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OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL PROTECTION AGENCY

BRIEFING BOOK

March 1978

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OFFICE OF RESEARCH AND DEVELOPMENT

WASHINGTON, D. C.

OFFICE OF RESEARCH AND DEVELOPMENT

WASHINGTON, D. C.

MISSION

Produce scientific data and technical tools on which the Agency can base sound National policy in the development of effective pollution control strategies and reasonable environmental standards. Promote programs to provide insight to complex environmental issues such as:

- How pollution can be identified, measured, and monitored;
- What determines a substance in the environment becoming a pollutant requiring regulation and control;
- What levels of pollutant discharge from specific sources can be permitted while still attaining defined ambient quality standards;
- What are the health and ecological effects of pollutants on people, other life forms and the inanimate environment;
- What technologies are available for controlling pollution and what are their characteristics;
- How can environmental quality best be maintained.

RESEARCH PROGRAM RESOURCE SUMMARY

	FY-77		FY-78	
	$ (M)	Positions	$ (M)	Positions
Air	43.0	460	42.3	416
Water Quality	41.3	546	47.3	504
Water Supply	13.6	104	16.4	115
Solid Wastes	4.1	22	7.6	21
Pesticides	8.3	121	9.5	123
Radiation	0.8	30	0.8	30
Noise	--	--	--	--
Interdisciplinary	25.9	214	23.1	228
Toxic Substances	1.4	6	3.4	45
Energy	96.4	123	96.3	144
Program Management and Support	7.2	101	7.3	106
ORD Program Total	242.0	1727	254.0	1732

RESEARCH PROGRAM

The ORD research program is administered through 4 Offices and implemented by 15 Laboratories:

	FY-77 ($1,000's)	FY-78 ($1,000's)
Office of Health and Ecological Effects	67,551	73,117
Office of Energy, Minerals, and Industry	91,280	92,258
Office of Air, Land and Water Use	53,927	61,375
Office of Monitoring and Technical Support	23,213	24,488

Program Areas

1. Health Effects - Investigate health hazards associated with environmental pollution in air, water, pesticides, radiation, water supply and toxics.

2. Ecological Processes and Effects - Determine effects of atmospheric, aquatic and terrestrial pollutants on the structure and function of ecosystems and on biotic and abiotic subcomponents of these ecosystems.

3. Transport and Fate of Pollutants - Investigate the chemical and physical phenomenon of pollutants as they migrate from source to receptor and otherwise persist in the ambient environment.

4. Minerals, Processing and Manufacturing - Address point sources of pollution from the industrial sector and focus on mining, manufacturing, service and trade industries which are involved in the extraction, production and processing of non-energy materials into consumer products.

5. Renewable Resources - Develop total management systems to control air, water and land pollution resulting from the production and harvesting of food and fiber and their related residual wastes.

6. Waste Management - Research the prevention, control, treatment, and management of pollution resulting from wastewater discharges from community, residential or other non-industrial activities.

7. Water Supply - Provide technology and management criteria necessary for the maintenance of a dependably safe supply of drinking water.

8. Environmental Management - Develop improved procedures for planning, implementing, enforcing, and assessing cost-effective environmental protection strategies for particular problem areas (air, water, etc.).

9. Characterization and Measurement Methods - Provide methodologies and measurement instrumentation for all pollutants (pesticides, toxic substances, industrial chemicals, petrochemicals, combustion products, etc) in air, surface and groundwaters.

10. Measurement, Techniques and Equipment Standardization - Provide candidate analytical reference methods, sampling procedures and instrumental monitoring systems so that standardized techniques are available for Agency monitoring requirements.

11. Quality Assurance - Provide methodologies and criteria for establishing validated measurement systems and conduct quality control activities to assure the inter-comparability of all monitoring data.

