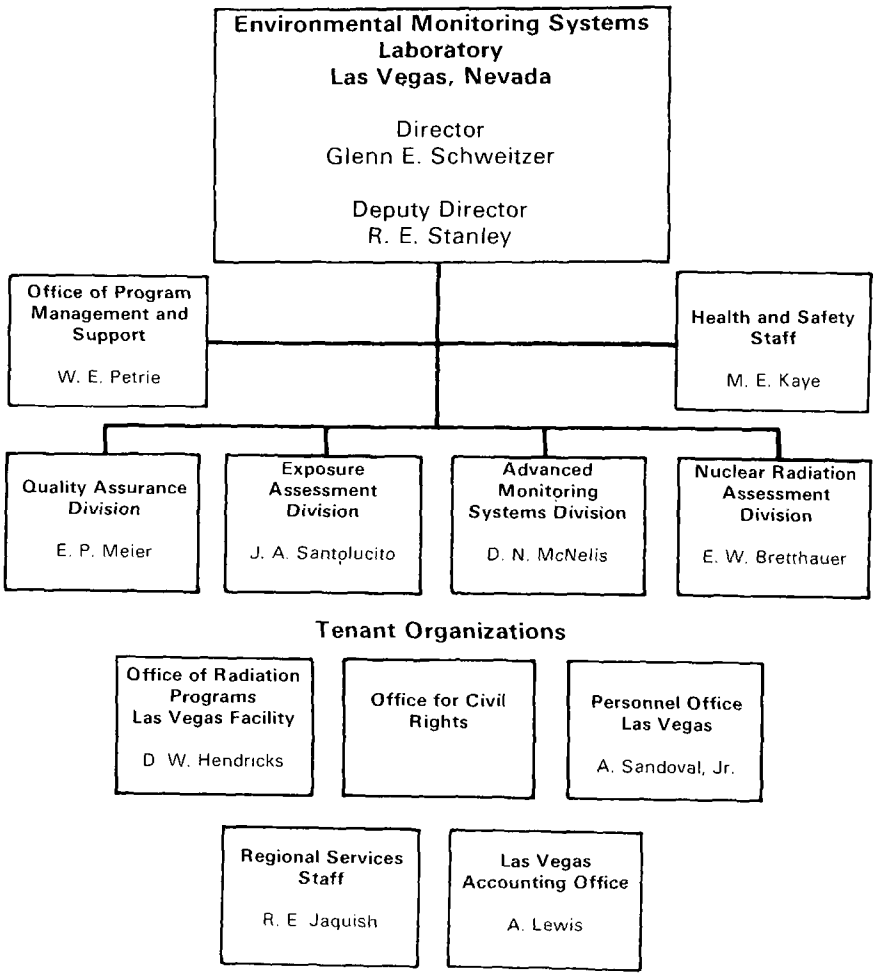
Glenn E. Schweitzer **Director, Environmental Monitoring Systems Laboratory—Las Vegas, Nevada**

Education: U.S. Military Academy, B.S.
California Institute of Technology, M.S.

Professional Experience:
Director, Environmental Monitoring Systems Laboratory, Las Vegas, 1980-Present
Director, Office of Toxic Substances, EPA, 1973-1976
Director, Office of Science and Technology, Agency for International Development, 1969-1973
Senior Positions, Department of State and National Council on Marine Research and Engineering Development

Professional Affiliations:
New York Academy of Sciences
American Chemical Society
Society for International Development

Honors:
DAR Award for Excellence in Mechanical Engineering
State Department Meritorious Honor Award
AID Superior Honors Award

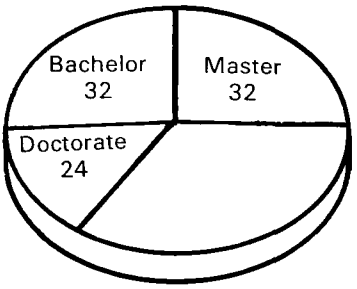


FTS Telephone No. 595-2969
Commercial Telephone No. (702) 595-2969

Research Program Resources Summary ($1,000's)

FY 1979		FY 1980	
In-House	Extramural	In-House	Extramural
$5,400	$1,190	$5,047	$2,624

Personnel



Full-time EPA Personnel = 123

Recent Accomplishments

1. *Environmental Monitoring of Three Mile Island*—Provided emergency monitoring of radioactivity in the environment from the Three Mile Island reactor accident and coordinated a long-term interagency monitoring program of the area. Prepared a complete data base of all known environmental radiation measurements taken near three Mile Island from March 28 to May 1, 1979, for the President's Commission on Three Mile Island.

2. *Quality Assurance Programs*—Completed a three-year program of quality assurance audits of Region IX air quality monitoring stations and initiated an Agency quality assurance program for hazardous waste monitoring.

3. *Airborne Laser Fluorosensor*—Achieved a significant breakthrough in developing this method of monitoring chlorophyll *a* in surface waters by discovering a method to reduce interference from suspended solids.

4. *Exposure Monitoring System for Pristine Areas*—Developed by EMSL-LV and adopted by several international organizations for the Biosphere Reserves Program.

Research Program

1. *Solid Waste*

- Design and develop a national quality assurance program for hazardous wastes monitoring and measurement.

- Evaluate, improve, or develop sampling and analytical methods needed for monitoring hazardous wastes.

- Provide research and development and technical assistance in measurement, monitoring, and quality assurance to support the Office of Solid Waste in the promulgation of regulations under the Resources Conservation and Recovery Act.

- Develop guidelines for monitoring hazardous waste sites and for assessing exposure to pollutants from those sites.

- Coordinate and provide field monitoring, analytical support, and emergency response to hazardous waste problems that require special technical capabilities available within the Office of Research and Development.

2. *Water Quality*

- Apply statistical scenarios to design more economical monitoring systems for water quality assessment and control.

- Develop and test techniques to assess toxic substances in surface waters of the semi-arid areas of western synfuel development.

- Develop overhead photography and spectral scanning techniques for assessing environmental impact on water quality and for monitoring compliance with water pollution control regulations.

- Provide a quality assurance program for measurement of radionuclides in environmental waters and wastewater.

- Develop and apply an airborne laser fluorosensor for rapid, synoptic measurement and mapping of chlorophyll *a* in lakes and estuaries.

- Investigate effluents from publicly owned treatment works (POTW) to determine the type

and concentration of toxic substances discharged to receiving waters.

- Correlate trophic index values for lakes with multispectral scans to develop a cost-effective remote sensing technique for determining the trophic state of lakes.

3. *Drinking Water*

- Provide a national quality assurance program for radiochemical analyses of drinking water as mandated by the Safe Drinking Water Act and the National Interim Primary Drinking Water Regulations.

4. *Municipal Wastewater and Spill Prevention*

- Develop airborne monitoring techniques to identify surface and subsurface discharges from municipal wastewater facilities and characterize their impacts on turbidity of receiving waters.

- Optimize techniques for analyzing infrared photographs to detect septic system failures.

- From aerial photographs, assess spill potential from oil and hazardous materials storage and transportation facilities.

- Analyze historical and current aerial photographs to locate and evaluate uncontrolled hazardous materials disposal sites.

- Provide a quality assurance program to support the national program for investigation of uncontrolled waste sites.

5. *Chemical Testing and Assessment*

- Develop guidelines for validating models that will predict the transport and fate of organic pollutants in aquatic environments, and test the guidelines on a designated stream.

- Determine whether specific microbial systems can be used to detect 2,3,7,8-tetrachloro-dibenzo-p-dioxin in environmental samples.

- Develop a rapid Fourier transform infrared method for analyzing organic pollutants and

design a plan for developing methods for rapid multielemental analysis of inorganics.

- Conduct a study in southeastern Ohio that evaluates available monitoring techniques, provides a basis for identifying potentially exposed populations, and provides a data base in order to establish an ongoing capability within EPA for monitoring human exposure to environmental toxics and carcinogens.

6. *Gases and Particles*

- Perform airborne and land-based monitoring with state-of-the-art *in situ* and remote sensors to assist Program and Regional Offices in assessing air quality.

- Provide a quality assurance program for measurements of radionuclides in air and for biological monitoring of air quality.

7. *Oxidants*

- Develop airborne laser systems to study large-scale oxidant transport and perturbation of oxidant levels by natural and manmade sources.

- Develop a modular air quality monitoring package to use in light aircraft for making three-dimensional measurements of urban air masses and plumes.

- Obtain measurements with airborne instrumentation to assist the Agency in characterizing three-dimensional oxidant development and transport for the Eastern Corridor Oxidant Study.

8. *Energy*

- Develop and evaluate techniques for mapping and assessing visibility in the west.

9. *Ionizing Radiation*

- Provide a comprehensive national quality assurance program for measurements of radionuclides in environmental media.

10. *Nuclear Testing Safety Program for the U.S. Department of Energy (DOE)*

- Monitor airborne, surface, and subsurface radioactivity and radiation exposures to individuals at all United States sites of underground nuclear tests.

- Construct individual and cumulative fallout patterns for atmospheric nuclear tests conducted from 1953 to 1962.

- Provide off-site radiation safety support for nuclear tests through aerial tracking and ground-level monitoring, and take actions necessary to reduce population exposure.

- Measure radionuclides in persons living near the Nevada Test Site.

- Measure radionuclide burdens in domestic and wild animals living near the DOE's nuclear test sites, and investigate claims of radiation damage to these animals.

- Direct the Medical Liaison Officer Network and assist the DOE by investigating claims against the Government for radiation injury.

Industrial Environmental Research Laboratory

Research Triangle Park, North Carolina

Mission

- Determine the multimedia environmental impact of energy and industrial processes.
- Ensure development of control technology and process modifications in order to establish and meet standards for air, water, and solid wastes in a timely and cost-effective manner.

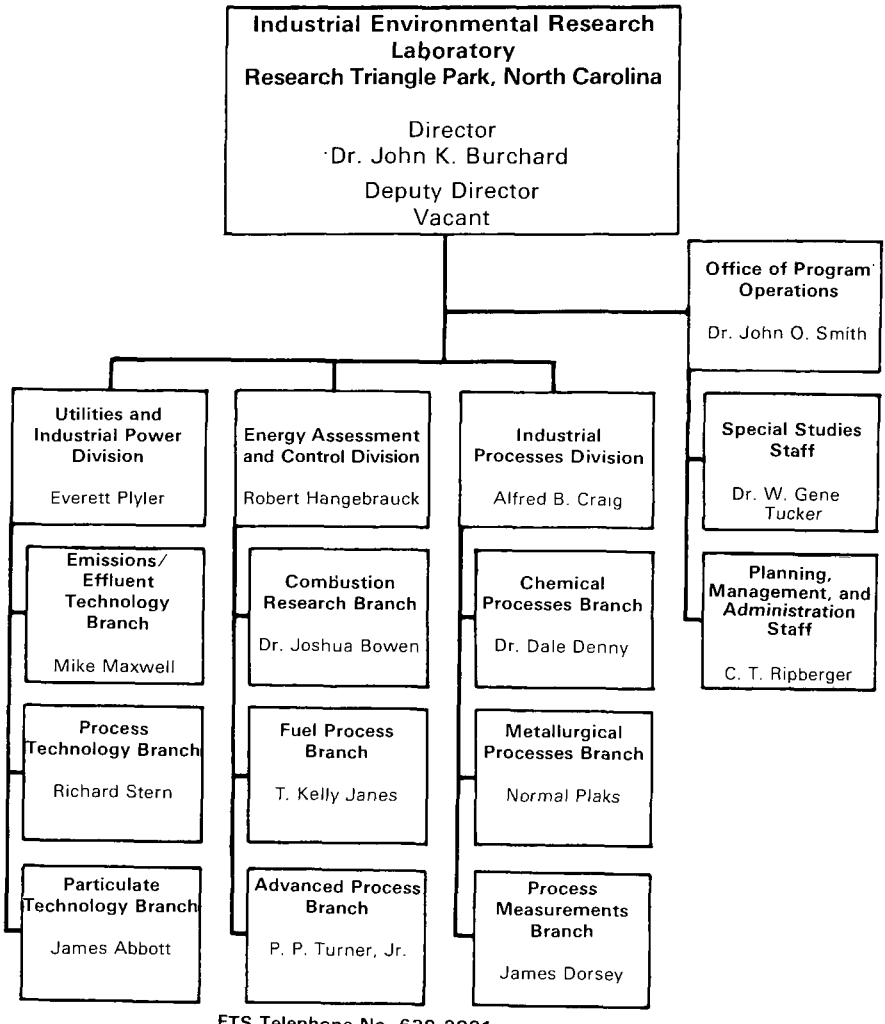
John K. Burchard **Director, Industrial Environmental Research Laboratory—Research Triangle Park, North Carolina**

Senior Official for Research and Development, Environmental Research Center, Research Triangle Park, North Carolina

Education: Carnegie Tech—B.S.
Carnegie Tech—M.S.
Carnegie Tech—Ph.D. (Engineering) 1962
Federal Executive Institute

Professional Experience:
Director, Industrial Environmental Research Laboratory, 1974-Present
Senior ORD Official, 1977-Present
Director, Control Systems Laboratory, Office of Research and Development, 1972-1974
Branch Chief, Control Systems Division, National Air Pollution Control Administration, 1971-1972
Assistant Director, Control Systems Division, National Air Pollution Control Administration, 1970-1971
Chief Scientist, Combustion Power Company, Menlo Park, California, 1968-1970
Staff Scientist, United Technology Center, Sunnyvale, California, 1961-1968

Professional Affiliations:
American Institute of Chemical Engineers
Sigmi Xi

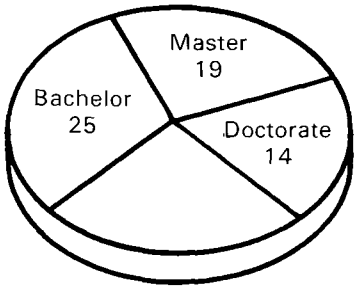


FTS Telephone No. 629-2821
Commercial Telephone No. (919) 541-2821

Research Program Resources Summary ($1,000's)

	FY 1979		FY 1980	
	In-House	Extramural	In-House	Extramural
	$5,365	$38,022	$5,643	$36,783

Personnel



Full-time EPA Personnel = 83

Recent Accomplishments

1. *Significant Cost Saving for Control of Fly Ash Projected from Pilot Scale Test of Novel Two-Stage Electrostatic Precipitator*
2. *New Stationary Gas Turbine Combustor Allows Environmentally Acceptable Combustion of Synthetic Liquid Fuels*
3. *Dry SO_2 Control Program Initiated*
4. *Low NO_x Burner Development and Field Evaluation*
5. *Energy Savings Through Environmental Control Technology*
6. *Synfuel Pollutants Identified*
7. *Review of Coal Cleaning for Industrial Boilers*

Research Program

Three-fold approach to stationary source pollution control:

- Environmental assessment to determine the feasibility/cost/benefit of proposed technologies as compared to present methods.

- Environmental control technology development—research, develop and demonstrate control technologies where needed.

- Technology transfer—dissemination of knowledge gained and of technologies developed by EPA and by the scientific community.

1. *Flue Gas Desulfurization*

   - Develop and demonstrate technology to prevent or abate sulfur dioxide emissions from utility and industrial power sources.

   - Make available near-term technology to meet emission standards for sulfur dioxide.

   - Permit use of high-sulfur fuels without undue environmental degradation.

   - Accelerate development and commercialization of technology to meet expanded use of coal while protecting the environment (national energy program, conversions, etc.).

2. *Fine Particulate Emissions Control*

   - Develop and demonstrate control technologies to remove large fractions of under 3-micron-size particles.

   - Identify capabilities and improve performance of existing equipment and technology.

   - Identify and develop new technology.

   - Develop technology for use with low-sulfur coal.

   - Develop technology for HP/HT processes for cleanup of advanced energy processes.

   - Develop technology for control of fugitive particulate emissions.

   - Develop technology for control of particulate emissions from diesel engines.

3. *Flue Gas Treatment Program for NO_x and SO_x/NO_x Control*

   - Determine need for FGT technology by development of: (a) Nitrogen Oxide Control Strategy and (b) Economic Assessments.

- Develop processes for control of nitrogen oxide and for simultaneous control of nitrogen oxide/sulfur oxide.

4. *Thermal Pollution Control*

   - Develop advanced cooling technology for waste heat rejection from power plants.

   - Demonstrate models and measurement methods applicable to consumptive water use and thermal plumes.

   - Develop and demonstrate cooling water intake structures which are more environmentally acceptable than present ones.

   - Provide technical support for development of effluent guidelines and to assist Program and Regional Offices.

   - Develop waste heat utilization techniques for agricultural/aquacultural applications.

5. *Waste and Water Control Program for Conventional Combustion*

   - Develop environmentally acceptable, cost-effective technology for:

     — Disposal or utilization of solid wastes from power plants.

     — Minimizing or eliminating liquid discharges from power plants, with emphasis on water recycle/reuse.

6. *Conventional Combustion Environmental Assessment*

   - Provide the data and information needed to define the requirements for standards and control technologies through the following approach.

     — Determining the extent to which available information can be used to assess the total environmental, economic and energy impacts of conventional combustion processes.

     — Identifying and acquiring additional information needed for assessment.

— Defining the requirements for modifying present control technologies or for developing new control technologies.

— Making recommendations for the development of standards and control technologies.

7. *Combustion Modification*

- Develop and demonstrate combustion modification technology to control nitrogen oxides and related pollutants generated by combustion applicable to:

  — Utility Boilers
  — Commercial Boilers
  — Industrial Boilers
  — Residential Heating Systems
  — Industrial Process Furnaces
  — Stationary Engines
  — Advanced Processes

- Evaluate effects of the application of combustion modifications through environmental assessment.

8. *Fluidized Bed Combustion*

- Environmentally assess FBC technologies

- Develop environmental goals through environmental assessment.

- Utilizing multimedia environmental goals, determine best control/disposal technologies for FBC.

- Assess and test technology for control of sulfur oxide, nitrogen oxide emissions, solid wastes and other multimedia pollutants from fluid bed combustion systems as needed.

9. *Advanced Oil*

- Conduct multimedia environmental assessments of existing and projected processing and utilization technologies for residual oil use.

10. *Coal Cleaning*

- Complete environmental assessment of all coal cleaning processes.

- Develop control technology for coal cleaning plants.

- Develop physical and chemical coal cleaning technology to permit use of high-sulfur coal.

11. *Synthetic Fuels*

- Assess the environmental impact of the emerging coal-based synthetic fuels industry.

- Develop and demonstrate appropriate multimedia control technology.

12. *Chemical Processes*

- Identify and characterize chemical industry pollution discharges, particularly in:

  — Agricultural Chemicals
  — Petroleum Refineries
  — Petrochemicals
  — Shipboard Incinerators
  — Textiles
  — Conventional Combustion Systems

- Conduct multimedia assessments as needed.

- Develop and demonstrate control technology as needed.

13. *Metallurgical Processes*

- Identify major multimedia pollution sources, including solid wastes, in the steel-making, ferroalloy, and iron and steel foundry industries.

- Conduct environmental assessments on identified sources in iron and steel industries.

- Conduct engineering studies to show industry-wide applicability of demonstrated domestic and foreign pollution control technology.

- Develop and demonstrate control technology for priority sources.

14. *Process Measurements*

- Develop, evaluate, and assist in the application of sampling and analytical techniques for all Laboratory programs.

- Develop and maintain a Laboratory-wide quality assurance program to ensure reliability and accuracy of data developed by laboratory programs.

15. *Integrated Assessment—Coal*

- Identify environmentally, socially, and economically acceptable alternatives for meeting national energy supply objectives.

- Assist in the selection of *optimum* policies for the attainment of associated environmental quality goals.

Industrial Environmental Research Laboratory

Cincinnati, Ohio

Mission

Develop cost-effective techniques to prevent, control, or abate pollution impacts associated with the extraction, processing, conversion and use of mineral resources, with industrial processing and manufacturing and with new energy technologies. Identify and assess industrial, mining and energy-related sources of pollution and develop and demonstrate technology that will lead to the following:

- Cost-effective pollutant removal and disposal techniques.
- Changes in pollution-generating industrial processes to reduce or eliminate wastes; development of new, nonpolluting processes.
- Closed-loop systems to eliminate waste discharge to the environment.
- Recovery of wastes and energy as usable by-products.
- Improved methodologies and techniques for preventing, limiting, and cleaning up spills of oil and hazardous materials.
- Environmentally acceptable energy technologies and energy conservation methods.
- Cost-effective and environmentally acceptable industrial solid wastes processing and disposal techniques.
- Evaluation and assistance to public and private sectors on industrial toxic pollutants.