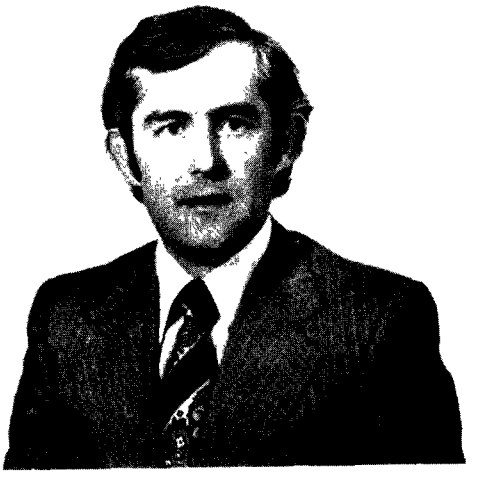
12. Technical Support - Provide scientific and technical consultative services to other Agency components to solve immediate and short term problems through the use of specialized expertise and ORD faciliites.

13. Technical Information - Effectively disseminate and transfer findings and products of the research and development program to users both within the Agency and throughout the public and private sectors.

14. Energy Extraction and Processing Technology - Includes characterization of pollutant sources, assessment of environmental problems and development of control techniques to mitigate the environmental impact of the extraction and raw material processing of energy fuels. Solid, liquid, and gaseous fuels, as well as advanced energy sources such as uranium and geothermal sites, are considered.

15. Energy Conservation, Utilization and Technology Assessment - Assure adequate energy production from fossil fuels with minimum damage to environmental quality.

16. Energy Health and Ecological Effects - Determine environmental effects associated with energy extraction, transmission, conversion and use so that criteria can be developed to protect human health and the ecosystem.



STEPHEN J. GAGE

Acting 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:
- Acting Assistant Administrator for Research and Development, EPA, 1977-Present
- 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 Men of Science
- Who's Who in the Southwest
- American Nuclear Society
- American Society of Mechanical Engineers
- American Association for the Advancement of Science
- Sigma Xi
- Sigma Tau
- Pi Tau Sigma
- Phi Eta Sigma

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

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Office of Research and Development

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  Jefferson, AR
  Director Dr Thomas Cairns*
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April 1978

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·On detail to Office of Science & Technology Policy, Executive Office of the President

OFFICE OF HEALTH AND ECOLOGICAL EFFECTS

WASHINGTON, D. C.

OFFICE OF HEALTH AND ECOLOGICAL EFFECTS

WASHINGTON, D. C.

MISSION

Document the ecological impact as pollutants move through the environment and evaluate the health risks to man. OHEE research contributes to the scientific foundation needed to make regulatory decisions that will protect and enhance the human environment.

Documentation of human exposure to environmental pollutants in relation to adverse health effects is necessary if EPA is to develop control strategies to protect the population against environmental insults. Exposure to pollutants may adversely affect man's physiological processes, resulting in subclinical changes, development or exacerbation of sickness, or even death. Man is usually exposed by three primary environmental media; respired air, drinking water, and food.

EPA is responsible for conducting research related to ecological systems and environmental quality. As with human health, documentation of exposure to environmental pollution in relation to adverse ecological effects is necessary if the Agency is to develop appropriate control strategies. Outputs from this program are used in developing water quality standards, effluent guidelines for toxic and hazardous materials, ocean discharge criteria, secondary air quality standards, and dose-response relationships for pesticides and other toxicants.

Ecological effects research investigates the impact of perturbations and contaminants on the environment as a whole, while health effects research determines the impact of these ecological changes and contaminants on the well-being of man. Ecological effects research and health effects research are complementary to each other. For example, ecological research is concerned with determining the toxic effects of contaminants and the ability of those organisms to concentrate the contaminants. Ultimately, many of these organisms pass through the food chain to man. Therefore, health effects research is supported by ecological effects studies.