David G. Stephan **Director, Industrial Environmental Research Laboratory—Cincinnati, Ohio**

Senior Official, Research and Development, Environmental Research Center, Cincinnati, Ohio

Professional Experience:

Director, Industrial Environmental Research Laboratory and Senior Official for Research and Development, 1975-Present

Director, Office of Program Management, Office of Research and Development, EPA, Washington, DC 1971-1975

Assistant Commissioner for Research and Development, Federal Water Quality Administration, DOI, Washington, DC 1968-1970

Director of Research, Federal Water Pollution Control Administration, DOI, Washington, DC, 1966-1968

Deputy Chief, Basic and Applied Sciences Branch, Division of Water Supply and Pollution Control, PHS, DHEW, Washington, DC, 1965-1966

Deputy Chief Advanced Waste Treatment Research Program, PHS, Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio, 1960-1965

Chief, Air Pollution Control Equipment Research, PHS, Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio, 1955-1960

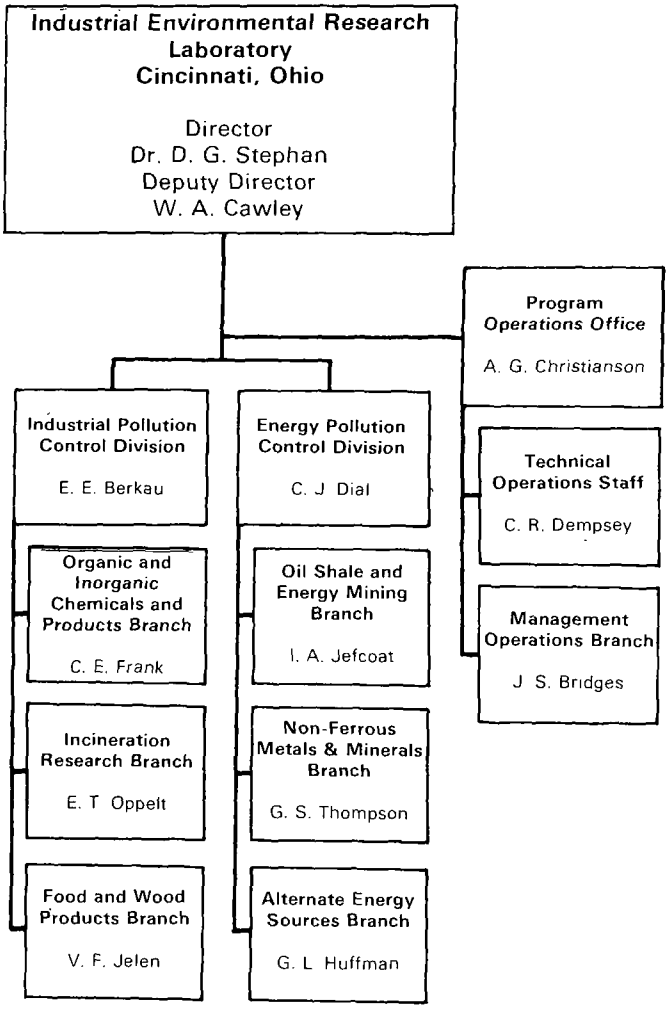
Technologist, National Lead Company of Ohio, Fernald, Ohio, 1952-1955

Professional Affiliations:

Air Pollution Control Association—past member
American Chemical Society
American Institute of Chemical Engineers
American Public Works Association
Federal Water Quality Association

International Association on Water Pollution Research (Governing Board)
Marine Technology Society (Director, 1970-1973)
Water Pollution Control Federation

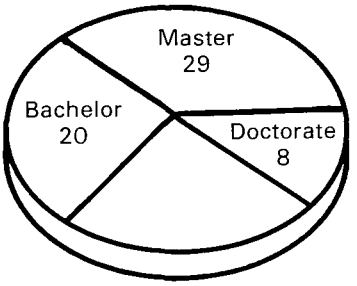
Honors: Diplomat, American Academy of Environmental Engineers
Registered Professional Engineer (Ohio)
Superior Service Award for Meritorious Achievement, DHEW (April 1965)
Distinguished Alumnus—College of Engineering, Ohio State University (March 1970)



FTS Telephone No. 684-4402
Commercial Telephone No. (513) 684-4402

Research Program Resources Summary ($1,000's)	FY 1979		FY 1980	
	In-House	Extramural	In-House	Extramural
	$3,838	$12,929	$4,084	$12,023

Personnel



Full-time EPA Personnel = 74

Recent Accomplishments

1. *Office of Research and Development Clean-Up Support of Chemical Waste*—Supported EPA Region III and Emergency Response Team with a massive cleanup effort in the Pittston, Pennsylvania area of a 670 mile-long oil slick. The oil slick was traced to a mine drainage tunnel located at Pittston and contained a mixture of industrial waste chemicals including dichlorobenzene and other toxic compounds. Over 500 on-site analyses were performed on board ORD's Mobile Spills Laboratory and the clean-up efforts were successful.

2. *U.S. Coast Guard Adopts IERL-Ci Developed Technology*—Provided U.S. Coast Guard with technology incorporating high pressure water jet concept into the U.S. Coast Guard skimmer design. The Coast Guard ZRV skimmer is now capable of operating at speeds between two or three times as fast as conventional skimmers, and the water jets will permit it to improve its oil collection rate an additional 80% as well.

3. *Closed Water Cycle Process Reduces Wastewater Discharge of Hardboard Industry*—Assessed and demonstrated a closed-cycle process that reduced wastewater discharges by a wet process hardboard manufacturing plant from 200,000 gallons per day to 5,000 gallons per day. Other hardboard plants and, potentially, insulation board

and non-chemical pulping plants should be able to achieve results similar to those demonstrated in this project by using this closed-cycle process.

4. *Mobile Regenerator for Granular Activated Carbon Developed*—Developed and operates a trailer-mounted system for in-field regeneration of granular activated carbon that has been used (*spent*) in the clean-up of hazardous material contaminated water from spills or abandoned hazardous waste disposal sites. This system produces regenerated carbon cost effectively and in an environmentally safe manner and, in particular, will make granular activated carbon available for immediate reuse for the EPA Environmental Emergency Response Unit.

5. *Control Action Guidance Videotape Produced on Friable Sprayed-On Asbestos-Containing Materials in Buildings*—Produced a videotape entitled *What Your School Can Do About Friable Asbestos-Containing Materials* which is a direct response to a request from the Office of Toxic Substances. The purpose of this 16 mm sound film is to alert school officials to the health hazards of airborne asbestos fibers and to provide guidance on various remedial actions.

6. *Sensitive Analytical Procedure Developed for the Analysis of Dioxins in IndustrialSludges*—Developed a high resolution gas chromatography/mass spectrometry analytical methodology for the determination of ultra trace levels (parts per trillion) of tetrachlorodibenzo-p-dioxins in diverse chemical samples, including industrial wastes, sediments, and process streams. This methodology will be useful to the Regions in determining the extent of dioxin contamination from chemical plants.

7. *Demonstration and Evaluation of the Use of Waterborne Coatings for the Wood Furniture Industry*—Developed and demonstrated a method for commercial production of wood furniture utilizing water-based as opposed to solvent-based finishes. Waterborne coatings are recognized by the industry and the Agency to be the most promising viable alternative for the high efficiency reduction of volatile organic compound emissions from the wood furniture industry.

8. *Optimized Baghouse Performance for Controlling Asbestos Fiber Emissions*—Evaluated baghouse performance with optimization of baghouse

operating parameters such as shake amplitude, shake duration and shake interval in achievement of several-fold improvements in baghouse fiber collection efficiency. It has been proven that baghouses with mass efficiencies of practically 100% emit large amounts of asbestos fibers. Thus, it is important to establish baghouse efficiency criteria which are specific to collection of asbestos fibers.

Research Program

1. *Industrial Processes—Water Quality*

   - Assess the magnitude of industrial pollution problems; the economic, environmental, and energy use efficiency of existing technologies; and the potential for developing new technologies. Research, develop and demonstrate technology necessary to reduce or eliminate the discharge of pollutants from material processing industrial point sources. Included are industries involved in the production of chemicals, textiles, pulp, paper, wood products, metal fabrication and metal finishing, nonferrous and mineral production, rubber, plastics, transportation equipment, and miscellaneous industries such as the laundry and dry cleaning industry.

2. *Fuel Processing, Preparation, and Advanced Combustion*

   - Assure that adequate pollution control technology is developed and evaluated for emerging energy processes by assessment of oil shale processing, synfuels from non-coal, *in situ* coal gasification as well as new emerging energy sources. Develop and demonstrate alternative cost-effective control methods for pollutant discharges from the emerging energy processes.

3. *Fuel Extraction*

   - Assess multi-media environmental impacts from oil and gas production, storage and transportation facilities, active and abandoned mining operations, transportation and beneficiation processes. Develop and demonstrate economic pollution control technology for these operations.

4. *Energy Assessment of Conventional and Advanced Energy Systems*

   - Evaluate environmental impacts of various energy conservation methods and advanced

energy systems under development by industry and other Federal agencies. Identify environmental problems associated with these processes and, subsequently develop and demonstrate economical means of pollutant control technology. Assure that the environmental, economic and social impacts of alternative energy supply and use patterns on regional and national levels are anticipated so that environmentally acceptable approaches to energy supply and use can be developed and implemented.

5. *Industrial Processes—Air Quality*

- Assess industrial air pollution emissions and develop and demonstrate pollution control technologies capable of reducing or eliminating potentially hazardous and toxic pollutant emissions from industrial point sources. Develop technical and cost data bases which support regulatory standards development and provide industries such as chemical processing, agrichemicals, textiles, pulp and paper, metal fabrication and finishing, metal and minerals production, petroleum refining, and storage segments, as well as those emissions resulting from hazardous material incidents with environmental control options.

6. *Solid Waste Control Technology (Industrial)*

- Develop cost-effective technology for elimination of detrimental environmental effects from materials released into the environment from disposal of solid and hazardous industrial wastes, develop improved methods for the recovery of resources, including energy; develop methods to minimize environmental impacts of land disposal sites, develop and demonstrate environmentally acceptable means of disposal of industrial waste treatment sludges. Assess, develop and demonstrate methods to prevent and control environmental damage created by solid wastes from general mining activities; demonstrate technology for environmentally acceptable management of non-ferrous smelter residues.

7. *Industrial Processes—Toxics*

- Identify and quantify toxic pollutants from industrial point sources. Evaluate process

alternatives in terms of environmental acceptability based on toxic pollutant criteria. Provide technical assistance and assessments of toxic substances as impurities in commercially available chemicals. Provide assistance on matters of process chemistry on the synthesis of toxic substances. Provide evaluations of the potential for substituting less toxic material for toxic components.

Municipal Environmental Research Laboratory

Cincinnati, Ohio

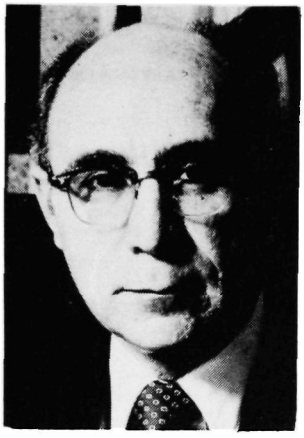
Mission

Develop technology, systems, processes and improved management practices to prevent, control and treat pollutants that affect communities and municipalities. Included are the development and demonstration of cost-effective methods in the areas of sewage and wastewaters, solid and hazardous wastes, and public drinking water supplies. Specific activities are to:

- Develop and demonstrate new and improved technology to control, treat and/or prevent a wide variety of pollutants, including the wastewaters from the sanitary sewage, storm and combined sewer flows, and runoff and industrial wastewaters discharged into municipal sewers.

- Develop new and improved technology for collection, transportation practices, processing and disposal, and recovery of valuable resources from solid and hazardous wastes.

- Develop technology to maintain and improve drinking water supplies and distribution systems. Included are better methods for the control and removal of contaminants, the prevention of water quality deterioration during storage and distribution, and research to lower the cost of producing and distributing drinking water.



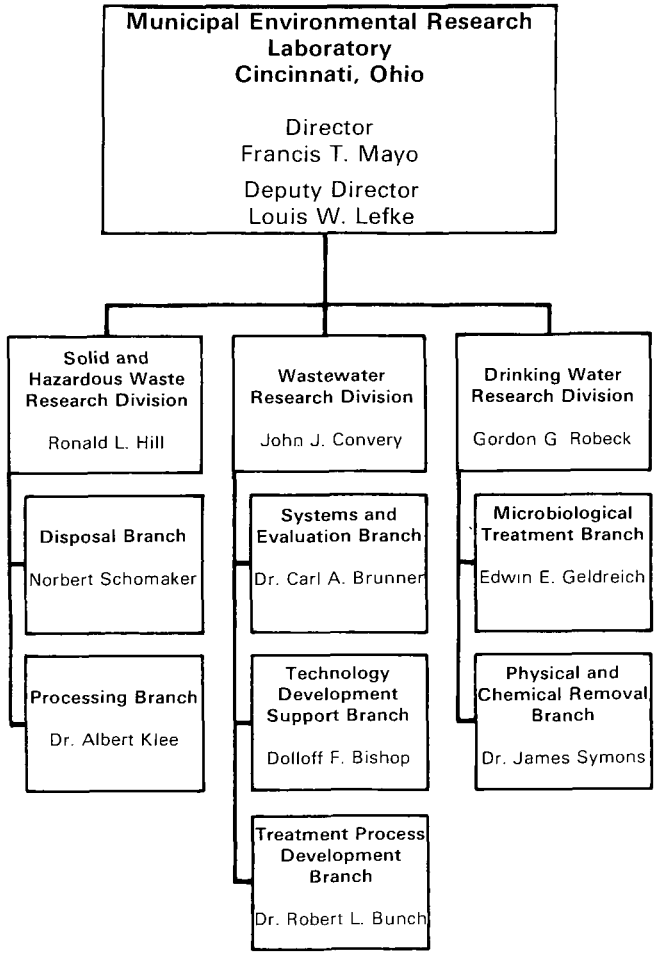
Francis T. Mayo **Director, Municipal Environmental Research Laboratory—Cincinnati, Ohio**

Education: University of Utah—B.S. (Civil Engineering) 1950

Professional Experience:
Director, Municipal Environmental Research Laboratory, 1976-Present
Regional Administrator, EPA, Region V, 1970-1976
Director, Division of Planning and Interagency Programs, Federal Water Quality Administration, 1968-1970
Regional Enforcement Representative, San Francisco Regional Office, Federal Water Pollution Control Administration, 1966-1968
Chief, Water Resources Division, Utah State Engineer's Office, 1952-1966
U.S. Geological Survey, Salt Lake City, 1950-1952

Professional Affiliations:
Registered Professional Engineer, State of Utah
Alternate Commissioner, Great Lakes Basin Commission, 1970
Commissioner, Great Lakes Basin Commission, 1971-1976
U.S. Co-Chairman, Great Lakes Water Quality Advisory Board, International Joint Commission, 1971-1976
Commissioner, Ohio River Basin Commission, 1971-1976
Commissioner, Upper Mississippi River Basin Commission, 1972-1975
Commissioner, Ohio River Valley Water Sanitation Commission, 1972-1976
American Water Works Association
Water Pollution Control Federation

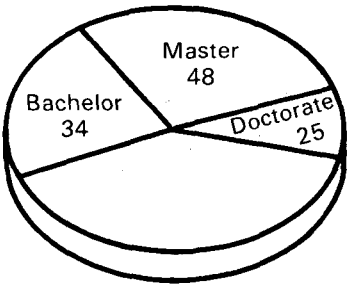
Honors: Chi Epsilon (Civil Engineering Honorary)
Tau Beta Pi (Engineering Honorary)
Distinguished Alumnus 1977, Department of Civil Engineering, University of Utah



FTS Telephone No. 684-7951
Commercial Telephone No. (513) 684-7951

Research Program Resources Summary ($1,000's)	FY 1979		FY 1980	
	In-House	Extramural	In-House	Extramural
	$7,194	$25,204	$7,136	$18,705

Personnel



Full-time EPA Personnel = 161

Recent Accomplishment

1. *Improvement in the Agency's Proposed Hazardous Waste Regulations*—Incorporated and integrated the latest research knowledge into the Agency's proposed hazardous waste regulations. Four MERL experts were named by Mr. Costle to assist the Office of Solid Waste with hazardous waste regulation development to meet a court-imposed deadline. Their contributions resulted in a complete revision of the basic approach to the regulatory management of hazardous wastes from a static, fixed posture to a dynamic one.

2. *Giardiasis Reports Produced*—Produced a number of reports dealing with the removal or inactivation of *Giardia lamblia* cysts by water treatment processes. Giardiasis, the disease caused by the protozoan microorganism has been the most common waterborne disease in the U.S. for the last several years. The reports include information on the survival of cysts in water, inactivation by chlorine, the efficiency of water filtration processes for cyst removal, and publication of the proceedings of a symposium on the waterborne transmission of giardiasis.

3. *Land Application of Sludge*—Demonstrated that municipalities and farmers are natural partners and mutual benficiaries of a system of responsible and well-managed land application of sludge.

Since 1977 the Ohio Farm Bureau has worked with MERL to promote the economical and safe disposal of sewage sludge on the land. The success of this project will serve as a model for future land application practices.

4. *Cost of Water Supply Treatment Processes*—Compiled and published a four-volume report on the cost of water supply treatment processes. The document contains costs for 99 unit processes and provides examples of how cost analyses can be conducted. It shows typical flowcharts for several of the processes, and offers help for efficient use of the data with the computer.

5. *Compliance with Hazardous Waste Regulations Delineation*—Completed two major protocols for complying with hazardous waste regulations. One protocol deals with linear technology; the other with chemical fixation. They will be used by permit writers, consultants and landfill operators in the selection of appropriate lining materials and fixation techniques for their specific needs.

6. *Techniques for Removal of Organic Solvents from Drinking Water*—Provided important information on the usefulness of treatment techniques such as aeration and adsorption for removing organic solvents from drinking water. The increasing incidence of ground water contamination prompted several cooperative pilot scale studies with the U.S. Air Force, and with water utilities on the east coast.

7. *Point-of-Use Water Treatment Devices*—Reported on tests of four commercially available point-of-use water treatment devices which claimed to remove organics from drinking water. The report indicates that the removal of chemicals such as chlorine and trihalomethanes by these devices is marginal, and that the growth of microorganisms in the filters sometimes result in higher bacterial populations in the effluent than in the influent water.

8. *Sludge Treatment and Disposal Design Manual*—Updated revised, and expanded the EPA's design manual on Sludge Treatment and Disposal to fulfill the pressing needs of the Regional Offices and consulting engineers. Four thousand copies were distributed at the annual meeting of the Water Pollution Control Federation in October 1979.

9. *Thermal Decomposition—Analytical System*—Designed, assembled and successfully tested a thermal decomposition analytical system to provide preuse and accurate thermal decomposition data for a wide variety of organic materials. This laboratory system will be able to test small amounts of toxics and other organic substances to determine fundamental decomposition data economically and on a quick response basis.

10. *Implementation of the Innovative and Alternative Technology Program*—Established a special five-man Technical Support Group to help the Regional Construction Grants Offices implement the Innovative and Alternative Technology Program. Developed and presented numerous I&A Technology Assessment Seminars for Federal/State personnel and consulting engineers.

11. *Design Procedure for Wastewater Systems*—Developed a computer-aided design procedure for the preliminary synthesis and evaluation of wastewater treatment and sludge disposal systems. It permits the designer to identify the combination of treatment processes and disposal options that will best meet stated criteria on effluent quality, cost/energy consumption, land utilization and subjective undesirability. The procedure has been used to analyze cost and energy trade-offs for a problem containing over 15,000 alternative system configurations.

12. *Alcohol as Fuel*—Developed methods for converting waste to sugar for production of alcohol as fuel. The most promising approach involves conversion of waste cellulose (paper, newsprint, crop wastes, etc.) into glucose by the acid hydrolosis process followed by conventional glucose fermentation to ethyl alcohol. Alcohol production from waste for use as gasoline extender appears to be more economically attractive than current practices of producing alcohol from agricultural grain crops.

13. *Innovative and Alternative Technology Asssessment Manual*—This document will be the major guidance and information document to support the Agency's three-year Innovative and Alternative Technology Program. It contains cost, performance, design and energy information on 117 municipal treatment technologies.

14. *Water Filtration of Asbestos*—Prepared a report on asbestos fiber removal by water filtration. This report brings together the available information on water filtration for removal of asbestos fibers. On the basis of available data, we can conclude that when water is conditioned properly before filtration and the turbidity of the water is 0.10 ntu or lower after filtration, the asbestiform fiber count of the water will generally be in the low range of 10^4 to 10^5 fibers per liter, if fibers are detected in the finished water.

15. *Construction of a Pollution Control Technology Test and Evaluation Facility in Cincinnati, Ohio*—Designed for maximum flexibility, a wide variety of sewage and sludges are piped in the building and can be made available at any of 16 stations distributed around the 25,000 square foot, two story high experimental area. Mixtures of industrial and municipal wastes are available. Current work includes the fate of priority pollutants in conventional sewerage systems for the office of Water Planning and Standards.

16. *Viral Presence in Drinking Water*—Provided the Office of Drinking Water with a report on the presence of viruses in drinking water. MERL's participation in a Report to Congress on virus contamination of water contributed to the scientific base for describing the current status of the problem of viruses and drinking water, and recommends specific areas in which further research is needed.

17. *Carbon Reactivation in an Electric Furnace*—Evaluated an electric furnace to show that granular carbon could be reactivated effectively and economically. Two reactivation cycles were completed at a filtration plant during 1979 using an infrared tunnel furnace. The exhausted activated carbon was restored to near-virgin conditions (less than 5% loss in volume), and the costs were very competitive with fossil fuel furnaces. The project was designed to give the Office of Drinking Water supportive data for a treatment regulation on controlling trace organics at water treatment plants vulnerable to upstream industrial waste discharges.

18. *National O&M Cause and Effect Survey*—Completed a national O&M cause and effect survey, the first large-scale research effort to identify and quantify specific cause and effect relationships in problems of performance,

operation and maintenance of biological wastewater treatment plants. Prepared a user-oriented field manual to help implement composite correction programs.

19. *Field Study to Document the Cost-effectiveness of Water Treatment Package Plants*—Results indicate that, with proper operation, package treatment plants can remove a wide range of contaminants. Two reports are being prepared. One deals with the results from the field data and is centered around removal efficiency. The other is a detailed examination of the economics of the small utilities, their package plant system, and cost performance relationships.

20. *Small Water Supply Systems Study*—Compiled and published a two-volume report containing results from the small water supply systems study. An economic impact analysis in which incremental treatment trains were added to an existing system revealed that small water systems costs could more than double under certain conditions. These results have significance for EPA in implementing the Safe Drinking Water Act in small utilities.

Research Program

1. *Drinking Water Supplies and Treatment Systems*

   - Physical and Chemical Contaminants. Organic contaminants, inorganic contaminants, particulate contaminants, economic analysis, and distribution system water quality are five major areas of research. Conduct laboratory and pilot scale studies to establish drinking water standards.

   - Control of Microbiological Contaminants. Develop information and methodology to combat waterborne disease and deleterious effects on the water and its distribution system. Emphasis is on enteric viruses, *Giardia lamblia,* alternate disinfection methodology, and growth of microorganisms in storage and distribution systems.

2. *Urban Systems and Residuals Management*

   - Municipal Sludge Management. Includes: processing and treatment to separate insoluble and adsorbed impurities; pathogenic organisms, and toxic substances from the

water phase; the conversion of these to more acceptable forms; the disposal of residues, most often on the land. Most recent intensive interest is in land application management and disposal.

- Wastewater Treatment Technology Reliability Energy and Cost-Effectiveness. Develop improved operating and maintenance practices and instrument control systems. Published surveyed O & M information in the form of guidance documents.