RESEARCH PROGRAM RESOURCE SUMMARY

($1,000's)

	Program Area	FY-77 In-house	FY-77 Extramural	FY-78 In-house	FY-78 Extramural
1.	Air	7,639	8,339	8,142	7,200
2.	Water Quality	10,614	5,779	10,948	8,491
3.	Water Supply	1,969	4,422	2,616	4,475
4.	Pesticides	5,440	2,620	5,926	3,572
5.	Radiation	776	54	758	72
6.	Interdisciplinary	747	6,533	1,627	6,871
7.	Toxic Substances	320	748	1,039	1,205
8.	Energy	936	8,515	1,130	6,855
9.	Program Management Support	1,735		2,190	
	Total	30,176	37,010	34,376	38,741

PERSONNEL

Total Full-time EPA Personnel = 727

- Professional = 486
- Non-professional = 241

Professional Staff

	Bachelor	Master	Doctorate	M.D.	Total
Biological Sciences	72	70	90	9	241
Chemical Sciences	52	14	41		107
Engineering	26	14	9		49
Physical Sciences	7	5	14		26
Other	21	19	23		63
	178	122	177	9	486

RESEARCH PROGRAM

The OHEE Research Program is implemented by the OHEE Laboratories located in Research Triangle Park, North Carolina, Cincinnati, Ohio, Corvallis, Oregon, Duluth, Minnesota, Gulf Breeze, Florida, and Narragansett, Rhode Island.

1. Air

Program consists of three areas:

- Health Effects - Conduct research to provide a sound scientific basis upon which to establish and continually evaluate primary ambient air quality standards. Toxicological investigations, controlled human exposure studies, and epidemiological studies of targeted populations focus on those air pollutants that may or do adversely affect the public health. Specific areas include: developing scientific data needed for a possible short-term NO_2 standard; clarifying the health data base for oxidants; reviewing new data to determine the adequacy of existing pollutant standards; compiling a data base to evaluate the health effects of sulfates, nitrates and other particulates; assessing exposure-effect relationships of chronic, low-level exposure to trace metals and other non-pesticide substances; collecting and analyzing information on the effects on public health of emissions from automobiles. Additionally, continuing an assessment of the contribution of environmental carcinogens to the incidence of cancer in the general population.

- Ecological Effects - Conduct research to provide a sound scientific basis upon which to establish and continually evaluate primary ambient air quality standards. Research focuses upon the effects of air pollutants on the structure and functions of ecosystems, especially on their economically useful components, such as forests and crops. Laboratory and field studies and mathematical theoretical simulations are conducted to support establishment and reevaluation of air pollutant criteria documents, and to provide policy makers with guidelines to assess the environmental impact of municipal, industrial, and agricultural emission sources as well as energy resource development.

- Biological and Climatic Effects Research (BACER) - Program is designed to reduce uncertainties concerning human health, biological, ecological, climatic, social, and economic effects resulting from anthropogenic generated pollutants which deplete stratospheric ozone. This research will provide integrated assessments to support regulatory decision-making.

2. Water Quality

Program consists of two areas:

- Health Effects - Develop criteria for the safe treatment and disposal of wastewaters and sludges; develop health-related criteria for fresh and marine recreational waters. Determine health effects associated with land application of wastewater and sludge for safe implementation of such practices; develop health effects information to assure public safety from pollutants emitted from wastewater treatment plants. This program also supports the national goal that water be suitable for recreation and fish and shell-fish production by 1983. The available data base for recreational and shellfish growing water quality standards is deficient. Possibly, current standards are too stringent, resulting in unnecessary closing of beaches and shellfish growing areas, excessive chlorination costs, and discharge of chlorinated effluents which are known to be ecologically harmful.

- Ecological Effects - Determine toxicological effects of water pollutants on aquatic organisms, both fresh and marine. Research is designed to determine pollutants and pollutant combinations on organisms in aquatic ecosystems, and on critical ecosystem parameters and processes. Investigate the physical, chemical, and biochemical transformation products of pollutants introduced to or passed through aquatic ecosystems. Additional research characterizes natural and stressed aquatic ecosystems; develops mathematical ecosystem simulations and laboratory models to predict pollutant stress effects on aquatic biota and ecosystems; develops methods to measure the relative health of aquatic ecosystems. Inherent in these efforts is the consideration of intermedia pollutant transport and effects, wherever applicable.