- Toxics Control. Effect control of toxic materials in the wastewater treatment cycle at the source, as pretreatment, within plants, or in residuals management.

3. *Solid and Hazardous Waste Management*

- Landfilling Solid Waste. Develop information on disposal site location, design, operation, and closure procedures to minimize environmental impacts due to landfills.

- Alternative Methods of Waste Residual Disposal to Land. Evaluate land cultivation, waste spreading, underground storage, deep well injection, and disposal in coastal areas as alternatives to landfilling.

- Minimizing the Environmental Impact of Unacceptable Land Disposal Sites. Generate guidance documents to assist users in selecting landfill sites where gas and leachate pollution may be minimized, and provide technology for remedial action at unacceptable inoperative land disposal sites.

- Processing/Treatment of Hazardous Materials. Develop disposal techniques for pesticides and other hazardous wastes. Emphasis is on such methods as direct disposal through encapsulation, incineration, irradiation, and biodegradation.

- Recovery and Reuse of Waste Materials. Develop and evaluate technology for recovering materials and energy from solid waste and pursue means of assisting communities to overcome the institutional, marketing, waste source and economic uncertainties associated with implementing resource recovery programs.

4. *Wastewater Systems Control Technology*

- New Treatment Alternatives for NPDES Requirements. Develop pilot plant testing and demonstrations to implement new and upgraded technology; e.g., for effluent disinfection, control of nutrient and hazardous organics, upgrading of existing plants, and new biological systems.

- Reuse of Municipal Wastewater Effluent. Demonstrate the feasibility and practicability of reusing wastewater for both potable and non-potable purposes, emphasizing direct reuse, surface and groundwater recharge, and source substitution to conserve high quality supplies.

- Small Wastewater Flows. Develop new and upgraded technologies for improved treatment and disposal of wastewaters from individual homes, rural communities, and recreational sources.

- Combined Sewer Overflow. Improve wet weather decision making techniques through the collection and analysis of assessment information from project performance and cost data. Determine the relative sensitivity of various receiving waters.

- Urban Stormwater Impact Quantification and Technology Development. Working with other programs (208, 108, 314, etc.) and Federal Agencies, assess and determine relative sensitivity of various receiving waters. Evaluate cost-effectiveness of semistructural methods and non-structural management practices.

5. *Acid Rain (Anticipatory) Research*

- Determine the scope of acid rain impacts on the nation's drinking water systems. Predict where acid rain may have important impacts in the future. Estimate the nature and extent of remedial action necessary to correct the problem.

Environmental Sciences Research Laboratory

Research Triangle Park, North Carolina

Mission

Determine the effects of air pollution on urban, regional, and global atmospheres and the subsequent impact on air and water quality and land use. Knowledge gained is used to develop the technical basis for air pollution control strategies. Specific activities are to:

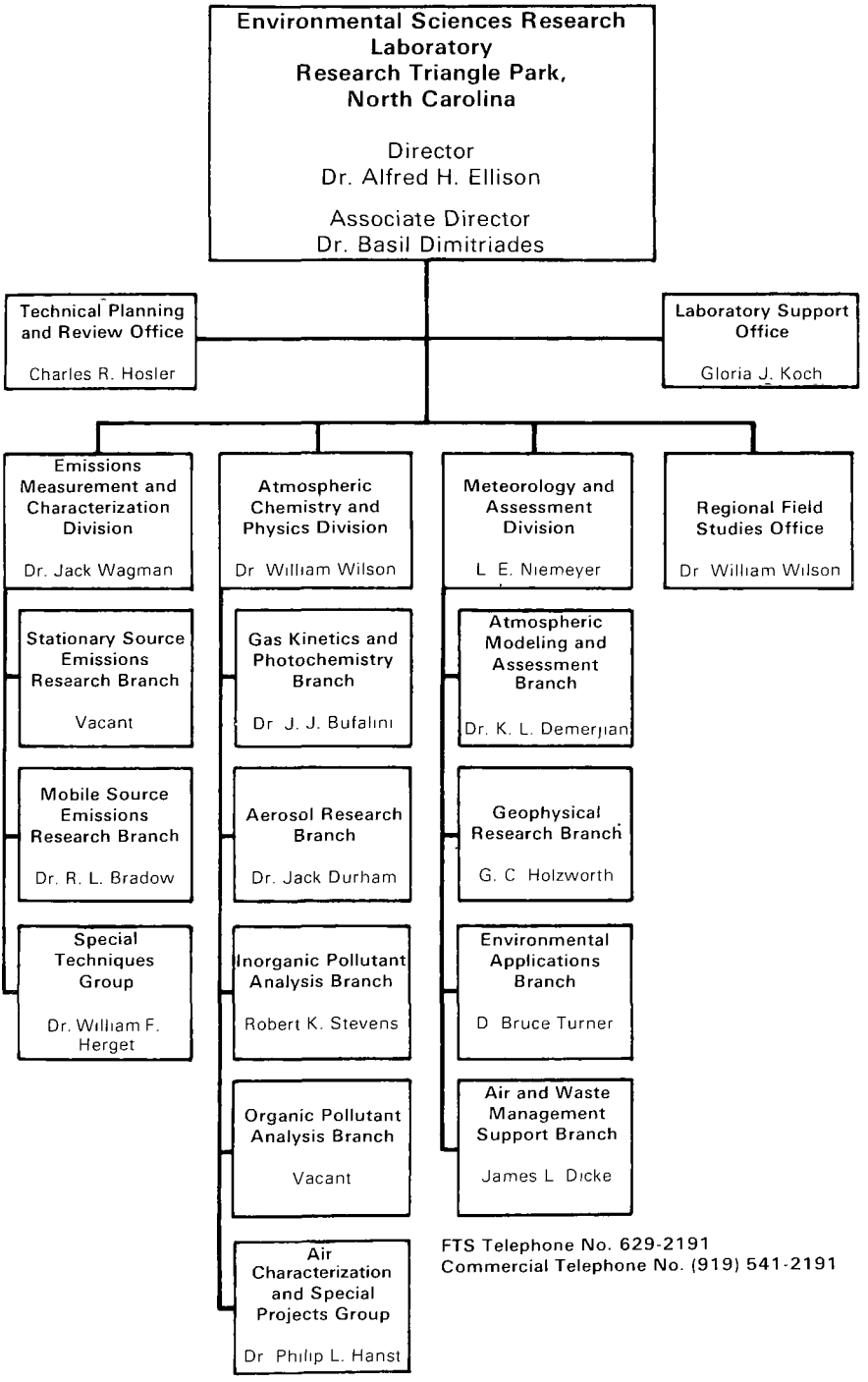
- Develop techniques, methods, and instruments for the identification and measurement of pollutants and toxic substances, in stationary and mobile source emissions, and in the ambient air.
- Measure and characterize stationary and mobile source emissions from existing and new sources.
- Characterize gaseous and aerosol pollutants and toxic substances in ambient air by identifying sources, determining reaction rates and mechanisms of chemical transformations (formation and removal) of pollutants during transport.
- Assess the effects of airborne pollutants on visibility, materials, weather and climate.
- Develop air quality simulation models and apply dispersion, transport, and concentration models used for relating source emissions and air quality, and for forecasting potential pollution crises.

Alfred H. Ellison **Director, Environmental Sciences Research Laboratory—Research Triangle Park, North Carolina**

Education:
Boston College—B.S., 1950
Tufts College—M.S., 1951
Georgetown University—Ph.D., 1956

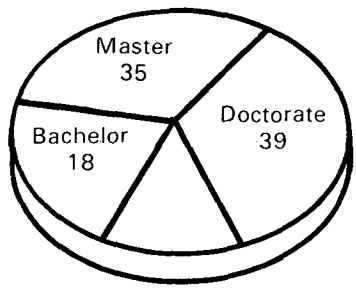
Professional Experience:
Director, Environmental Sciences Research Laboratory, 1979-Present
Deputy Director, Environmental Sciences Research Laboratory, Research Triangle Park, NC, 1975-1979
Deputy Director, Chemistry and Physics Laboratory, EPA, Research Triangle Park, NC, 1969-1975
Assistant Manager, Harris Research Laboratories Division, Gillette Research Institute, 1965-1969
Research Chemist, Texaco Research Center, 1956-1965
Research Chemist, Naval Research Laboratory, 1951-1956

Professional Affiliations:
American Chemical Society
Air Pollution Control Association
American Association for the Advancement of Science


Environmental Sciences Research Laboratory
Research Triangle Park, North Carolina
Director
Dr. Alfred H. Ellison
Associate Director
Dr. Basil Dimitriades
Technical Planning and Review Office
Charles R. Hosler
Laboratory Support Office
Gloria J. Koch
Emissions Measurement and Characterization Division
Dr. Jack Wagman
Stationary Source Emissions Research Branch
Vacant
Mobile Source Emissions Research Branch
Dr. R. L. Bradow
Special Techniques Group
Dr. William F. Herget
Atmospheric Chemistry and Physics Division
Dr William Wilson
Gas Kinetics and Photochemistry Branch
Dr J. J. Bufalini
Aerosol Research Branch
Dr. Jack Durham
Inorganic Pollutant Analysis Branch
Robert K. Stevens
Organic Pollutant Analysis Branch
Vacant
Air Characterization and Special Projects Group
Dr Philip L. Hanst
Meteorology and Assessment Division
L E. Niemeyer
Atmospheric Modeling and Assessment Branch
Dr. K. L. Demerjian
Geophysical Research Branch
G. C Holzworth
Environmental Applications Branch
D Bruce Turner
Air and Waste Management Support Branch
James L Dicke
Regional Field Studies Office
Dr William Wilson
FTS Telephone No. 629-2191
Commercial Telephone No. (919) 541-2191

Research Program Resources Summary ($1,000's)	FY 1979		FY 1980	
	In-House	Extramural	In-House	Extramural
	$5,559	$17,321	$5,979	$21,120

Personnel



Full-time EPA Personnel = 107

Recent Accomplishments

1. *Graphite/Epoxy Composite Study*—Determined that the disposal of graphite/epoxy composite waste materials by conventional refuse incineration would result in the release of large amounts of both intact and partly degraded graphite fibers; determined that dusts generated by sawing or drilling graphite/epoxy composites contain a significant number of fibers free of the resin matrix, with the possible generation of more respirable fiber fragments with diameters less than those (6-8 μm) produced during the fiber manufacturing process.

2. *Dohrman DC-50 Analyzer Test*—Successfully completed the performance testing at a maleic anhydride plant of a Dohrman DC-50 analyzer, for measuring nonmethane organic carbon emissions from chemical and petrochemical industries.

3. *In-Stack Diffusion Particle Size Classifier*—Successfully field tested a newly developed in-stack diffusion particle size classifier at an oil-fired power plant and in a jet engine test cell. The device separates submicron particles into four size fractions with cut points of 0.03, 0.05, 0.1, and 0.2 μm.

4. *Sulfuric Acid Vapor Monitor*—Developed and successfully field tested a prototype *in-situ* sulfuric acid vapor monitor, capable of selective

monitoring real time concentrations of sulfuric acid vapor in stack gas emissions.

5. *Regional Air Pollution Study*—Documented the Regional Air Pollution Study (RAPS), conducted in the St. Louis Air Quality Control region during 1973-78. Report includes descriptions of nearly all RAPS and related investigations conducted, as well as locally operated air quality and meteorological networks.

6. *Aerosol Characterization*—Documented the characterization of atmospheric visibility—reducing aerosols in the Southwestern U.S. under Project VISTA.

7. *Halocarbon Distribution*—Measured the global atmospheric distributions of a large number of halocarbons over a three-year period to show that CH3 may be a potential depletor of stratospheric ozone, due to its long residence time in the atmosphere.

8. *Carcinogenic Compounds*—Identified 20 potential atmospheric carcinogenic compounds for calculating probable locations of maximum carcinogenic pollution concentration, based on source emisisons, site locations, and climatology.

9. *CO Monitor*—Documented the application of a new CO monitor for ambient air measurements. The gas filter correlation instrument, designed for the RAPS, has been used in nine separate studies to document extreme variability of atmospheric concentrations of CO in urban environments.

10. *User's Guide for RAM*—Issued a system of efficient Gaussian-plume multiple-source air quality algorithms and also primary algorithms for urban areas. These algorithms can be used for estimating air quality concentrations of relatively nonreactive pollutants for averaging times from an hour to a day, from point and area sources.

Research Program

1. *Atmospheric Chemical and Meteorological Processes and Effects*

   - Develop, evaluate and validate air quality simulation models for predicting and describing air quality impacts anticipated from various control abatement strategies.

- Determine the sources and sinks, kinetics of formation and removal and chemical/physical interactions of airborne gaseous and particulate matter.

- Quantify the atmospheric effects of air pollutants on visibility degradation, local climate, and materials.

2. *Air Pollution Characterization and Measurement*

   - Develop new and/or improved methodology and instrumentation technology for measuring air pollutants in ambient air and from stationary and mobile sources.

   - Identify and characterize emissions from stationary and mobile sources.

   - Characterize urban-rural ambient pollutants and identify sources.

   - Determine the concentration and size distributions of carbon fibers released to the atmosphere and develop an adequate measurement technology for their monitoring.

3. *Fate and Effects of Toxic Substances*

   - Develop and evaluate a model capable of predicting the exposure of population groups to organic toxic substances from specific sources.

   - Describe the transformation of toxic organics in ambient air, including the reaction mechanisms of brominated and chlorinated substances.

   - Determine the persistence of specific toxic chemicals in the atmosphere.

   - Develop models for defining concentration of toxic chemicals in air.

4. *Characterization and Methods Development for Toxic Substances in the Environment*

   - Characterize toxic organics from samples collected to evaluate exposure near selected sources.

- Develop improved separation techniques and methodologies for analysis of airborne toxic substances.

- Develop new detectors for high pressure liquid chromatography.

5. *Air Exposures and Their Effects: Diesel Emissions Research*

   - Characterize the emissions from in-use diesel vehicles to provide emission factors for mutagens, particles, and harmful gases from consumer-owned diesel passenger cars.

   - Develop an improved model for estimating the exposure of the commuting population to atmospheric pollutants from gasoline and diesel powered motor vehicles.

6. *Transport and Fate of Energy-Related Pollutants in Ecosystems*

   - Determine the impact of Western energy resource development on regional visibility.

   - Conduct smog chamber and field studies to assess the atmospheric transport and chemistry of emissions from second generation fossil fuel technology facilities and from new energy technologies.

   - Assess the transport and transformation of secondary fine particulates, sulfates, and nitric acid aerosols from conventional power plants equipped with various control devices.

   - Assess the chemical and physical characterization and distributions of nitrate/nitric acid aerosols in areas of the Eastern United States subject to sources originating from the Ohio River Valley.

7. *Energy-Related Pollutant Measurement and Instrument Development*

   - Develop analytical methods and instrumentation for measuring energy-related pollutants in ambient air, particularly for fine particulate sulfate.

   - Identify, measure, and characterize the inorganic compounds, high molecular weight organic compounds, and hydrocarbons in

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emissions from power plants, oil refineries, coal gasification, and liquefaction plants.

8. *Anticipatory Research—Acid Precipitation*

- Development, validation and application of regional-scale atmospheric model to examine the impact of acid precipitation on the Eastern United States.

- Support to U.S. Department of Agriculture rain sites in their program to measure atmospheric concentrations of acids, gases and aerosols.

Robert S. Kerr Environmental Research Laboratory

Ada, Oklahoma

Mission

Conduct research, development, and demonstration activities related to ground water, treatment of waste water with soil and other natural systems, irrigated agriculture, animal production, petroleum refining, the petrochemical industry, and treatment of combined industrial or mixed industrial and municipal wastes. Specifically the Laboratory's function is to:

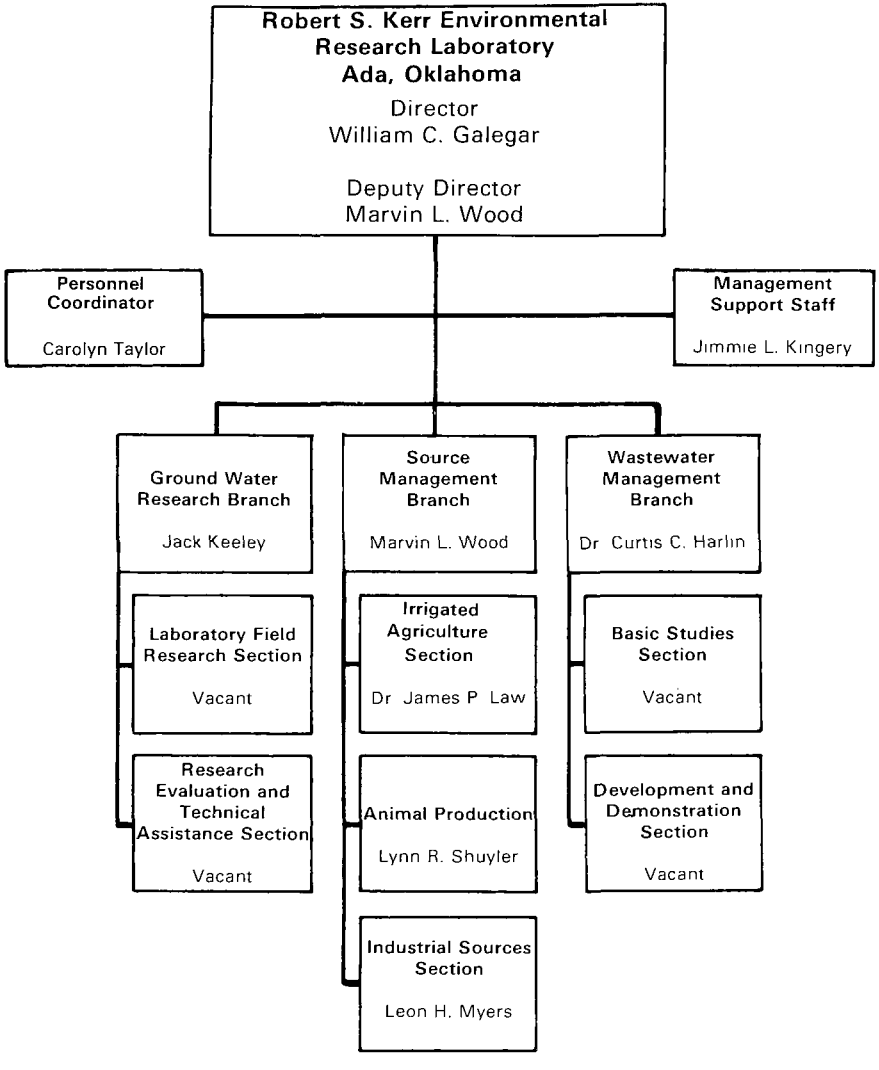
- Provide EPA with management techniques and treatment and control technology to reduce or prevent pollution and environmental exposure to toxic and hazardous materials.
- Provide EPA with social, economic, and institutional assessments relative to technological developments.
- Provide EPA with basic data for the establishment of guidelines, standards, and criteria.
- Provide technical assistance and support to EPA Program and Regional Offices.

William C. Galegar **Director, Robert S. Kerr Environmental Research Laboratory—Ada, Oklahoma**

Education:
University of Oklahoma—B.S., 1949
University of Oklahoma—M.S. (Chemical Engineering) 1953
Federal Executive Institute

Professional Experience:
Director, Robert S. Kerr Environmental Research Laboratory, 1970-Present
Regional Director, South Central Region, FWPCA, Dallas, Texas, 1967-1970
Director, Robert S. Kerr Water Research Center, FWPCA, Ada, Oklahoma, 1966-1967
Detailed to Washington, D.C. to establish and coordinate water pollution control activities with all other Federal agencies and departments for FWPCA, 1965-1966
Water Quality Enforcement Section, Dallas Regional Office of the Public Health Service, Dallas, Texas, 1963-1965
Deputy Director, Arkansas-Red River Basin Water Quality Conservation Project, 1960-1962
Lecturer in Occupational Health at the School of Medicine, University of Oklahoma, 1954-1960
Engineer, Oklahoma State Department of Health, 1949-1960

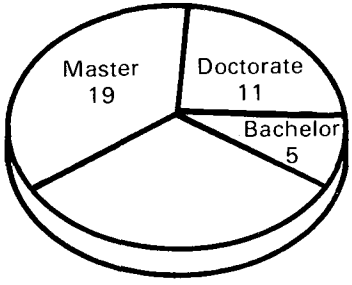
Professional Affiliations:
Diplomat in Engineering, American Academy of Environmental Engineers
Registered Professional Engineer
Sigma Xi



FTS Telephone No. 743-2224
Commercial Telephone No. (405) 332-8800

Research Program Resources Summary ($1,000's)	FY 1979		FY 1980	
	In-House	Extramural	In-House	Extramural
	$2,446	$3,628	$2,914	$3,852

Personnel



Full-time EPA Personnel = 55

Recent Accomplishments

1. *Ground-Water Aspects of Hazardous Waste Disposal Regulations*—Hazardous Waste Disposal Regulations have been under consideration for approximately one year. Recent directives by OWWM have required that the regulations for hazardous waste disposal be in first draft by November 21. A draft of this segment of the regulations has been submitted to OSW to be included in the revised RCRA regulations.

2. *Determination of Reliability of Hydrogeologic Data Associated with Industrial Dumps in the Niagara Falls Area*—Techniques used April 18-19, 1979, at the Hyde Park site make the validity and usability of the data highly questionable. Other data generated by the investigation will be used in litigation brought by EPA against industries operating the industrial dumps. It is anticipated that such litigation, scheduled for early 1980, will require expert testimony from members of the Ground Water Research Branch.

3. *Cooperative Agreement to Evaluate Nonpoint Source Control Measures for the West Branch Delaware River, MIP, Delaware County, New York*—The overall purpose is to: verify whether the controls being installed do contribute to specific water quality improvement in the WBDR; assess the effectiveness of specific NPS controls for

water quality improvement; and attempt to identify the costs and water quality benefits associated with specific NPS controls to better understand the relative cost effectiveness of the controls. The NPS controls are important because they are to reduce the phosphorus and other nutrient loads to the autrophic Cannonsville Reservoir. This study will be conducted by Cornell and the New York Department of Environmental Control and will use data generated by the other research studies to verify less costly evaluation procedures to be used on other MIP and RCWP sites throughout the U.S.

4. *Applied Research Study at an Animal Pharmaceutical Plant in Charles City, Iowa*—The plant is unique in that it produces only pharmaceuticals for animal husbandry application. Their predominant waste problem consists of discharging high concentrations of arsenic, orthonitroaniline, 2-nitrophenol, 4-nitrophenol, phenol, 1,1-dichloroethylene, and 1,1,2-trichloroethane to the POTW in Charles City, Iowa. The results of the study were forwarded to Region VII and Effluent Guidelines Division. A meeting will be held in Kansas City to review the data obtained in recommended levels of attainment for a discharge permit.

5. *Publication of the Report, Potential Effects of Irrigation Practices on Crop Yields in Grand Valley* (EPA-600/2-79-149)—The study involved an analytical method to determine the economically optimal seasonal depth of irrigation water to apply under conditions of both plentiful and limited water supply. Corn and wheat were grown on research plots under different irrigation regimes to determine the effects of stress on crop yields at different stages of plant growth.

6. *Publication of the Report, Irrigation Practices and Return Flow Salinity in Grand Valley* (EPA-600/2-79-148)—The study was undertaken to evaluate the effects of the volume of leachate on the quality of the leachate from field research plots. A numerical model of salt transport was used in a series of hypothetical simulations following the testing and calibration of the model to Grand Valley conditions.

7. *Publication of the Report, Evaluation of a Hydrosalinity Model of Irrigation Return Flow Water Quality in the Mesilla Valley, New Mexico* (EPA-600/2-79-173)—The Mesilla Valley lies

along the Rio Grande River in southern New Mexico and encompasses about 40,500 hectares of irrigated land below Elephant Butte Reservoir. The model, a multi-cell, lumped parameter model of irrigation-related water quality, simulates diversions and pumping to meet irrigation needs, irrigation return flows, chemical transformations in the soil, and mixing in groundwater reservoirs.

8. *Publication of the Report, Achieving Irrigation Return Flow Quality Control Through Improved Legal Systems* (EPA-600/2-78-184)—The study developed legal alternatives that will facilitate the implementation of improved water management technologies developed to reduce and control pollutants emanating from agricultural uses of water and other primary inputs to irrigated crop production. Recommendations for Federal and State activities to achieve irrigation return flow quality control include an action program termed the *influent control approach*. The basic and required components of such a program are outlined and discussed.

9. *Evaluation of Filter Feeding Fishes for Removing Excessive Nutrients and Algae from Wastewater*—Experiments involved silver carp and bighead carp (exotic filter feeding finfish). Results indicate that this process has good potential for application in the treatment of municipal wastewater.

10. *Proposition of a Report Summarizing Results of Studies of Long-Term Effects of Four Rapid-Infiltration Systems*—This report will make the data from these studies more usable for the user community rather than requiring the analysis of the four separate project reports by individual designers and planners. The report will also provide input for the revision of the Land Treatment Process Design Manual.

11. *Development of a New Design Rationale for Rapid-Infiltration Systems*—In addition to hydraulic acceptability of the most restrictive layer, the rationale includes certain water quality parameters which can also be limiting. Parameters considered include sodium absorption ratio, biological oxygen demand, suspended solids, ammonia, nitrate, and phosphorus.

12. *Publication of Volume VI of Livestock and the Environment*—This bibliography on animal waste management now contains 5300 articles. These

deal with all phases of waste management and pollution control from livestock production enterprises, including range and pasture conditions.

13. *Publication of Animal Waste Utilization on Cropland and Pastureland*—This document was prepared jointly with USDA, SER, FR for use by 208 planners, RCWP project planners, and USDA farm planners. It allows the planner to evaluate the effectiveness of various BMP's on water quality leaving the farm.

14. *Publication of an ERL-Ada/Effluent Guidelines Evaluation Report Entitled Indicatory Fate Study* (EPA 600/2-79-175)—The purpose of the study was to indicate the media disposition of selected priority pollutants through industrial biological treatment systems. Twelve plant sites representing organics and plastics, pharmaceuticals, pesticides, rubber, wood-preservative and petroleum refining industries, were evaluated.

15. *Distribution of an Extramural Report, Treatment of Organic Chemical Manufacturing Wastewater for Reuse*—Union Carbide conducted the study at its facility in Ponce, Puerto Rico, where there is an inadequate water supply. Biologically treated effluent was treated by flocculation, filtration, activated carbon, deionizer, and reverse osmosis. Product water for each step was evaluated for cooling water or boiler water.

16. *Establishment of an Anticipatory Research Institutional Center for Groundwater Quality Research*—At a consortium of Oklahoma, Oklahoma State, and Rice Universities, principal research areas are transport and fate of pollutants, subsurface characterization, and methods development.

17. *Preliminary Laboratory Evaluation of the Transport and Transformation in a Soil Profile of Approximately 20 Priority Organic Pollutants*—The information gained should permit a preliminary evaluation of the probable impact on ground-water of releasing such compounds to the soil, and is particularly needed to assess the probable consequences of chlorinating wastewater prior to land application and of releasing chlorinated organic products such as septic tank cleaners into cesspools and septic systems.

18. *Development of Protocol to Determine Radius of Influence of Waste Disposal Wells to Support the Underground Injection Control Regulations of the Safe Drinking Water Act*

Research Program

1. *Ground Water*

- Develop methods for making ground water quality investigations.
- Develop guidance documents for ground water pollution source control decision making.
- Develop predictive models for estimating the transport and transformation of contamination in the subsurface.
- Develop educational and informational materials on ground water protection for the use of ground water managers and regulators.

2. *Renewable Resources*

- Develop and field evaluate fundamental technologies required for full-scale pollution control programs in irrigated areas.
- Assess effectiveness of structural improvements in irrigation systems, of improved on-farm water management practices, and of new concepts relating to solute movement and storage in soil profiles.
- Develop analytical methodology to evaluate legal, social, economic and other institutional factors acting as deterrents to water management reform and implementation of irrigation return flow quality controls.
- Develop manuals and guidance for recommended management practices to control irrigation return flow pollutants, including cost-effectiveness.
- Develop mathematical models capable of predicting irrigation return flow quality based on physical/chemical/biological processes in irrigated soils.
- Verify under field conditions the predictive capability of the models when applied to areas of widely different soils and climatic characteristics.

- Develop data base required for adequate verification of the models.

- Develop management models which integrate on-farm water management methods and treatment technology, including cost-effective and optimization techniques.

- Quantify physical and chemical spatial variability functions to improve predictive capabilities.

- Develop and demonstrate the feasibility, applicability, effectiveness, and economics of treatment and/or control technologies for abating pollution from the animal production industry.

3. *Wastewater*

   - Define technological factors for design, construction, and operation of land application and aquaculture systems for municipal wastewater treatment and reuse.

   - Develop criteria to maximize treatment and management capabilities to these systems and to minimize or eliminate health risks and adverse long-term effects on the soil, ground water, surface waters, and other environmental components.

   - Identify the most beneficial system selection to achieve optimum reuse of nutrients, organic material, and water.

4. *Water—Industrial*

   - Develop the necessary technology to: (1) eliminate the discharge of pollutants for the areawide or combined point sources where industrial sources are the predominant contributor, (2) eliminate toxic pollutant discharges for petroleum refining and the petrochemicals industries.

5. *Transport and Fate of Toxic Substances*

   - Develop microcosm and models for defining movement of toxic chemicals in soils.

   - Develop testing protocols for leaching of toxic chemicals.

6. *Energy*

   - Validate and apply mineralogy model used to predict groundwater contamination on proposed oil shale commercialization sites.

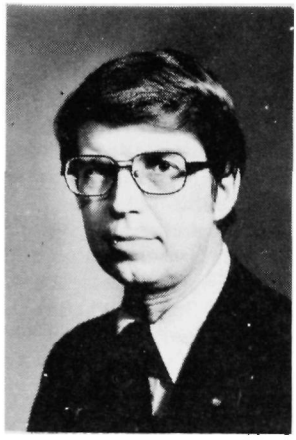
Environmental Research Laboratory

Athens, Georgia

Mission

Research and development on analytical chemistry of pollutants; pollutant transport, transformation, and fate in water, sediment, and soil; control of agricultural or silvicultural non-point sources of water pollution; and environmental management to achieve water quality goals. Specific activities are to:

- Develop techniques, methods, and instruments for the identification and measurement of low concentrations of chemical constituents in drinking water, in wastewaters, in rivers or lakes, and in sediments and soils.
- Define and quantitatively describe the individual microbial, chemical, and physical-chemical processes that control the transport, transformation, and impact of pollutants in water, sediment and soil.
- Define, quantitatively describe, and test the conceptual validity of chemical pollutant transport and transformation systems in water and sediment.
- Develop computerized analysis methods for predicting chemical concentrations in water and sediment and estimating environmental exposures to toxic chemicals.
- Develop technology for controlling agricultural or silvicultural non-point sources of water pollution.
- Develop analysis and planning techniques for comprehensive basin-wide cost-effective environmental management to achieve water quality objectives.



David W. Duttweiler **Director, Environmental Research Laboratory—Athens, Georgia**

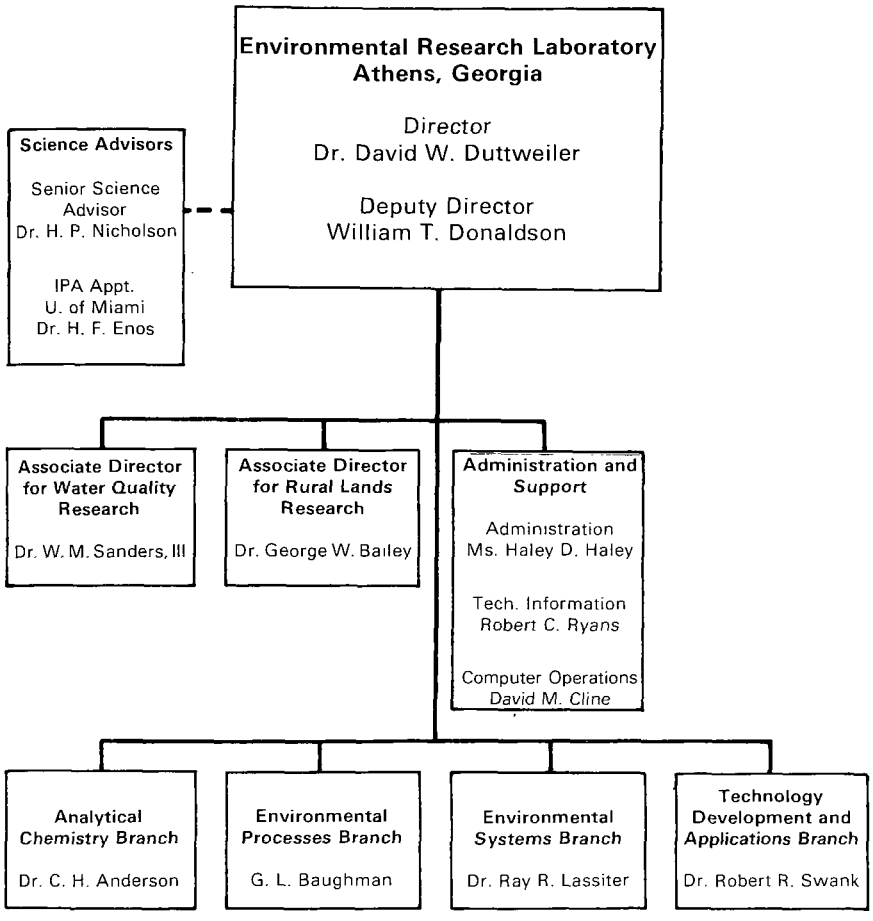
Education:
University of Michigan—BSE (Civil Engineering) 1948
Johns Hopkins University—MSE (Sanitary Engineering) 1957
Johns Hopkins University—Ph.D. (Sanitary Engineering) 1963

Professional Experience:
Director, Environmental Research Laboratory, 1970-Present
Director, Southeast Water Laboratory, Federal Water Pollution Control Administration, Athens, Georgia, 1969-1970
Sanitary Engineer Instructor (Lt. Col.), U.S. Army Medical Field Service School, Fort Sam Houston, Texas, 1968-1969
Sanitary Engineer Consultant (Lt. Col.), Office of the Surgeon, Headquarters U.S. Army, Viet Nam, 1967-1968
Chief, Sanitary Engineering Research Section (Lt. Col.), U.S. Army Medical Research and Development Command, Washington, D.C., 1965-1966
Chief, Department of Sanitary Engineering (Major), Walter Reed Army Institute of Research, Washington, D.C., 1962-1965
Chief, Sanitary Engineering Division (Capt.), U.S. Army Environmental Hygiene Agency, Edgewood, Maryland, 1958-1960
Industrial Hygiene Engineer (Capt.), U.S. Army Environmental Hygiene Agency, Edgewood, Maryland, 1957-1958

Industrial Hygiene Engineer, U.S. Army Europe Medical Laboratory, Landstuhl, Germany, 1955-1956
Sanitary Engineer (1st Lt.), Office of the Chief Surgeon, Headquarters, U.S. Forces in Austria, Salzburg, Austria, 1953-1955
Sanitary Engineer Instructor (1st Lt.), U.S. Army Medical Field Service School, Fort Sam Houston, Texas, 1952-1953
Assistant Sanitary Engineer (1st Lt.), Office of the Surgeon General, Washington, D.C., 1951
Sanitary Engineer Instructor (2nd Ltd.), U.S. Army Engineer School, Ft. Belvoir, Virginia, 1949-1951
Structural Designer, T. H. McKaig Consulting Engineers, Buffalo, New York, 1948-1949

Professional Affiliations:
Registered Professional Engineer, Texas Diplomate, American Academy of Environmental Engineers
American Society of Civil Engineers
Water Pollution Control Federation
American Association for the Advancement of Science
Sigma Xi
International Association on Water Pollution Research
Conference of Federal Environmental Engineers
Research Associate, University of Georgia, 1969-Present
Adjunct Professor, Clemson University, 1971-Present
Visiting Committee, University of Florida Department of Environmental Engineering Sciences, 1974-Present
University of North Carolina Water Resources Research Institute Advisory Committee, 1976-Present
Armed Forces Epidemiological Board, Commission on Environmental Health, 1970-1973

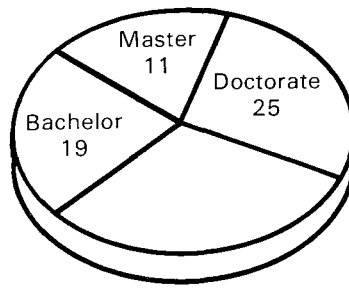
Honors:
Who's Who in Government
Who's Who in the South and Southwest
American Men and Women of Science
U.S. Army Legion of Merit, Commendation Medal
Department of Defense Patriotic Civilian Service Award, 1973
1977 Distinguished Service Award, Athens Area Chapter of Federally Employed Women, Inc.



FTS Telephone No. 250-3134
Commercial Telephone No. (404) 546-3134

Research Program Resources Summary ($1,000's)	FY 1979		FY 1980	
	In-House	Extramural	In-House	Extramural
	$3,741	$4,194	$4,702	$4,730

Personnel



Full-time EPA Personnel 78

Recent Accomplishments

1. *Vidicon Tube*—Demonstrated the use of vidicon tube coupled to a liquid chromatograph to identify and measure nonvolatile organic compounds (those that cannot be determined by conventional gas chromatography). The new detector improves selectivity and sensitivity for these organics, which comprise a large fraction of unidentified water pollutants.
2. *Exposure Analysis Modeling System*—Demonstrated the Exposure Analysis Modeling System (EXAMS), a tool for assessing the fate of chemicals in environmental waters. More than 100 draft copies of the users manual and the associated computer program have been distributed to users in chemical industries, academia, state regulatory agencies, and EPA offices.
3. *Ion Chromatography*—Applied ion chromatography, a promising analysis technique for distinguishing and measuring the valence states of toxic metals in water, to selenite and selenate at detection limits of 50 nanograms. The results demonstrate that the technique can be useful in drinking water treatment and health effects studies where selenium is apt to be a problem and in studies of similar metallic substances.
4. *Exposure Assessment of Iowa's Coralville Reservoir*—Demonstrated the application of

exposure assessment developed through Laboratory research to real world problems in a study that provided predictions of a continued decline of the pesticide dieldrin concentrations in Iowa's Coralville Reservoir. The results supported the State's decision to allow the resumption of commercial fishing in the reservoir that was based on observed current reductions in levels of the pollutant.

5. *Ultrasonic Nebulizer System*—Developed and evaluated a new ultrasonic nebulizer system for the plasma emission spectrometric analysis of water samples for 20 to 30 elements. Sensitivity of the analytical technique is improved by a factor of 5 to 10 depending on the element of interest and all elements of interest can be determined rapidly in the low part per billion range.

6. *Anaerobic Degradation*—Determined the rates of anaerobic degradation of several substituted benzoic acids in laboratory-developed sediment samples and in natural bottom sediment cores.

7. *Photochemical Transformation*—Demonstrated that photochemical transformation of some toxic substances is much faster in river and lake waters than in distilled waters. Dissolved humic substances in natural waters are believed to be partly responsible for this acceleration.

8. *Joint Agricultural Research Project*—Joined with the U.S. Department of Agriculture to establish a research project in Iowa to examine the relationship between agricultural land management practices; the generation of pollutants that reach water bodies; and the downstream fate, transport, and impact of those pollutants. An evaluation of agricultural Best Management Practices is included in the project.

9. *Liquid Chromatography—Mass Specrometry*—Identified phenol, cresols, aromatic phenols, chlorophenols, nitrophenol, cholesterol, caffeine, nitroaniline, trihydroxycoumarin, prophylthiophene, and dihydroxyphenylpropanol in tannery plant wastewater using liquid chromatography-mass spectrometry. The latter three polar compounds had never been reported before in environmental samples.

Research Program

1. *Water—Characterization and Methods Development*

- Develop and assess new, broadly applicable techniques for identifying and measuring chemical constituents of soil and water.

- Apply innovative methods to rapidly characterize concentrations of organic pollutants in aqueous samples.

- Develop a computerized register of all organic compounds found in water.

- Demonstrate the applicability of analysis techniques so that other laboratories can adopt them efficiently.

- Develop analysis techniques by which multiple elements can be identified and measured at the same time using a single reference standard.

- Assess individual techniques for chemical speciation such as electron microscopy for analyzing waterborne asbestos.

2. *Soil and Water Processes and Systems*

- Elucidate the individual environmental processes that control the fate of pollutants in soil, sediment, and water.

- Identify potentially hazardous transformation products of pesticides and toxic chemicals, such as the formation of N-nitrosoatrazine from the herbicide atrazine.

- Provide data on the environmental transformation of chemicals to EPA regulatory offices and to the public.

- Elucidate systems and process interactions that affect the transport and transformation of pollutants in water, sediment and soil.

- Construct, test, and verify models of the transport and distribution of pollutants in water, sediment, and soil.

3. *Renewable Resources*

- Produce tested techniques for estimating pollutant loads from non-irrigated agriculture and silviculture.

- Develop environmental transport models to predict pesticide and nutrient losses from agricultural lands.

- Provide managers with easy-to-use tested techniques for evaluating and minimizing water pollution problems from agricultural non-point sources.

4. *Water Quality—Transport and Fate*

   - Develop and test techniques for constructing feasible, cost-effective water pollution control strategies for basin—or smaller-scale areas.

   - Combine models of water quality, of pollutant sources, and of health and ecological effects of water pollution into tested comprehensive water quality management planning tools.

   - Establish usable data and mathematical model files to support application of watershed management planning and analysis techniques.

5. *Fate and Effects of Toxic Substances*

   - Develop protocols for tests to produce data for calculating environmental exposure to toxic substances.

   - Develop technology for multimedia exposure assessment.

   - Develop methodologies for determining anaerobic degradation of toxic chemicals.

   - Develop tested Exposure Analysis Modeling System (EXAMS) to calculate concentrations of toxic chemicals in water and sediment.

   - Develop laboratory ecosystems for testing of EXAMS.

   - Determine the fate of polycyclic aromatic hydrocarbons.

Environmental Research Laboratory

Corvallis, Oregon

Mission

- The misson of the Corvallis Environmental Research Laboratory is to support the policy, regulatory, and operational responsibilities of the Environmental Protection Agency by conducting a high quality program of research development, and technical assistance in the following areas:

- The movement, transformation and fate of toxics and other environmentally harmful substances within terrestrial ecosystems, with empahsis on predicting the amounts to which man may be exposed by terrestrial pathways such as the agricultural food chain.

- The pathways and mechanisms by which aquatic biota transform and accumulate toxics and other environmentally harmful substances within freshwater ecosystems, with empahsis on predicting the concentrations to which man may be exposed.

- Field assessment of the effects of toxics and other environmentally harmful substances or factors on terrestrial and freshwater ecosystems (excluding the Great Lakes) to:

  — assess the ability of an ecosystem to support specific uses;

  — determine the benefits of improved environmental quality and/or the costs of degradation;

  — determine criteria to protect or achieve the ability of an ecosystem to support specific uses;

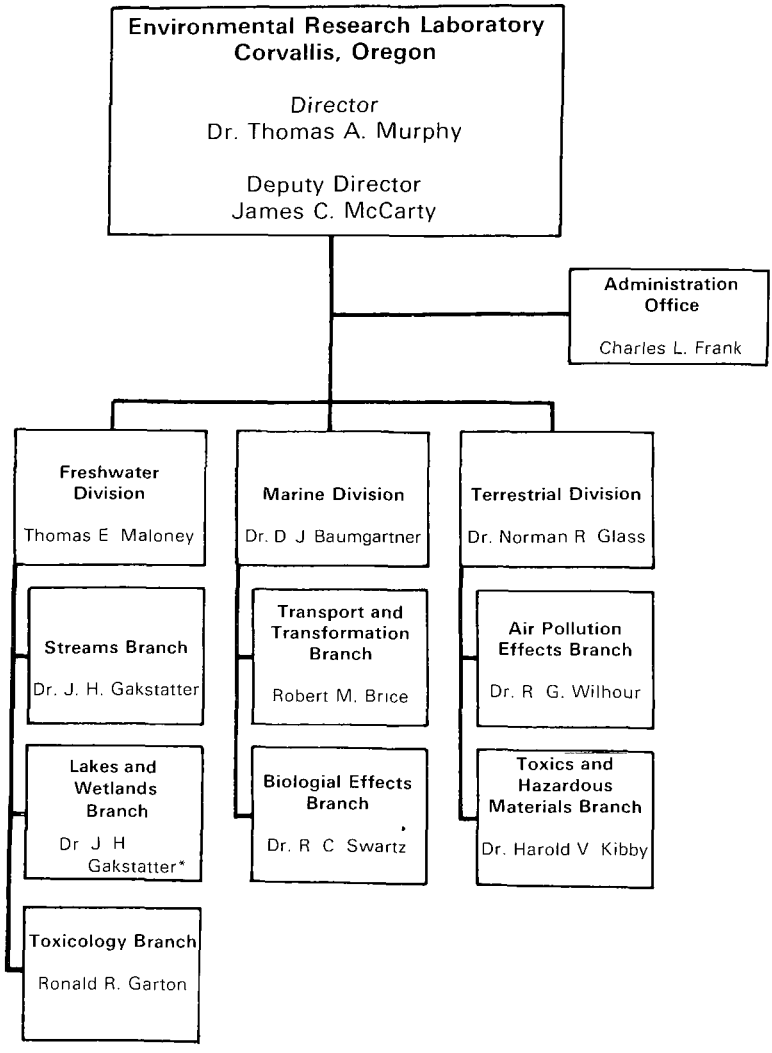
  — assess the degree of risk of injury to the environment, such as will be required for the implementation of the toxic substances control act.