3. Water Supply

- Health Effects - Conduct research to provide the health effects data bases necessary for issuing, under the Safe Drinking Water Act, maximum contaminant levels (MCL) for organic, inorganic and microbiological contaminants of drinking water. Provide the health effects data bases necessary for setting criteria for the reuse of wastewaters for potable purposes. Research is designed to determine the nature and health effects of substances found in drinking water or formed during water treatment. Rapid screening techniques, toxicological and epidemiological studies are utilized to assess the health effects of drinking water contaminants.

4. Pesticides

Program consists of two areas:

- Health Effects - Evaluate the health effects of pesticides under the registration, reregistration and rebuttable presumption against registration processes and under the substitute chemical program. Develop and validate new toxicological and analytical methods. Develop supplementary data and missing information as well as checks to establish the validity of registrant provided data.

- Ecological Effects - Study the ecological effects of pesticides and determine candidate substitute pesticide chemicals. These programs aid in the registration and reregistration of pest control agents and in the formulation of policies involving the registration process.

5. Radiation

- Health Effects - Conduct research on non-ionizing electromagnetic radiation (EMR) to provide the health effects data base for guideline decisions by the Office of Radiation Programs. Preliminary U.S. data indicate current exposure standards may be too high. Determine biological effects and interaction mechanisms of EMR frequencies and power densities. Toxicologic studies are used to assess behavioral, teratologic and immune defense effects of exposure to chronic, low-level, microwave exposure.

6. Interdisciplinary

Program consists of three areas:

- Assessment documents - Synthesize and assess available scientific and technical knowledge on major pollutants; summarize information on the validity and significance of such data prior to initiating action to develop regulations.

- Socio-economic research - Develop and demonstrate improved methodology for quantifying the benefits of pollution control expenditures and for other means for assessing tradeoffs in pollution control management. Results aid the Agency in establishing national goals and priorities for national pollution abatement activities and in anticipating the need to alter these priorities if necessary.

- National Center for Toxicological Research (NCTR) - Funded jointly by the Food and Drug Administration and EPA as a national facility to study the long-term effects of low doses of chemical toxicants. Scientific community continues to be concerned about the possibility that much more severe damage to man and the environment may be

occurring through low dose exposure to toxicants over a long period of time. Research is undertaken to evaluate such cumulative, low dosage chronic effects.

7. Toxic Substances

Program consists of two areas:

- Health Effects - Determine adverse effects of toxic substances and their metabolites on human health. Included is the assessment of toxicity of metals and inorganic and organic non-pesticide pollutants that reach man through different routes of exposure. Also, develop protocols for improved toxicity testing of substances, validate these protocols, and establish criteria for determining which substances should be declared hazardous to human health.

- Ecological Effects - Develop rapid, reliable and economic procedures for screening chemical substances and mixtures. These screening procedures will provide the scientific basis for deciding the safety and acceptability of the chemical, or mixture, in the environment. Research utilizes physical and biological processes and effects at various levels (cellular to organism or ecosystem) to test for toxicity, carcinogenicity, teratogenicity, bioaccumulation and ecosystems response. The research will be closely coordinated with the development of health effects screening procedures. The screening tests developed would be statistically related to long-term chronic studies for validation purposes.

8. Energy

Program consists of two areas:

- Health Effects - Examine possible carcinogenic, mutagenic, teratogenic and respiratory effects on humans from existing and emerging energy technologies. Of particular interest is new information about previously unanticipated pollutants related to fossil fuel combustion and their effects.

- Ecological Effects - Investigate the environmental aspects of freshwater, marine, and terrestrial ecosystem response to energy-related activities. Freshwater studies concentrate on impacts from coal- and oil-shale extraction, and coal gasification and liquefaction. Near-term marine research establishes background contaminant levels in both ocean and estuarine dwelling organisms and their habitats. The terrestrial portion of the program emphasizes the ecosystem impacts of pollutants from coal combustion and effects of strip mining and methods for strip mined land reclamation.