Thomas A. Murphy **Director, Environmental Research Laboratory—Corvallis, Oregon**

Education:
Knox College, B.A., 1959
Yale University, M.S.
Yale University, Ph.D. (Biology), 1964

Professional Experience:
Director, Environmental Research Laboratory, Corvallis, 1979-Present
Deputy Assistant Administrator for Environmental Processes and Effects Research, 1979
Deputy Assistant Administrator for Air, Land, and Water Use, EPA, 1975-1979
Director, Nonpoint Pollution Control Division, EPA, 1973-1975
Chief, Program Development Branch, EPA, 1972-1973
Special Assistant to Assistant Commissioner for Research and Development at the Federal Water Quality Administration, 1971-1972
Edison Laboratory, EPA, 1967-1971
Medical Service Officer, U.S. Army, Edgewood Arsenal and Viet Nam, 1964-1966

Honors:
EPA Bronze Medal, 1978 - For distinguished and outstanding service to environmental protection through unparalleled scientific and administrative leadership in the planning and management of a large and complex research program in the areas of air, land, and water pollution problems.



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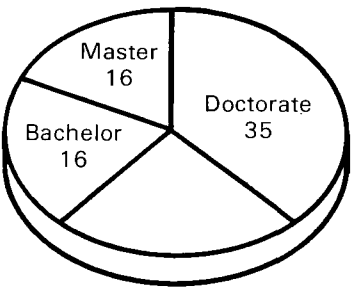
FTS Telephone No. 420-4601
Commercial Telephone No. 503-757-4601

Research Program Resources Summary ($1,000's)	FY 1979		FY 1980	
	In-House	Extramural	In-House	Extramural
	$6,027	$4,712	$6,082	$6,073

Personnel



Full-time EPA Personnel = 84

Recent Accomplishments

1. *Short-term Acid Precipitation Program*—Provided information on the extent and magnitude of the acid precipitation problem in the eastern part of the United States. A series of summary reports are being prepared that document the effects on crop sensitivity, forest growth, bedrock geology, soil sensitivity, surface waters and stream ecosystems.

2. *Office of Water Program Operations*—Conducted four workshops on section 301(h) that provided potential applicants an opportunity to review application requirements and evaluation strategies.

3. *Plant Responses to Herbicide Treatment*—Developed a rapid assay method for determining plant responses to herbicide treatment.

4. *Water Quality Criteria*—Provided input for those heavy metals included in the 65 consent decree chemicals. The research generated acute toxicity data for all metals and chronic data for cadmium, copper, lead, nickel, chromium, beryllium, and zinc. By taking hardness into consideration, criteria for metals may be set at levels less stringent than otherwise necessary.

Research Program

1. *Air—Ecological Effects*

- Develop information necessary to support air quality control strategies and standards. Measure acute and chronic effects of photochemical oxidants and sulfur dioxide upon selected forest and agricultural ecosystems.
- Establish a National Crop Assessment Network to determine the economic impacts of current and changing air pollution levels on agronomic crops.
- Characterize the biogenic emission of hydrocarbons from vegetation to assist Program and Regional Offices in developing related ozone control strategies.
- Utilize a newly designed greenhouse system to determine the effects of nitrogen oxides in mixture with other pollutants on crop productivity to determine the influence of ozone on the genetic and population aspects of plant sensitivity; and to determine the interaction of ozone and water in stress situations.
- Determine the effects of PAN (photochemical oxidant) on the growth and yield of vegetation.

2. *Freshwater—Ecological Effects*

- Determine the toxic effects of selected organic and inorganic pollutants on Western aquatic species.
- Determine the transport, effects, transformation and fate of growth-promoting and inhibitory materials in fresh water ecosystems.
- Determine ecological effects of non-point sources (NPS), pollutants and pollutant loadings. Determine the ecological effectiveness of NPS control. Develop a regional approach that relates land use activities to NPS pollution problems. Develop the scientific basis for establishment of stream standards emphasizing the non-steady nature of NPS pollutants.
- Assess the effectiveness of lake restoration techniques including overall environmental social and economic cost benefits.

- Develop methods to improve predictive capabilities regarding changes in water resources which result from attempts to improve their quality for recreational use.

- Develop scientific basis for criteria to protect wetlands from environmental stresses; develop methodology to evaluate effects of hydrological modifications, dredging and filling activities and construction activities.

- Develop criteria to determine the boundaries of wetlands.

3. *Marine—Ecological Effects*

- Analyze biomathematical indices of community structure and population dynamics for their use as criteria of pollution.

- Compare effects of stresses (both natural and human perturbations) on a variety of marine communities in different biogeographic provinces. Identify patterns of community alterations along pollutional gradients.

- Assess effects of different techniques of pollution control or abatement in minimizing the disruption of natural marine assemblages.

4. *Pesticide—Ecological Effects*

- Develop terrestrial model ecosystems (microcosms) for comparative measurements of ecosystem routes, rates of movement and transformation, sources and sinks of candidate chemicals which are alternatives to pesticides under RPAR.

- Assess the ecological effects of pesticides and other toxic substances using suitable terrestrial microcosms.

- Evaluate verification of chemodynamic effect and mathematical models, derived from basic physical, chemical and biological data, in model ecosystems and natural environments.

5. *Energy*

- Continue protocol work which assesses the impact and effects of Western coal mining, combustion and conversion activities on terrestrial ecosystems.

- Develop and validate predator-prey behavior, and structure/activity test methodologies needed to evaluate the effects of energy-related pollutants on terrestrial and aquatic ecosystems.

6. *Fate and Effects of Toxic Substances*

- Develop structure/activity concepts for defining reduction of toxic chemicals.
- Develop marine algal toxicity tests for toxic chemicals.
- Develop round-robin tests for defining toxicity in rainbow trout.
- Develop models for defining the exposure concentration of toxic chemicals in terrestrial environments (T-EXAMS).
- Develop methodologies for defining concentration of toxic chemicals in food chain systems.
- Develop terrestrial microcosm for predicting fate and effects of toxic chemicals.
- Assess the food chain effects of waterborne toxicants.

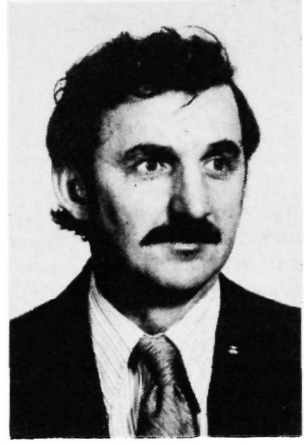
Environmental Research Laboratory

Duluth, Minnesota

Mission

Conduct research in aquatic toxicology methods, evaluate the predictive capability of these methods in natural surface waters, provide toxicology data for Agency use and develop methods to predict effects of pollutants in the Great Lakes. Specifically, the Laboratory:

- Develops toxicity test methods for aquatic life for EPA's regulation development.
- Provides primary Agency consultation on freshwater toxicology problems.
- Provides toxicity data to confirm effects of problem chemicals for court cases.
- Prepares Agency criteria documents for aquatic life.
- Conducts EPA's Great Lakes research program and fulfills EPA's research obligations under the U.S./Canada Water Quality Agreement of 1972 and 1978.
- Evaluates toxicity of complex effluents treated by various control technologies.
- Interfaces pollutant fate, toxicity and accumulation data with on-going human health research of other EPA Laboratories and Program Offices.



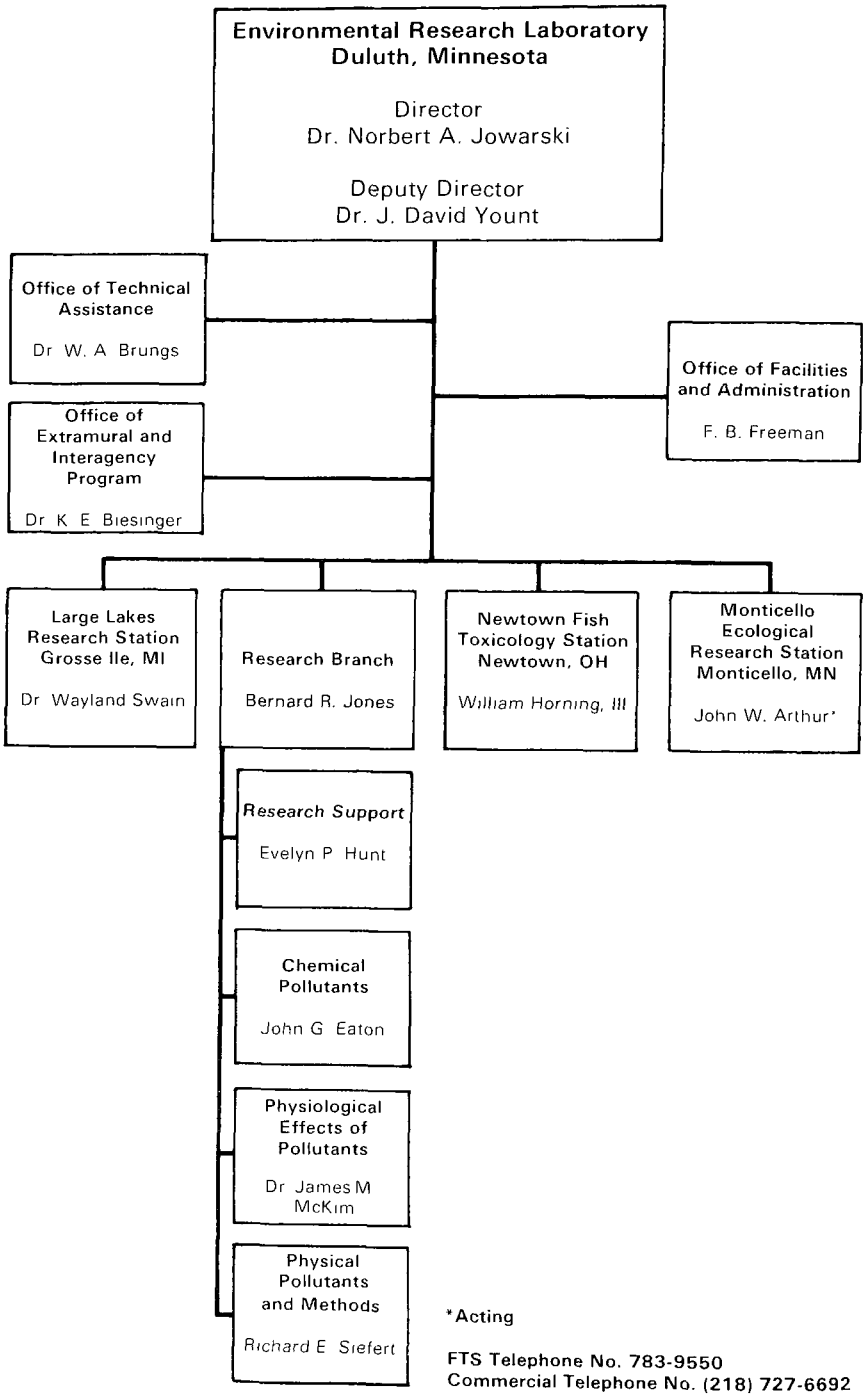
Norbert A. Jaworski **Director, Environmental Research Laboratory—Duluth, Minnesota**

Education:
University of Wisconsin—B.S. (Civil Engineering) 1959
University of Wisconsin—M.S. (Civil Engineering) 1960
University of Michigan, Ph.D. (Water Resources Engineering) 1968

Professional Experience:
Director, Environmental Research Laboratory, 1980-Present
Deputy Director, Industrial Environmental Research Laboratory, Research Triangle Park, 1975-1980
Director, Pacific Northwest Environmental Research Laboratory, Corvallis, 1972-1975
Director, Grosse Ile Laboratory, Grosse Ile, Michigan, 1971-1972
Technical Assistant, Division of Water Quality, FWPCA, Washington, D.C., 1970-1971
Chief, Engineering Section, Chesapeake Technical Support Laboratory, FWPCA, Annapolis, Maryland, 1966-1970
Sanitary Engineer, Commissioned Officer, Commissioned Corps, PHS, Outside of Service Training at University of Michigan, Ann Arbor, Michigan, 1964-1966
Sanitary Engineer, Commissioned Officer, Commissioned Corps, PHS, Chesapeake Bay-Susquehanna River Basins Project, New Cumberland, Pennsylvania, 1962-1964
Sanitary Engineer, Commissioned Officer, Commissioned Corps, PHS, National Institutes of Health, Bethesda, Maryland, 1960-1962

Professional Affiliations: Registered Professional Engineer, State of Maryland
US/USSR Stationary Source Air Pollution Control Technology Group
EPA Technical Advisory Committee, Chesapeake Bay Program
North Carolina Board of Scientific Advisors on Water Quality
Professional Engineers of North Carolina
North Carolina Wildlife Federation
National Wildlife Federation
Oregon State University, Visiting Professor
North Carolina State University, Adjunct Professor

Honors: Chi Epsilon
FWPCA

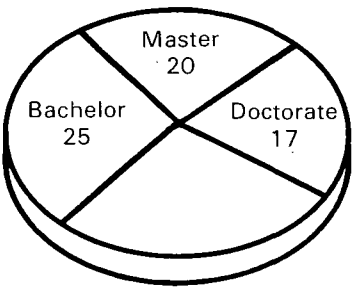


*Acting

FTS Telephone No. 783-9550
Commercial Telephone No. (218) 727-6692

Research Program Resources Summary ($1,000's)	FY 1979		FY 1980	
	In-House	Extramural	In-House	Extramural
	$4,817	$5,068	$5,475	$4,406

Personnel



Full-time EPA Personnel = 83

Recent Accomplishments

1. *Accumulation of Mineral Fibers in Aquatic Organisms*—A method of freeze drying followed by low temperature ashing was found to be the most effective technique for quantitative transmission electron microscopy analysis. Fish tissue samples collected from waters containing chrysotile asbestos have been found to contain small chrysotile fibers. Fish tissue samples collected from waters containing amphibole asbestos are being examined, although to date, few fibers have been identified. Further analysis is in progress to relate tissue fiber concentrations to water fiber concentrations.

2. *Acid Deposition*—Determined the susceptibility to acid deposition of 350 lakes in northern Wisconsin, an area of sandy and rocky soils lacking in buffering materials. This is an important study area because, the lower the buffering capacity of an ecosystem, the higher the potential for damage from acid deposition will be.

3. *Guideline Modification for Water Quality Criteria*—Utilized ERL-D staff experience in forming the Guidelines for the 65 priority pollutants. Until the Guidelines are final, criterion document revisions will be limited to ancillary preparations such as quality assurance review of data bases and critique of additional references

from public comment and the literature since the initial search.

4. *Kelthane Toxicity Tests*—Conducted tests with embryo-larval stages of the fathead minnow and juvenile amphipods *(Hyalella azteca)* to determine the effect of kelthane on the most sensitive life stages and to predict long-term toxicity. A concentration of 19 µg/l was the highest concentration. Kelthane did not adversely affect egg hatchability of fathead minnows but decreased larval survival at 39 µg/l, the lowest concentration. A similar concentration of 33 µg/l decreased the survival of amphipods after this period.

5. *Tissue Sampling of Fish*—Identified a series of polychlorinated propyl and butylamines in fish from the Ashtabula River of Ohio by negative chemical ionization gas chromatography/mass spectrometry. These compounds have not previously been reported in field sampled fish tissue.

Research Program

1. *Freshwater Ecological Processes and Effects*

- Develop toxicology methods for aquatic organisms, determine mode of action and develop rapid screening tests for chronic effects.
- Determine toxic effects on individual organisms and identify key physiological processes and effects which can be used to provide early warning of chronic effects.
- Determine the validity of laboratory tests to predict the effects of pollutants in natural systems.
- Develop methods to predict toxicity by use of chemical structure.
- Improve ability to measure the toxic effects of wastes after treatment, especially those wastes receiving BPT or BAT and which are expected to contain chemical contaminants.
- Identify chemical pollutant problems of the Great Lakes, determine the dynamic processes

affecting the pollution of large lakes, and develop management-oriented models for controlling the effects of pollutants in the Great Lakes.

- Determine the dispersal of fine particles in the environment by water and air and relate to human exposure.

- Determine physical, chemical, and structural characteristics of inorganic particles which influence their biological activity.

2. *Effect of Energy-Related Pollutants on Organisms and Ecosystems*

   - Utilizing the Monticello Field Station, assess the ability of a controlled microcosm to evaluate the transport, fate and effects of organic energy-related pollutants on freshwater ecosystems.

   - Assess the impacts of atmospheric deposition, both wet and dry, from fossil fuel combustion on aquatic and terrestrial ecosystems in upper Minnesota and Wisconsin.

3. *Fate and Effects of Pesticides on Aquatic Ecosystems*

   - Determine the toxicity and bioaccumulation of certain pesticides in sediments.

   - Determine exposure methods, persistence and toxicity of certain pesticides to freshwater organisms.

4. *Fate and Effects of Toxic Substances*

   - Develop round-robin validated toxicity tests using embryo/larvae stages of fathead minnow.

   - Develop a structure/activity concept for predicting toxicity of chemicals to aquatic animals.

   - Develop microcosms for defining fate and effects of toxic chemicals in the aquatic environment.

5. *Great Lakes Research*

- Determine the pathway and reservoirs of selected toxicants, such as PCB's, in a major Great Lakes system.

- Develop a series of mathematical models to be used in the simulation of the transport bioaccumulation and loss of Great Lakes toxicants.

- Determine the importance of atmospheric contributions of toxic substances to the Great Lakes.

- Determine the role of sediments as sink and source of toxic substances and develop a mathematical modeling capability for simulating sediment/water interactions.

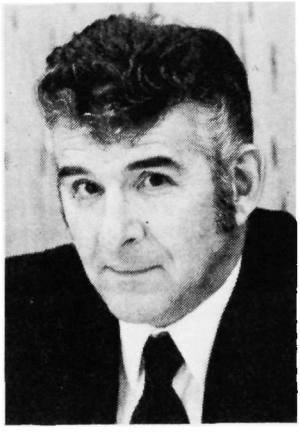
Environmental Research Laboratory

Gulf Breeze, Florida

Mission

Determine exposure—effects relationships of hazardous organic pollutants in marine and estuarine ecosystems. This information is required to: (1) register and control pesticides; (2) develop testing protocols for toxic substances; (3) develop water quality criteria protective of human aquatic life; and (4) develop ocean dumping and dredged material disposal guidelines. Investigate potential human health impacts of mutagenic and carcinogenic compounds in aquatic systems. Determine ecological impact of pollutants derived from energy extraction, conversion, transmission and use. Specific activities are to:

- Develop new and improved methodologies for determining fate and effects of hazardous organic substances in marine and estuarine ecosystems.
- Determine organism and ecosystem level effects of hazardous organic compounds in marine and estuarine ecosystems.
- Determine fate of hazardous organics in marine and estuarine ecosystems.
- Develop aquatic animal sentinel models and screening tests for the early detection and laboratory assay of carcinogens and their effects.
- Determine prevalence of carcinogens, mutagens and teratogens in select animals, sediments and waters of the Northeastern Gulf of Mexico.
- Assess impact of halogens and biocides used in energy-related processes on marine and estuarine ecosystems.
- Determine impact of drilling muds on marine and estuarine ecosystems.
- Identify and assess impact of toxic organic components of specific industrial wastes on the marine and estuarine environments.



Henry F. Enos **Director, Environmental Research Laboratory—Gulf Breeze, Florida**

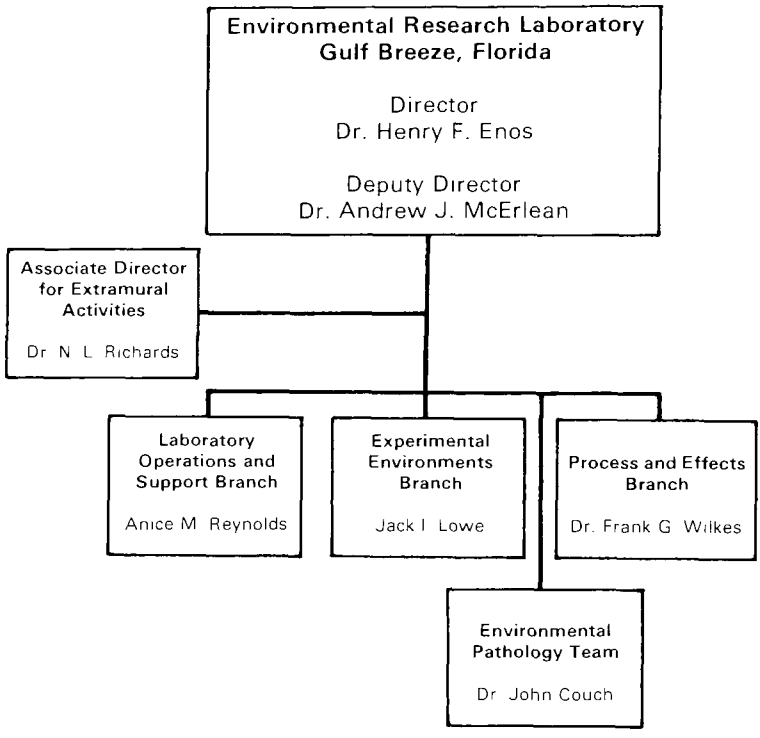
Education:
University of New Hampshire—B.S. (Zoology) 1951
University of New Hampshire—B.S.(Agricultural & Biological Chemistry) 1953
Pennsylvania State University—Ph.D. (Biochemistry) 1966

Professional Experience:
Director, Environmental Research Laboratory, 1979-Present
Visiting Professor and Director, Chemical Epidemiology Division, University of Miami School of Medicine, 1977-1979
Deputy Director, Environmental Research Laboratory, EPA, Athens, Georgia, 1975-1977
Director, Equipment and Techniques Division, EPA, Washington, D.C., 1973-1975
Deputy Director and Chief Chemist, Research Laboratory, EPA, Perrine, Florida, 1971-1973
Chief, Chemistry Section, Perrine Primate Research Laboratory, Perrine, Florida, 1967-1971
Group Leader of Analytical Chemistry Research, Pesticides Research Laboratory, Perrine, Florida, 1966-1967
Research Chemist, U.S. Army Natick Laboratories, Natick, Massachusetts, 1960-1966
Instructor, Pennsylvania State University, 1956-1960
Chief Chemist, Commercial Solvent, 1953-1956
U.S. Army, 1945-1946

Professional Affiliations:
American Chemical Society (ACS) Past Chairman, Division of Pesticide Chemistry

Natick, Massachusetts Chapter, Research Society of America, Past Treasurer
American Association for the Advancement of Science
Phi Lambda Upsilon
Sigma Xi

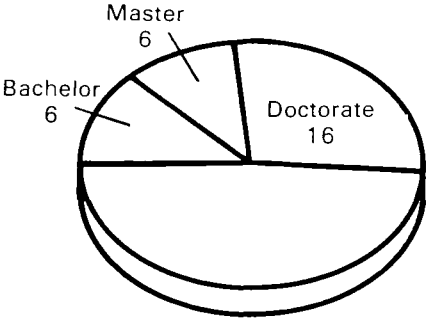
Honors: Elected Fellow of Division of Pesticide Chemistry, ACS, 1975
Outstanding Performance Award, EPA, 1974



FTS Telephone No. 686-9011
Commercial Telephone No. (904) 932-5311

Research Program Resources Summary ($1,000's)	FY 1979		FY 1980	
	In-House	Extramural	In-House	Extramural
	$4,071	$2,708	$4,246	$3,913

Personnel



Full-time EPA Personnel - 54

Recent Accomplishments

1. *Adaptation Studies*—Studies showed that natural microbial populations can adapt in certain environments and that biodegradation rates observed in actual media laboratory systems can be affected by concentration and prior exposure Therefore, adaptation must be considered when predicting fate of toxic chemicals.

2. *Chlorine-Produced Oxidants*—Exposure of oysters to chlorine-produced oxidants (CPO) resulted in the uptake of bromoform ($ChBr_3$), a byproduct of chlorinated seawaters. A slight bioconcentration of $CHBr_3$ was depurated within 48 hours when oysters were placed in clean flowing seawater.

3. *Chlorination*—Studies of the effects of chlorination on fouling organisms demonstrated that barnacle growth is inhibited by even the lowest chlorination level. Mortality of oyster spat was high (80% after 12 weeks) in groups receiving 0.250 to 0.500 mg/l compared to groups receiving 0.00 to 0.125 mg/l (32 to 36% mortality). Spat growth was retarded at the lowest chlorination level tested.

4. *Ixtoc Oil Well Blowout*—As part of the emergency response to the *Ixtoc* oil well blowout, suspended and deposited oil was measured in near-shore Texas waters in August-September and

November-December 1979. Preliminary findings indicate that oil was deposited within 1 to 2 miles of the Texas coast and that some organisms are being impacted by tarballs. Analyses of the number and type of organisms collected in the field survey should aid the assessment of the impact on near-shore fauna.

5. *Mysid Shrimp*—A method was developed to culture the mysid shrimp, *Neomysis americana*, for use in life-cycle laboratory tests. Adult females released small clutches of 5 to 7 young at 28 to 31 days.

Research Program

1. *Fate Effects of Pesticides in Marine and Estuarine Ecosystems*

   - Develop new methods and improve existing methods of determining acute and chronic effects of pesticides on estuarine organisms.
   - Develop laboratory methods to determine the fate of pesticides in estuarine ecosystems.
   - Determine acute and chronic effects and bioaccumulation of pesticides and pesticide combinations and formulations for estuarine organisms.
   - Determine the organisms and ecosystem level effects of antifouling biocides and disinfectants on estuarine organisms and ecosystems.
   - Determine the sublethal effects of pesticides on the behavior of selected estuarine organisms.
   - Determine the significance of the occurrence in the marine and estuarine environment of carcinogenic compounds.
   - Determine the physico/chemical fate of selected pesticides in estuarine ecosystems.
   - Determine the microbiological fate of selected pesticides in estuarine ecosystems.
   - Determine fate and effects of substitute chemicals on laboratory systems and brackish wetlands.

2. *Environmental Transport, Fate and Effects of Toxic Substances*

- Validate static and flow-through acute toxicity tests with marine fish and invertebrates.

- Validate life-cycle toxicity test for mysid shrimp.

- Refine and validate embryo/larvae test for marine fish.

- Refine and validate methods to determine the bioconcentration potential for marine fish.

- Develop fate test protocols for toxic substances in the marine environment.

- Characterize biodegradation process for toxic chemicals in the marine environment.

3. *Water Quality*

   - Develop and assess data for use in the development of marine water quality criteria—especially with respect to *consent decree* chemicals.

4. *Anticipatory Research*

   - Conduct field survey of cellular proliferative disorders and residues of carcinogens, mutagens and teratogens in select animals, sediments and waters of the northeastern Gulf of Mexico.

5. *Carcinogen Research*

   - Develop carcinogenicity assays utilizing aquatic species as test organisms.

   - Complete design of quick-screening tests for mutagens and carcinogens in aquatic ecosystems.

   - Determine biochemical effects of carcinogens in aquatic species to detect preneoplastic lesions for early detection of carcinogens.

6. *Effects of Energy—Related Pollutants on Organisms and Ecosystems*

   - Determine the effects of halogens and other biocides in energy-related processes on marine ecosystems.

   - Determine the ecological impact of discharges from offshore oil and gas extraction and production facilities on marine ecosystems.

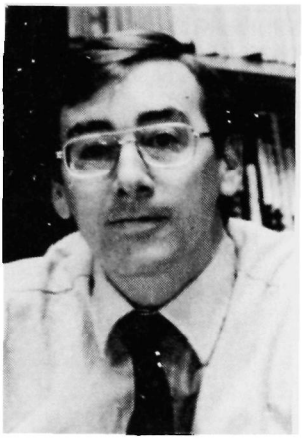
Environmental Research Laboratory

Narragansett, Rhode Island

Mission

Provide a scientifically sound basis for Agency decisions on the environmental safety of various uses of marine systems. This is accomplished through research on the effects of pollutants on marine ecosystems. Specific studies include:

- Chemical and physical behavior of pollutants in marine systems.
- Significant responses of organisms to pollutant stress.
- Characterization of marine ecosystems and their responses to stress.
- Development of appropriate systems for quantitation of response to specific pollutants.
- Methods of determining the impact of specific pollution incidents.



Tudor T. Davies **Director, Environmental Research Laboratory, Narragansett, Rhode Island**

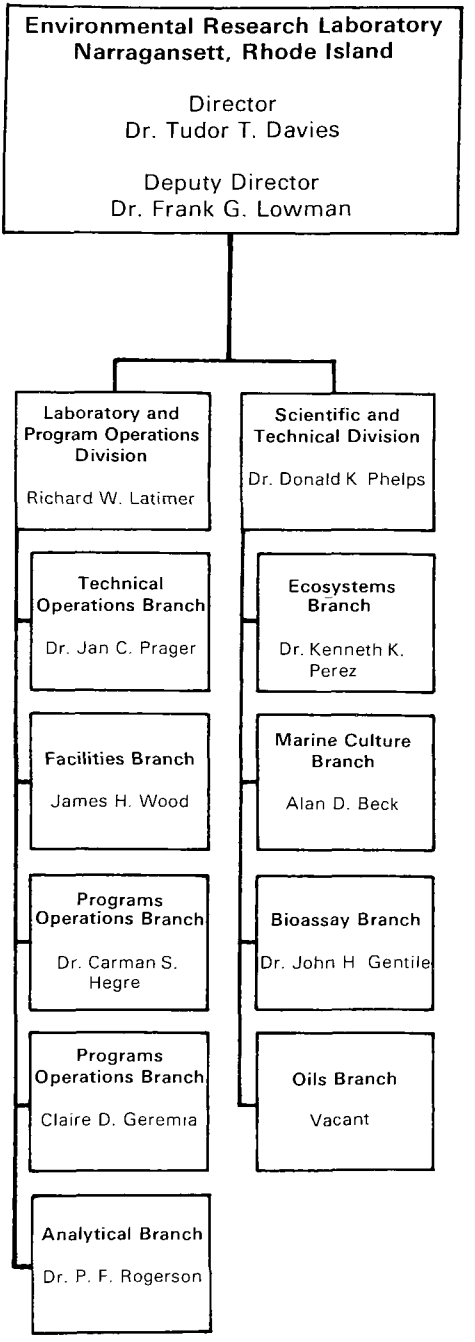
Education: University of Wales (Swansea)—B.S., 1957-1960
University of Wales (Swansea)—Ph.D., 1964

Professional Experience:
Director, Environmental Research Laboratory, 1979-Present
Deputy Director, Environmental Research Laboratory, EPA, Gulf Breeze, 1975-1979
Director, Great Lakes Research Program and Grosse Ile Research Laboratory, EPA, 1972-1975
Associate Professor, Department of Geology, University of South Carolina, 1966-1971
Research Associate, Bedford Institute of Oceanography, 1965-1972
Post-Doctoral Fellowship, National Research Council of Canada, Dalhousie University, 1964-1966

Professional Affiliations:
American Association for the Advancement of Science
Geological Society of America
Geochemical Society
International Association of Geochemistry and Cosmochemistry
International Association of Great Lakes Research
Paleontological Association
Sigma Xi (Vice President, 1970, U.S.C. Chapter)
Society of Economic Paleontologists and Mineralogists
Systematics Association
US/USSR Agreement on the Environment, Chairman of Working Group on Water Pollution
US/USSR Agreement on the Environment, Working Group on Protection of Lakes and Estuaries

Member, National Committee on the International Hydrologic Project
Director, Chesapeake Bay Program, Chairman, Technical Advisory Committee
Committee on Challenges to Modern Society, Project Leader, Estuarine Management

Honors: EPA Bronze Medal for Commendable Service, 1978
EPA Special Achievement Award, 1979



FTS Telephone No. 838-4843
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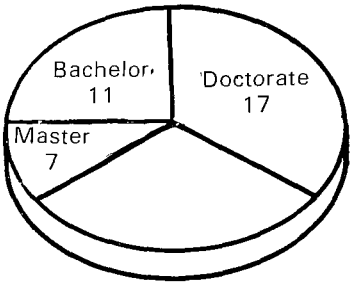
Research Program Resources Summary ($1,000's)	FY 1979		FY 1980	
	In-House	Extramural	In-House	Extramural
	$2,871	$1,534	$3,336	$1,840

Personnel



Full-time EPA Personnel 55

Recent Accomplishments

1. *Mussel Watch and Coastal Ecosystem Assessment Studies*—Developed techniques for biological monitoring of pollutants in the marine environment and for the assessment of the impacts of such pollution on field populations. Mussel Watch and CEAS data will be included in the upcoming Council on Environmental Quality publication "Environmental Conditions and Trends."

2. *Experimental Evaluation of Ecosystem Linearization by the Ecosystems Branch*—Concluded that a complex marine microcosm did not linearize a variable sinusoidal water turbulence input. A series of non-harmonic responses indicated that these systems are non-linear. If microcosms are analogues of natural, large-scale systems, then results from previous studies that attempted to simulate natural systems by means of linear mathematical models are subject to question.

3. *Marine Ecosystems Research Laboratory*—Demonstrated that microcosms of the marine environment can be managed to duplicate many important features of the natural environment, making possible studies of pollutant dynamics and effects in complex systems without affecting field populations. Preliminary conclusions are:

Sediments release toxic compounds at slow or unmeasureable rates during cool and cold water periods; the sediment community controls the ecology of the overlying water column; benthic sediments act as a reservoir in instances of even low level pollution and pollutants remain in residence for several years.

Research Program

1. *Marine—Ecological Effects*

- Develop and assess data for use in the development of marine water quality criteria—especially with respect to *consent decree* chemicals.

- Develop bioassay systems and techniques allowing interaction between test organisms and pollutants under conditions simulating their natural environment to determine water quality criteria.

- Identify problems of bioaccumulation and the significance of an organism's body burden to both public health standards and the effects on reproduction and population integrity.

- Compare responses of laboratory cultures to standard pollutants with field stock in a world-wide intercalibration experiment to assure intercomparability of results.

- Develop aquaria systems and culturing techniques for inducing spawning and handling captive marine animals, to provide a variety of species and life stages for testing by other programs. Determine optimization of holding conditions, diet, disease prevention and simulation and environmental requirements such as temperature, salinity and nutrients.

- Determine biological effects of pollutants on marine life by histopathological examination of the organs and tissues of the animals. Identify morphological changes which may have potential as pollution monitors in the determination of water quality criteria.

- Develop new methodology, techniques and quality control procedures for analysis of ambient conditions and pollutants in marine samples.

- Analyze metals, nutrients and hydrocarbons in

tissue, water and sediment samples using gas chromatography, atomic absorption spectrophotometry, ATP analysis and neutron activation.

- Quantify sublethal effects of pollutants on marine organisms, focusing on stress. Investigate biological indicators such as growth, fecundity, successful hatch, larval development and recruitment in species of ecological importance.

- Quantify movement and behavior of experimental organisms using *Bugwatcher* (computerized behavioral analysis system).

- Determine alterations in locomotion and behavior patterns induced by sublethal concentrations of toxicants prior to irreversible damage or death.

- Conduct multi-disciplinary effort aimed at the development of standard methods to assess the environmental consequences of open marine disposal of municipal sewage, non-petroleum industrial wastes and dredge spoils.

- Elucidate short-term effects in the water column and benthic areas proximate to a disposal site as well as long-term integrative impacts of a broader scope.

2. *Fate and Effects of Toxic Substances*

- Develop techniques and general information to be used in building models of toxic chemicals in the marine environment.

- Develop whole/partial life-cycle tests for fish, polychaetes, and crustaceans.

- Develop marine microcosms for predicting fate of toxic chemicals.

3. *Energy*

- Determine the structural and functional responses of marine ecosystems to a number of environmental stresses. Quantify the effects of relatively low chronic levels of oil on the marine biota and the fate of oil within the system. Detail pathways and fluxes of petroleum hydrocarbons through the

ecosystem and measure their rates of exchange between organisms, water and sediment. Develop quantitative predictions about pathways and ultimate fate of a substance introduced into the marine environment.

4. *Anticipatory*

Ecosystem Analysis

- Examine the response of interdependent groups of organisms to pollutant stress by creating a microcosmic model of the marine ecosystem.

- Develop a laboratory-sized ecosystem that replicates the natural system in structure and function. Use the ecosystem to predict effects of pollutants in nature and translate these results into meaningful water quality criteria.

Mussel Watch

- Conduct a national marine monitoring program using indicator organisms as a biological monitoring system measuring for petroleum, hydrocarbons, chlorinated hydrocarbons, heavy metals and transuranic radionuclides (Plutonium and Americium) in marine coastal waters.

- Bivalves (including mussels and oysters) are used as surveillance organisms for recording exposure levels of pollutants which are concentrated at levels well over that found in seawater.

- Determine baseline levels of organic and metallic pollutants in U.S. coastal waters and identify zones of high pollutant concentrations (hot spots).

- Provide information on changes with time within a given coastal zone and a basis to assess potential impacts on public health.

Coastal Environment Assessment Study

- Establish and evaluate methods for monitoring environmental stability and tracking adverse environmental impact using biological indicator organisms.

- Conduct short-term studies using standardized methods as a means of understanding natural perturbations in the interpretation of long-term monitoring programs.

Genetic Toxicology

- Assess genetic toxicology of specific compounds or mixtures via short-term tests with mammalian cell systems. Evaluate potential impact of genetic natural populations.

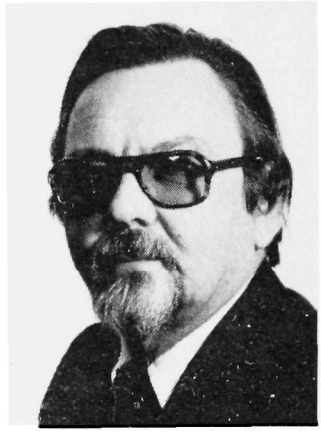
Health Effects Research Laboratory

Research Triangle Park, North Carolina

Mission

Provide the health intelligence necessary for determining the need and the establishment of environmental standards. Studies are performed that address problems in air pollution, non-ionizing radiation, environmental carcinogenesis, and the toxicology of pesticides and other toxic chemical pollutants. Specifically, the Laboratory's function is to:

- Conduct toxicological, clinical, and epidemiological research to identify health effects of environmental pollutants;
- Provide data to assist in making regulatory decisions concerning the registration of new pesticides or the proposed suspension of those already in use;
- Conduct research on hazardous and toxic materials, including establishing a biological data base upon which to establish standards for non-ionizing radiation;
- Provide technical assistance to Agency's Regional and Program Offices.



F. Gordon Hueter **Director, Health Effects Research Laboratory, Research Triangle Park, North Carolina**

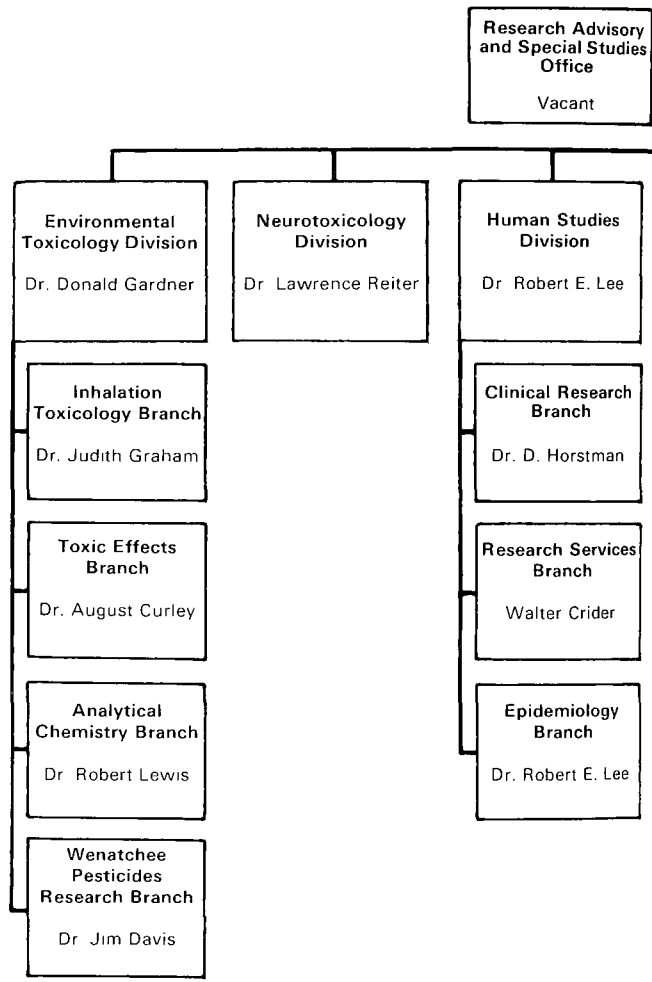
Education:
University of Maryland—B.S., 1948-1952
University of Maryland—M.S., 1954-1956
University of Maryland—Ph.D. (Animal Science, Physiology, Biochemistry) 1956-1958

Professional Experience:
Director, Health Effects Research Laboratory, 1978-Present
Associate Director, Health Effects Research Laboratory, EPA, Research Triangle Park, 1975-1978
Director, Special Studies Staff, Environmental Research Center, EPA, Research Triangle Park, 1973-1975
Deputy Director, Office of Criteria Development, EPA, Research Triangle Park, 1972-1973
Special Assistant, Office of the Director, EPA, Research Triangle Park, 1971-1972
Assistant Director, Division of Effects Research, EPA, Research Triangle Park, 1969-1971
Chief, Biological Research Branch, Division of Health Effects Research, National Air Pollution Control Association, 1968-1969
Chief, Physiology Section, Division of Health Effects Research, National Air Pollution Control Administration, 1961-1968
Assistant Professor, Animal Science Department, Oregon State University, 1958-1961

Professional Affiliations:
Session Co-Chairman, Air Pollution Control Association, Annual Meeting, 1967

Session Chairman, 10th Annual Hanford Biology Symposium, 1970
Session Co-Chairman, International Air Pollution Conference, 1970
U.S. Delegate to: Policy Panel on Effects, Air Management Research Group, Organization for Economic Cooperation and Development
U.S. Representative for: United States-German Cooperative Agreement concerning air pollution effects research
Chairman, Panel on Criteria for NATO/CCMS Air Pollution Study
Member and Secretary of PAMA's Section on Environmental Health Sciences
Assignment to WHO (Geneva) to assist in the initiation and implementation of the WHO Environmental Health Criteria Program
United States EPA representative as official member of Secretariat for Environmental Workshop on Biological Monitoring and Tissue Banking. Workshop cosponsored by the EPA, WHO, and Commission on European Communities
Author or co-author on 11 scientific papers addressing subjects in the area of environmental health
Membership in: American Association for the Advancement of Science; The Smithsonian Associates; National Audubon Society
Co-Coordinator, US/USSR Environmental Protection Agreement

Honors: Borden Agricultural Scholarship Award, 1952
Sigma Xi, 1959
EPA Bronze Medal for Commendable Service, 1978



FTS Telephone No. 629-2281
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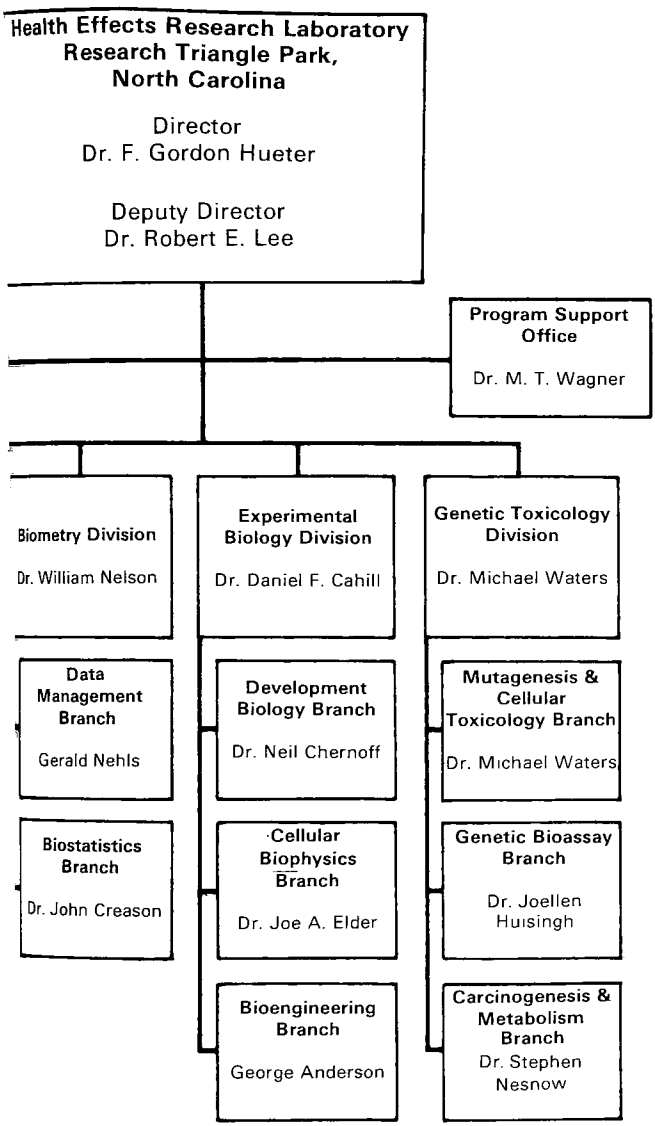
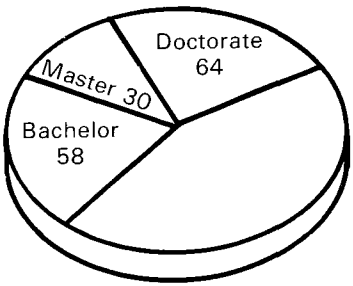

Health Effects Research Laboratory
Research Triangle Park,
North Carolina
Director
Dr. F. Gordon Hueter
Deputy Director
Dr. Robert E. Lee
Program Support Office
Dr. M. T. Wagner
Biometry Division
Dr. William Nelson
Experimental Biology Division
Dr. Daniel F. Cahill
Genetic Toxicology Division
Dr. Michael Waters
Data Management Branch
Gerald Nehls
Development Biology Branch
Dr. Neil Chernoff
Mutagenesis & Cellular Toxicology Branch
Dr. Michael Waters
Biostatistics Branch
Dr. John Creason
Cellular Biophysics Branch
Dr. Joe A. Elder
Genetic Bioassay Branch
Dr. Joellen Huisingh
Bioengineering Branch
George Anderson
Carcinogenesis & Metabolism Branch
Dr. Stephen Nesnow

Research Program Resources Summary ($1,000's)	FY 1979		FY 1980	
	In-House	Extramural	In-House	Extramural
	$13,833	$10,434	$19,866	$21,668

Personnel



Full-time EPA Personnel = 250

Recent Accomplishments

1. *Light Duty Diesel Exhaust Studies*—In cooperation with other EPA laboratories bioassays have been run on a variety of light duty diesel exhaust samples. These include twelve certification vehicles in cooperation with Ann Arbor, additional testing of the Oldsmobile and Nissan samples, and fractionization studies of light duty diesel samples. Preliminary testing of malfunction vehicle samples was begun, and further testing of long-term storage and stability of samples was continued. These results are being analyzed. A computer program is being prepared to handle all bioassay data.

2. *Diesel Exhaust Toxicity Studies*—Preliminary studies to determine the toxicity of diesel exhaust extracts in various solvents indicated that 1% or lower doses in 10% DMSO, 20% propylene glycol and 70% saline could be administered once per week for fifteen weeks without inducing acute toxicity. Pathological examination of the trachea and lungs of hamsters sacrificed one week after being treated showed only minor, probably reversible, changes in the epithelial cells. The remaining animals will be held for six months.

3. *Confirmatory Bioassays of Diesel Emission Organics*—The extractable organics from diesel particulate emissions have been shown to be mutagenic in a bacterial screening assay (Ames,

S. Typhimurium). This report summarizes the mutagenicity and carcinogenicity results from a battery of confirmatory bioassays. The test systems included in this battery are primarily mammalian cell systems, however, one assay was conducted in insects (*Drosophila*) and one in yeast (*Saccharomyces*). The bioassays detected the following biological effects: gene mutations, DNA damage, and oncogenic (neoplastic) transformation.

4. *Evaluation of the Various Metal Sulfate Aerosols on Alveolar Macrophage Function In Situ*—Hamsters were sacrificed 1, 24, and 48 hours following a single four-hour exposure to various aerosols and their Alveolar Macrophage Phagocytic Rates were measured by determining the uptake of Radioactive Colloidal Gold (198AU). The concentration causing a 50% depression in normal controlled phagocytosis of gold particles (LD_{50}) was determined. In addition, the number and size of cells harvested by Pulmonary Lavage were determined when hamsters were exposed for four hours to either Zinc Sulfate, Zinc Ammonium Sulfate or Cupric Sulfate, Macrophage Endo-Sulfate, Zinc Ammonium Sulfate or Cupric Sulfate, Macrophage Endocytosis of Collodial Gold was significantly reduced one hour following exposure as compared to unexposed controls.

5. *H_2SO_4 Studies*—Young healthy subjects were exposed to H_2SO_4 concentrations as high as 973 micrograms per cubic meter. These exposures had no significant effect on pulmonary function. The negative results obtained in these studies almost certainly reflects the neutralization of the H_2SO_4 breathed into the lung spaces by the ammonia produced metabolically in the lungs.

6. *Ozone Studies*—Immunological effects were studied in 30 young, healthy male non-smoking human subjects exposed to an atmosphere of 0.4 ppm ozone for four-hour periods on each of four consecutive days. Blood drawn from these subjects before and after the exposures was analyzed for immunological components. Peripheral blood lymphocytes obtained before and after the exposures were characterized by quantitation of surface membrane receptors, membrane immunoglobulins, and nucleic acid (DNA and RNA) synthesizing activities. The studies on lymphocyte receptors revealed a significant decrease in Fc and active T-determinants.

Decreased DNA synthesis also was observed in T-cells. These changes represent decrements in the overall resistance to infection of the subjects.

Exposure to humans to ozone has been shown to result in decreased diffusion capacity of the lung, increased closing volume, and altered ventilation distribution. A study was performed to study the influence of peripheral bronchoconstriction and the formation of interstitial edema on these lung function decrements.

7. *Development of Computer Programs*—Written and tested for the measurement of parameters of the S-T segment of the electrocardiogram, including the J-point depression, the slope of the S-T segment, and the area under the S-T segment. These programs have been adapted to the PDP-15 computer, the LSI-11 computer, and the Intel 8080 computer. Using these programs, a series of studies was performed on dogs in which it was clearly shown that the cardiac effects of carbon monoxide poisoning and of hypoxemia induced by low partial pressure or oxygen are additive.

8. *Cancer Assessment in Asbestos Mining Areas*—Cancer mortality rates were compared for asbestos mining counties and non-mining counties within the same states. Whites residing in asbestos mining counties displayed higher age-adjusted rates for buccal and pharyngeal tumors in males, and for buccal, pharyngeal, and urinary tract cancers in females. Non-white comparisons showed male excesses for buccal and pharyngeal, respiratory tract and cluster 2 cancers; non-white females experienced excesses for respiratory tract, breast, genital tract, urinary tract, cluster 1 and cluster 2 neoplasms, and for leukemia. Comparisons of age-specific rates reveal higher rates in asbestos mining counties among white males for buccal and pharyngeal, gastro-intestinal and benign tumors, and for leukemia. Leukemia did not display the usual biomodality but rather increased steadily with age. White females displayed higher rates for buccal and pharyngeal, breast, urinary tract cancers, and for leukemia and the lymphomas. Non-white males revealed higher rates for buccal and pharyngeal, gastrointestinal, respiratory tract, cluster 1 and cluster 2 tumors, as well as for leukemia. Non-white females displayed excesses for respiratory tract, breast, genital tract, urinary tract, cluster 1 and cluster 2 cancers, and for leukemia. These findings suggest the need for additional research concerning health effects

related to possible ambient as well as occupational forms of asbestos exposure.

9. *Advances in Research*—An assay has been developed which can detect the generation of unusual alterations in the metabolic pathway of a model substrate. The procedure utilized lindane as the model substrate. The altered metabolite profile serves as an indication of toxicant exposure and can signal the presence of interactions. The procedure has been found to be useful in studying exposure to pesticides, drugs, metals, other toxic chemicals, and microwave radiation.

   Twin-well calorimeters were used to determine the whole body specific absorption rates for mice and rats exposed to 2450MHz, 425 MHz, or 100 MHz radiation. Exposures were made of single animals at one of the three frequencies and in one of three orientations with respect to the E and H fields. The three orientations of the long axis on the animal were parallel to the E field, parallel to the H field, and parallel to the K vector, the direction of propagation. For each animal species there were three animal weight ranges.

   The 2450 MHz exposures were made in an anechoic chamber in the far field. The 425 MHz and 100 MHz exposures were made in TEM Transmission Lines (Crawford Cells). Incident power density was measured with a dipole probe in the 2450 MHz exposures, whereas the 425 and 100 MHz incident power densities were calculated from the incident power and effective cross sectional area of the transmission line.

   Comparison of the measured SAR values with the theoretical values given in the Radiofrequency Radiation Dosimetry Handbook (2nd Ed.) are in reasonable agreement. The measured values tended to be greater than the handbook values by a factor of 2 and as high as a factor of 4.

   The usefulness of the mouse lymphoma assay in a test battery has already been validated by extensive testing with positive and negative carcinogens. This system presently has the following advantages: (1) it utilizes a mammalian cell; (2) it is capable of detecting as mutagens several carcinogens which are missed in bacterial assays; (3) it is a forward mutational assay capable of detecting a complete range of gene damage, and (4) it is a quantiative assay.

In previous studies, exposure to a single relatively high dose of endrin, a chlorinated hydrocarbon pesticide, has been shown to induce a central nervous system terata in hamsters. In further studies, however, administration of multiple doses of endrin using the commonly used teratology bioassay protocol resulted in few fetal central nervous system defects. Similarly, multiple doses of endrin were not found to be teratogenic in the rat or mouse even at doses which induced maternal toxicity. Using the multiple (non-teratogenic) dosing regimen the post-natal behavioral development of rats and hamsters was studied following prenatal endrin exposure. Endrin was found to induce emotional disturbances in pre-weanling hamsters and rats in the absence of overt teratologic events. These early behavioral disorders were observed at doses below those that were maternally toxic. Although the hyperactivity noted in the low dose groups was generally attenuated following weaning hamsters exposed to higher levels remained hyperactive throughout their lifespan.

Methodologic research in the development of more powerful statistical procedures has continued at both Stanford University and Columbia University. At Stanford, Whittmore has received notification that her asthma panel analysis report has been accepted for publication in biometrics. She and Kopn are also continuing to analyze the effects of ozone and nitrogen dioxide on asthmatics. Duan is continuing his analysis of the distribution of human exposure patterns of air pollutants. Switzer has completed arrangements to begin cooperative studies with the Bay Area Air Pollution Control District in the near future which will add a valuable data resource and much practical experience to the Statistics Department capability. At Columbia, Goldstein and Cusick have examined relationships between air pollutant exposures and illness patterns in New York City.

The objectives of another study are to perform comparative cytotoxicity experiments *in vitro* to determine the plausability of using cellular and biochemical indicators to rank the toxicity of environmental samples. Three mammalian cell systems (Rabbit Alveoloi Macrophage [RAM], Human Neonatal Fibroblasts [HNF], and Chinese Hamster Ovary [CHO] were used to determine the relative cellular toxicity of lead sulfate, lead oxide—coated fly ash, a fine particle obtained from

stack gas of a fluidized-bed combustion process, and Aroclor 1254 (a polychlorinated biphenyl). Toxicity was determined after 20 hours of exposure. Analysis of the results showed that the relationship between cell viability (percent surviving cells) and measured biochemical indicators could be expressed as a straight line with a mean correlation coefficient of 0.9. The biochemical changes were more sensitive indicators of cellular toxicity than cell viability.

Thirteen compounds have now been tested in the mouse teratology screen under development. In this procedure pregnant mice are exposed to near maximally tolerated doses of chemical toxicants during a period of peak organogenesis (days 8-12) after which the dams are allowed to deliver naturally. The growth and survival of the pups are monitored over a 72-hour period. Previously identified teratogens (cacodylic acid, vitamin A and 5-BUDR) have shown teratogenic activity in this test system corresponding to positive data in standard protocols for teratology. Kepone, caffeine, and sodium salicylate have shown mild effects also consistent with results found in the literature. Non-teratogens (carbaryl, dinoseb, toxaphene, and endrin) have been inactive in this system.

Research Program

1. *Criteria Pollutants*—Obtain data, through controlled human studies, epidemiological studies, and animal studies, on health effects of criteria pollutants, either singly or in combination, to identify additive and possible synergistic effects.

2. *Non-Criteria Air Pollutants*—Obtain data on acute toxicological effects of sulfuric acid, sulfates, nitrates, and metal oxides in the 2.5 and 2.5-15 micrometer range on normal and impaired animals. Obtain data, through controlled clinical experiments, on the effects of the same materials on human subjects. Relate elevated particulate levels by size classification to observed health effects through epidemiological studies. Determine threat to human health from exposure to heavy metals including lead, copper, zinc, and other non-metallic substances. Develop protocols and analytical procedures for the National Environmental Specimen Bank pilot program.

3. *Non-Regulated Pollutants Specifically Associated with Transportation*—To ascertain whether or not

non-regulated emissions from vehicles or engines manufactured after model year 1978 will cause or contribute to an unreasonable risk to public health. Particular emphasis is placed on developing the scientific data base necessary to assess public health risk associated with diesel automotive exhaust products.

4. *Pesticides*—Activities include a variety of laboratory and field studies to determine the human exposure and toxicological effects of pesticides. Specific areas of investigation involve: determining the implications of *new generation* pesticides, evaluating for humans the potential carcinogenicity, mutagenicity, teratogenicity, and other toxicological effects of pesticides; evaluating human exposure during application procedures; and developing predictive models for extrapolating human effects from animal studies. Research is also developing and validating analytical methods for determining the presence of pesticides and their metabolites in environmental and biological samples as an aid in defining human exposure and human hazard.

5. *Toxic Substances and NCTR*—Major emphasis is placed on research to promote and validate improved screening techniques to determine the carcinogenic, teratogenic, mutagenic, neurotoxic, and other toxicological effects of chemical substances. Long-term low-dose research is correlating environmental and ambient levels of pollutants and measured routes of exposure with tumor induction and other health effects. In addition, epidemiological studies evaluate and confirm the significance of toxic effects in animals as related to health effects in human populations.

6. *Anticipatory*—Identify candidate compounds or categories of compounds for carcinogenicity assessment in mammalian and *in vitro* test systems. Using available vital statistics, identify populations with increased cancer incidence, delineate specific neoplasm type and relevant demographic factors. Relate these cancer incidence data to known or suspected chemical carcinogens. These carcinogens are determined by environmental monitoring and emissions inventories

7. *Radiant Energy*—Investigations are continuing on the health effects of non-ionizing radiation from environmental sources such as television, radio, and radar transmissions. Current emphasis is on

experimental animal studies employing chronic, low-level exposures using low power densities in the range of 1-10 milliwatts per square centimeter; the initiation of epidemiological studies of exposed populations; and development of a criteria document which provides a critical, comprehensive review of the non-ionizing radiation health effects literature. Results from these studies are for establishing protective guidelines for environmental levels of such radiation. Specific activities include: Determination of the health effects of exposure to environmentally occurring electromagnetic radiation, including neurophysiologic, behavioral, teratogenic and immunologic effects; definition of absorption frequencies of electromagnetic radiation in biological systems; and identification of mechanisms of interaction, including frequency dependence and power densities.

8. *Health Effects from Pollutants Associated with Energy Development*—Collect health effects data as a result of exposure to sulfates, particulates, and organics. Objectives are to identify hazardous agents associated with non-nuclear energy technologies, develop more rapid and sensitive methods to evaluate dose to man, determine metabolism and fate of hazardous agents associated with alternate energy technologies, evaluate hazards of exposure of normal, susceptible, and stressed population groups.

9. *Quality Assurance (Pesticides)*—Conduct Quality Assurance Program to insure reliability of all EPA pesticide analysis laboratories. This program includes methods development and standardization, provision of high purity analytical standards, instrument modification, and repair services. This program supports the Office of Pesticide Programs.

Health Effects Research Laboratory

Cincinnati, Ohio

Mission

Provide health effects data base to support regulatory activities of the Agency. Identify, characterize, and quantitate harmful effects that may result from exposure to biological or chemical agents found in the environment. Present these data in a form consistent with the decision-making responsibilites to Agency policymakers.

Specific activities are:

- Conduct field and laboratory studies of the effects on human health and welfare associated with:
  - Emissions from diesel-powered vehicles.
  - Chemical and biological contaminants in drinking water.
  - Pollutants occurring in waters used for recreation.
  - Pollutants emitted from wastewater-treatment plants.
  - Land treatment and disposal of wastewater and sludge.
  - Toxic substances.
  - Biological pest control.
- Develop models and test systems for quantifying carcinogenic potency.
- Provide critical review expertise for documents which evaluate health and environmental effects of multimedia exposure to priority pollutants.
- Provide technical assistance to the various Program Offices and Regional Offices.

R. John Garner **Director, Health Effects Research Laboratory—Cincinnati, Ohio**

Education:

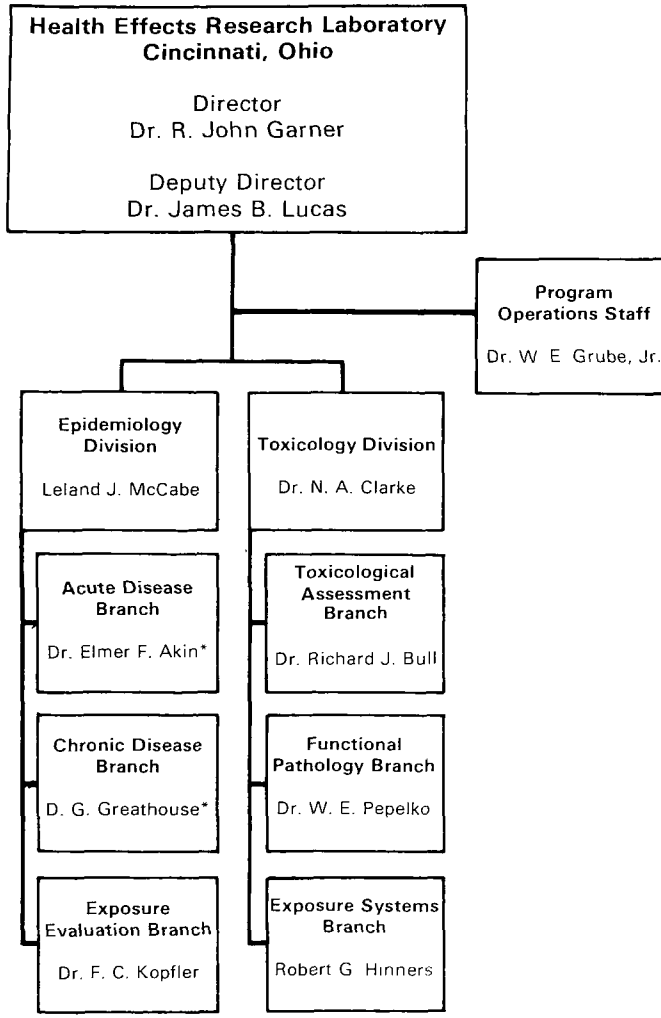
Downing College, Cambridge University
B.A. (Honors) (Natural Sciences), 1942
M.A. (Honors) (Biochemistry), 1946
Royal Veterinary College, London University
M.R.C.V.S. (equivalent to DVM), 1945
F.R.C.V.S. (Veterinary Biochemistry), 1952
Liverpool University
M.V.Sc. (Biochemistry), 1952
D.V.Sc. (awarded on Published Research), 1961

Professional Experience:

Director, Health Effects Research Laboratory, 1975-Present
Director, Experimental Biology Laboratory, EPA-Research Triangle Park, 1972-1975
Director, Collaborative Radiological Health Laboratory, Colorado State University, 1965-1972
Professor of Radiation Biology and Biochemistry, Colorado State University, 1965-1972
Head, Public Health Section, Authority Health and Safety Branch, Atomic Energy Authority, United Kingdom, 1960-1965
United Kingdom Agricultural Research Council, 1957-1960
Senior Lecturer in Chemical Pathology,Bristol University, 1953-1956
Lecturer in Veterinary Biochemistry, Liverpool University, 1950-1953
Research Biochemist, Colonial Veterinary Service, Nigeria, 1946-1950

Professional Affiliations: AAAS
Associate, Royal Institute of Chemistry
Health Physics Society
New York Academy of Sciences
Sigma Xi

Honors: Churchill Foundation Fellowship, Copenhagen, Denmark, 1956

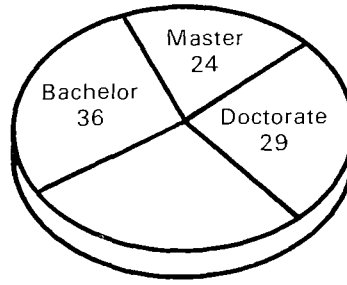


*Acting

FTS Telephone No. 684-7401
Commercial Telephone No. (513) 684-7401

Research Program Resources Summary ($1,000's)	FY 1979		FY 1980	
	In-House	Extramural	In-House	Extramural
	$5,022	$11,345	$6,939	$18,475

Personnel



Full-time EPA Personnel = 118

Recent Accomplishments

1. *International Symposium on the Health Effects of Diesel Emissions*—Conducted December 3-5, 1979. Proceedings will be published.

2. *Three-year Study of High Barium Contact in Drinking Water*—Completed and published the results of this study, one of significant value to Regional officials in getting action from communities and state ofifcials who have been *foot dragging* on submission of plans for variance or control.

3. *Multidisciplinary Health Assessment*—Investigated potential health effects related to the use of toxic-organic contaminated water supply at a manufacturing plant in Granger, Indiana. Analyses of workplace air samples and waters from private wells in the surrounding area provided verification that affected employees were exposed through dermal, inahalation and ingestion routes.

4. *Drinking Water Standards*—Provided expert testimony in court which results in the enforcement of compliance with drinking water standards. A community in Region X was forced to upgrade its drinking water system.

5. *Criteria Documents for Maximum Acceptable Limits of 18 Pollutant Compounds in Drinking*

Water—Prepared and forwarded to Geneva, Switzerland in response to a request from the Environmental Health Criteria and Standards Office within the World Health Organization's Division of Environmental Health to ORD.

6. *Carcinogen Assessment Information*—Developed a short-term initiation/promotion assay in rat liver as one component of a system designed to provide data for rapid assessment of carcinogenic potency, and conducted a workshop to assess information on the relationships of various Short-Term *In Vivo* Assays for Environmental Carcinogens. Proceedings to be published.

7. *Evaluation of Toxicity of Diesel Exhaust*—Determined that mortality from *streptococcal* respiratory infection was significantly greater in mice exposed for six hours or two weeks to dilute diesel exhaust. Several experiments showed that diesel exhaust may be more toxic than catalytic gasoline exhaust with respect to the effect in the bacterial test system.

8. *EPA Virus Studies*—Completed a five-year study of viruses in drinking water. Of 205 large-volume samples analyzed, none were recovered. This supports the adequacy of current water treatment practices in the prevention of overt viral transmission. Concluded the first study to show a statistically significant association between exposure to recreational waters and an increased risk of enteroviral disease. Produced and submitted to Congress a comprehensive report on EPA virus studies.

9. *Evaluation of the Health and Welfare Effects of Exposure to Hazardous Waste Disposal Sites*—Revealed a high prevalence of liver abnormalities in persons consuming water from a contaminated well. Results were prepared and presented at a public hearing in Region IV.

10. *Evaluation of the Health Effects of Ammonium Sulfate*—Evolved from concern by the Agency that the use of the platinum palladium catalytic converter to reduce automobile exhaust pollution would increase ambient sulfuric acid levels. Since sulfuric acid is neutralized fairly quickly, the study concluded that ammonium sulfate is non-toxic at very high dose levels. If ammonia is present in the respiratory tracts, then ambient levels of sulfuric acid will be neutralized to ammonium sulfate rendering the sulfuric acid harmless.

11. *Symposia*—Published Proceedings of the Symposium on Waterborne Giardia. A symposium on Wastewater Aerosols and Disease was held September 19-21, 1979. Proceedings will be published.

12. *Recognition of Senior Toxicologist*—Received the Agency's highest level scientific achievement award in recognition of his development of a unique analytical approach to measurement of brain biochemical changes, and application to the first direct demonstration of lead-induced delays in brain development.

13. *Development of Marine Recreational Water Criteria*—Completed and forwarded for outside peer review a draft document which presents complete epidemiological and microbiological bases for developing these criteria. These data present the relationship of the incidence (stated deterministically) or risk (stated stochastically) of disease among swimmers to the quality of the water as measured by the effector itself or an appropriate indicator.

14. *Evaluation of Vital Statistics for Kibutzim in Israel*—Found the incidence of shigellosis, salmonellosis, typyhoid fever, and infectious hepatitis higher in communities practicing wastewater irrigation compared to kibutzim not using wastewater. Further research is planned to determine whether the cause of the disease was aerosols or one of several other pathways of infection.

15. *Evaluation of Health Effects of Diesel-Powered Equipment in Coal Mine Environments*—Began whole animal exposures to a four-pronged protocol including clean air, diesel exhaust alone, coal dust alone, and combined diesel exhaust and coal dust, under an IAG with NIOSH. This project, expected to require 2.5 million dollars over a two-year exposure period, will contribute essential health effects data to both this Agency and to decision makers charged with determining whether diesel-powered equipment is allowable in coal mine environments.

16. *Problem Solving Committee*—Formed for the purpose of improving Employee/Management interactions. Such improved communications will ultimately result in more effective implementation of the research mission of HERL-Cincinnati.

17. *Completion of Research and Publication of Results—Pathogenic naeglaria: Distribution in nature.*

18. *Completion of the Study, Causes of Death of Anesthesiologists from the Chloroform Era*—Determined whether long-term toxic effects of exposure to this compound would be reflected in mortality statistics for this group.

19. *Evaluation of Asbestos Ingestion*—Developed data showing a statistically significant positive relationship between several cancer sites and ingestion of asbestos from drinking water. Another study found asbestos fibers in urine and tissues of baboons ingesting infant formula containing asbestos fibers. This demonstrates that ingested fibers penetrate gastrointestinal tissues and migrate through the body.

20. *Water Supply Survey*—Completed a national survey covering water supplies serving approximately one-fifth of the U.S. population, showing that almost 70 percent of the representative utilities have moderately to highly aggressive waters. Corrosion caused by aggressive water not only carries the threat of distribution system deterioration but also poses a potential health hazard where asbestos fibers may be leached into the drinking water supply.

21. *Epidemiological Studies of Populations Affected by Fossil Fuel Energy Development*—Completed three broad-ranging epidemiological studies of populations affected by fossil fuel energy development in eastern, midwestern, and western U.S. coal fields. Data developed by this work documents potentially and actively exposed populations; geographical, geological, hydrological, and other environmental parameters; and presents a broad range of information needed to effectively implement more detailed approaches to documentation of the human health effects of energy-related pollutants.

Research Program

1. *Drinking Water Health Effects Research*

   - Develop scientific basis for establishing, evaluating and revising drinking water standards and drinking water treatment technologies. Priority projects include: assessment of relative hazards from chlorine and alternate disinfectants and their by-

products (trihalomethanes, etc.); toxicological studies on organic concentrates from finished water. Continuing objective is to identify relationships between water quality and major causes of death (e.g., cancer, cardiovascular disease).

- Determine occurrence and effects of microbiological contaminants in water supplies. Studies include: surveys for the occurrence of pathogenic organisms; determination of what diseases are or may be transmitted by drinking water and of what conditions allow this to occur. Waterborne disease outbreaks provide useful data. Provide assistance to CDC with investigation of such outbreaks.

- Determine health effects of asbestos fibers of the type found in water supplies. The toxicological component includes support of an interagency long-term feeding study. Epidemiological studies include investigation of cancer incidence in communities supplied through asbestos-cement pipes.

- Evaluate potential health hazards associated with water reuse for domestic purposes. Ultimate objective: develop data base to set criteria for the potability of highly treated wastewaters.

2. *Pollutants Posing a Health Risk Related to Water Quality Directly or Indirectly*

- Determine health risks (chemical and biological) from land application of municipal wastewater. Data will assist in developing criteria for land application systems. Emphasis is on the persistence and movement of viruses, heavy metals and organics such as PCB's. A closely related program considers aerosols among wastewater treatment plants.

- Determine health risks of land application of municipal sludge and of other sludge treatment and disposal techniques. Support Cincinnati's municipal sludge management program by conducting projects to interpret generated and existing data to provide guidance to Agency policymakers. Metals, organics, and pathogenic organisms are considered, with immediate emphasis on cadmium and lead.

- Develop rapid bioassay methods for characterizing complex effluents. Provide assistance to OEMI's environmental assessment program in developing, interpreting, and reviewing bioassay protocols for liquid effluents.
- Quantify health effects associated with direct disposal of wastewater and sludge into the aquatic environment; associate the health effects with some index of the quality of the water. Current programs aimed at developing criteria for the *swimmability* of freshwater and marine beaches.

3. *Risk Assessment of Pollutants Associated with Transportation*

   - Assess impact on public health of use in automobiles of alternative engines, fuels, fuel additives, and emisison control systems. Principal approach is through exposure of animals to whole auto emissions. Immediate emphasis is on emissions from light-duty diesel engines.

4. *Health Effects from Pollutants Associated with Energy Development*

   - Identify, characterize, and determine health effects of pollutants from fossil fuel conversion and utilization processes. Included are studies of the metabolism and fate of biologically active pollutants from a Lurgi Process coal gasification plant (with IERL-RTP), and on the health risks to people using water supplies in areas used for coal extraction.

5. *Identification of the Health Effects of Toxic Substances*

   - Assess toxicity of selected high-priority toxic materials using improved screening methods and appropriate animal model systems. Determine which materials are significantly toxic at low levels, how and where they produce adverse health effects, and what are their general mechanisms of action.

6. *Environmental Carcinogens*

   - Develop *in vivo* systems for rapid assessment of carcinogenic and co-carcinogenic potential and carcinogenic potency of environmental pollutants.

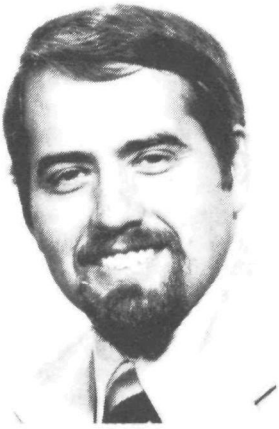
Environmental Criteria and Assessment Office

Research Triangle Park, North Carolina

Mission

The Environmental Criteria and Assessment Office, Research Triangle Park (ECAO/RTP) is responsible for criteria establishment and health assessment primarily concerning ambient air pollution. The primary functions of ECAO/RTP consist of:

- Preparing, publishing, and periodically revising criteria documents as input for establishing environmental standards.
- Preparing and publishing health assessment documents for various pollutants.
- Furnishing appropriate scientific information to those in EPA and Congress who are responsible for making regulatory and legislative decisions.
- Supplying reports and assessments as needed to the Carcinogen Assessment Group and the ORD Health Assessment Group, and performing tasks assigned to ORD as the World Health Organization (WHO) collaborating center for environmental pollution control.



Lester D. Grant **Director, Environmental Criteria and Assessment Office—Research Triangle Park, North Carolina**

Education:
University of Pittsburgh, B.S. (Psychology), 1964
Carnegie-Mellon University, M.S. (Psychology), 1967
Carnegie-Mellon University, Ph.D. (Psychology), 1969

Professional Experience:
Director, Environmental Criteria and Assessment Office, Office of Research and Development, U.S. EPA, 1978-Present
Associate Professor, Departments of Psychiatry and Anatomy, University of North Carolina, Chapel Hill NC, 1977-1978
Codirector, Neurobiology of Environmental Pollutants Program Project, University of North Carolina, Chapel Hill NC, 1974-1978
Assistant Professor, Department of Anatomy, University of North Carolina, Chapel Hill NC, 1973-1977
Acting Director, Neurobiology Program, University of North Carolina, Chapel Hill NC, June 1973
Associate Director Training, Neurobiology Program, University of North Carolina, Chapel Hill NC, 1972-1973
Assistant Professor, Department of Psychiatry, University of North Carolina, Chapel Hill NC, 1971-1977
Instructor, Department of Anatomy, University of North Carolina, Chapel Hill NC, 1971-1973
Research Scientist, Biological Sciences Research Center of the Child Development Institute, University of North Carolina, Chapel Hill NC, 1970-1978
Member, Laboratories for Reproductive Biology, University of North Carolina, Chapel Hill NC
Member, Neurobiology Program, University of North Carolina, Chapel Hill NC

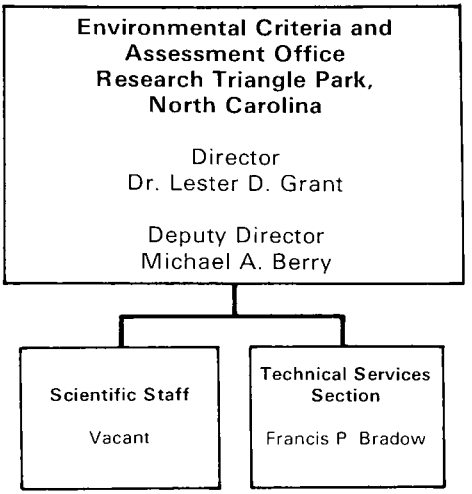
Instructor, Department of Psychiatry, University of North Carolina, Chapel Hill NC, 1970-1971
NIMH Postdoctoral Fellow in Biopsychology, University of Chicago (S.P. Grossman, Sponsor), 1969-1970
Graduate Assistant, Psychoactive Drugs Course, Carnegie-Mellon University, Spring 1969
Graduate Supervisor, Educational Testing Service Test Center, Carnegie-Mellon University, 1968-1969
NASA Predoctoral Trainee-Graduate Research Assistant, Physiological Psychology, Carnegie-Mellon University, 1966-1968
Graduate Instructor, Social Psychology, Carnegie-Mellon University, Spring 1966
Graduate Assistant, Ford Foundation Workshop on Research in Organizational Behavior, Carnegie-Mellon University, Summer 1965
Graduate Research Assistant, Social-Organization Psychology, Carnegie-Mellon University, 1964-1966
Research Assistant, Team Training Laboratory, American Institutes for Research, Pittsburgh PA, 1962-1966
Undergraduate Research Assistant, Social Psychology, University of Pittsburgh, PA, 1961-1964

Professional Affiliations:

Society of Sigma Xi
American Association for the Advancement of Science
American Psychological Association
Society for Neuroscience
American Association of Anatomists

Honors:

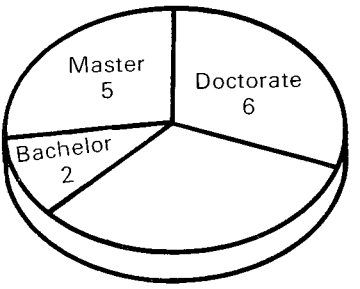
University Scholarship, University of Pittsburgh
Honors Program-Advance Placement, University of Pittsburgh
Departmental Honors in Psychology, University of Pittsburgh
NASA Predoctoral Traineeship, Carnegie-Mellon University
NIMH Postdoctoral Fellowship, University of Chicago



FTS Telephone No: 629-2266
Commercial Telephone No. (919) 541-2266

Research Program Resources Summary ($1,000's)	FY 1979		FY 1980	
	In-House	Extramural	In-House	Extramural
	$1,655		$1,488	$382

Personnel



Full-time EPA Personnel 22

Recent Accomplishments

1. *Air Quality Criteria Documents*—Initiated preparation of documents for Sulfur Oxides/Particulate Matter and Carbon Monoxide.

2. *Health Assessment*—Initiated preparation of documents for Arsenic, Trichloroethylene, Methyl Chloroform, Methylene Chloride, Fluorocarbon 113 and Vinylidene Chloride.

Environmental Criteria and Assessment Office

Cincinnati, Ohio

Mission

The Environmental Criteria and Assessment Office, Cincinnati (ECAO/Cin) is reponsible for the preparation of criteria and risk assessment documents primarily concerning, but not limited to water pollution and solid wastes in support of program needs for use in Agency regulatory activities. ECAO/Cin serves as an ORD focal point to collect, summarize, evaluate, and assess all available scientific data, national and international, on toxic effects resulting from exposure to environmental pollutants. The primary functions of the ECAO/Cin consist of:

- Preparing, publishing and periodically revising criteria documents as input for establishing environmental standards.
- Preparing and publishing health and ecological risk assessment documents, which serve as a basis for decisions by the EPA Administrator regarding the listing of pollutants for control under various legislative authorities.
- Responding to requests for scientific documentation from Agency Program Offices and the Office of General Council, and preparing special reports and assessments to these groups as needed.
- Communicating with and assisting international agencies, such as the World Health Organization, Food and Agriculture Organization and the International Atomic Energy Commission in the execution of ORD's role as a collaborating center for environmental pollution control.

  Maintaining a high degree of liaison/interaction with ECAO/RTP, CAG and other components of OHEA.

Jerry F. Stara **Director, Environmental Criteria and Assessment Office—Cincinnati, Ohio**

Education:
University of Brno, Czech.—B.S. (Biology) 1948
University of Georgia—D.V.M. (Vet. Med.) 1954
Harvard University—M.P.H. (Public Health) 1955
University of Rochester, N.Y.—M.Sc. (Radiotoxicology) 1961

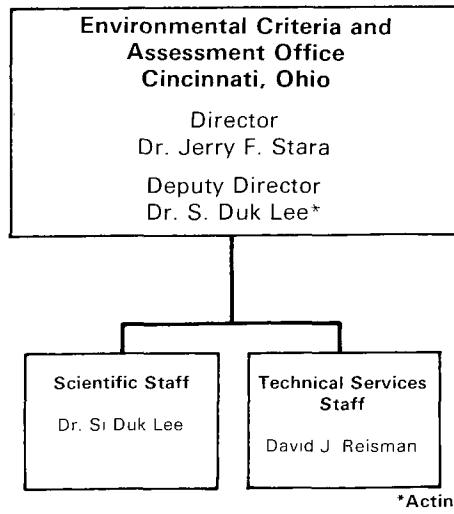
Professional Experience:
Director, Environmental Criteria and Assessment Office, 1979-Present
Adjunct Professor of Environmental Health, Kettering Institute, Cincinnati, 1972-Present
Adjunct Clinical Professor of Radiology, College of Medicine, University of Cincinnati, 1966-Present
Director, Office of Program Operations, Health Effects Research Laboratory, EPA, Cincinnati, 1976-1978
Director, Environmental Toxicology Research Laboratory, EPA, Cincinnati, 1970-1976
Chief, Biological Research Branch, National Air Pollution Control Administration, HEW, 1969-1970
Chief, Radionuclide Toxicology Laboratory, National Center for Radiological Health, DHEW, 1967-1969
Chief, Radiobiology Section, Div. Rad. Health, DHEW, 1962-1967
Senior Staff Member, Fission Product Inhalation Program, Lovelace Foundation, Albuquerque, New Mexico, 1960-1962
Chief, Communicable Disease and Food Control Section, McComb County Health Department, Mt. Clemons, Michigan, 1955-1960

Professional Affiliations:
American Association for the Advancement of Science

American Veterinary Medical Association
American Public Health Association
Radiation Research Society
Committee on Public Health, U.S. Livestock Assoc.

Honors: Sigmi Xi, 1968
Special promotion to Director Grade Commissioned Corps, PHS, 1968
PHS Meritorious Service Medal, 1973

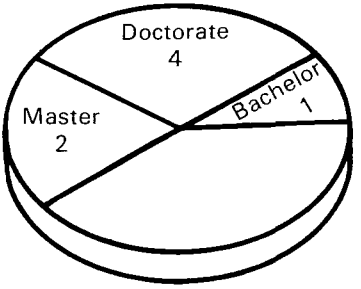
State Veterinary Boards: Michigan 1957, and Ohio 1963



FTS Telephone No. 684-7531
Commercial Telephone No. (513) 684-7531

Research Program Resources Summary ($1,000's)	FY 1979		FY 1980	
	In-House	Extramural	In-House	Extramural
	$311	$1,685	$801	$875

Personnel



Full-time EPA Personnel = 12

Recent Accomplishments

1. *Ambient Water Quality Criteria Documents*—Completed final drafts on the 65 Consent Decree pollutants for publication in Federal Register. Reviewed and resolved public comments on the 65, utilizing expert consultants and in-house scientists in work sessions.

2. *Hazard Profiles*—Completed 260 Hazard Profiles on chemical pollutants for the Office of Solid Waste as part of a comprehensive evaluation on toxic waste streams.

3. *Reviews of the Environmental Effects of Pollutants*—Published Reviews (REEPs) on 12 substances: mirex/kepone, benzidine, chromium, cadmium, cyanide, beryllium, lead, toxaphene, chlorophenols, hexachlorocyclopentadiene, and endrin.

4. *Chemical Reviews*—Completed for the Office of Enforcement a review of 12 chemicals which are under consideration for exemption under the 301g waiver provision of the Clean Air Act. Initiated work on environmental assessment for 12 multimedia documents of: acetone, ammonia, barium and compounds, chlorophenoxy herbicides, dibenzofurans, iron and compounds, kepone, malathion, manganese and compounds, methoxychlor, mirex, and parathion. The first drafts are being finalized.

5. *Monograph*—Finalized for publication a monograph entitled, *Long-Term Effects of Pollutants in Canine Species*.

6. *Organization Established*—Recruited and hired personnel to fill 18 of the 23 projected scientific and technical staff positions of the newly established ECAO/Cin. Made operational the Wang Office Information and Word Processing System, and trained appropriate personnel. Initiated establishment of telecommunication network between ECAO/Cin, OHEA, and outside contractors.

Research Program

1. *Ambient Water Quality Criteria Documents*

   - Characterize suspect chemical substances based on reported data of environmental exposure from aquatic media.
   - Locate and compile relevant information concerning suspect chemical substances by comprehensive literature searches.
   - Evaluate all data and select key health and ecological effects studies relevant to assessment of risk.
   - Perform quantitative and qualitative data analysis to establish criterion levels of environmental pollutants which would protect public health and welfare.
   - Publish the 65 Ambient Water Quality Criteria documents as an input for setting environmental standards.

2. *Scientific Assessment on Selected Water Pollutants*

   - Identify and characterize suspect chemical substances in the environment by examination of available test data, exposure patterns, and their impact on human health and overall ecological and environmental quality.
   - Prepare and publish scientific hazard risk assessments on selected water pollutants which will serve as a basis for Agency decisions regarding the listing of pollutants for standards.

3. *Hazard Profile Summaries*

- Preparation of 260 Hazard Profile Summaries on selected chemicals identified in solid waste effluent streams.

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