RECENT ACCOMPLISHMENTS

1. Demonstrated that exposure to 1200 $\mu g/m^3$ (0.6 ppm) of ozone for one hour results in significant impairment of lung function in humans. Impairment is greater after 2 hours exposure and a suppression of lymhocyte (white blood cell) function persists in these subjects for as long as eight weeks.

2. Documented evidence to support more restrictive SO_2 Secondary Air Quality Standards.

   - Using naturally varying SO_2 exposures within a range of median concentration, significant losses in yield or death of onion and radish were measured at median levels from 0.08 to 0.15 ppm SO_2.

   - Chronic, low level exposures of alfalfa to a range of median concentrations of SO_2 showed a threshold for significant effects on growth and symbiotic nitrogen fixation to be .02 ppm; at 0.06 ppm they were reduced 50% and 40%, respectively.

   - Preliminary results from controlled field studies using pH values typical of rainfall acidities occurring and expected in the U.S. show significant effects on soil litter decomposition, nutrient cycling and plant growth of tulip poplar, radish and snap beans.

3. Completed data gathering on Lake Ontario for the International Field Year for the Great Lakes, and developed an euthrophication model of Lake Ontario which enables managers to forecast lake response to different nutrient control strategies.

4. Epidemiological and other health studies have demonstrated a correlation between chlorination of drinking water, production of trihalomethanes, and excess cancer incidence.

5. Research results are used by the Agency's Office of Pesticide Programs in the registration and reregistration program for pesticides. This information often appears on the caution label of particular pesticides.

6. FY-76-77 - Investigated waterborne disease outbreaks in eleven states and Puerto Rico in collaboration with the Center for Disease Control. Several outbreaks in 1977 have been found to involve the protozoan Giardia lamblia. Findings have been summarized in a continuing series of annual reviews.

7. The nationwide biological monitoring program (Mussel Watch) has identified several localized "hot spots" of PCB's and of DDT and its degradation products in coastal waters.

8. Conducted baseline studies in clean air to demonstrate the effective operation of the CLEANS facilities prior to population studies. Thirty subjects have been tested for baseline pulmonary function. Results indicate that the air quality of the data resulting from computer control will be a major asset in detecting small changes resulting from pollutant exposures.

9. Biological and Climatic Effects Research (BACER) studies have shown that UV-B has a detrimental effect on certain plant and animal species, and their relationships in ecosystems, both on land and in water. This suggests that increased UV-B could reduce food production.

10. Completed Lead Criteria document which was issued by the Administrator, December 2, 1977.

See Laboratory reports for HERL-Research Triangle Park, HERL-Cincinnati, ERL-Corvallis, ERL-Duluth, ERL-Gulf Breeze and ERL-Narragansett for additional accomplishments.

RESEARCH PROGRAM TRENDS

1. Ecological and health effects research will become increasingly complementary. Ecological research is concerned with determining the toxic effects of contaminants on organisms, populations, and ecosystems. Research on the ability of contaminants to concentrate and pass through the food chain to man is supportive of human health effects research.

2. The need to expand beyond single organism or individual population approach to establish effects of man's activities on ecosystems has received increasing attention in recent years. For example, how far can we stress a portion of a coastal area before it loses its resiliency or ability to return to a productive level indigenous to that system? Also, problems such as the effects of boundary conditions of the microcosms in its ability to track the natural systems to be systematically evaluated.

3. Ecological and health effects research is needed to provide a coordinated approach to environmental carcinogenesis. Increased awareness of the implications of carcinogens in the ambient environment requires more research and better coordination of research in this area. This program includes in vitro, whole animal, and population studies; exposure and dose assessments; and risk assessments.

4. A formal training program will be introduced to assure application of specialized analytical methods. EPA Regional Offices, academic institutions, and industrial interests, need ORD resources continually for some form of training. Better use of resources will result from the establishment of a formal training program presenting state-of-the-art research metods using technology transfer as a medium.

5. Develop a rapid and simple bioassay procedures for characterization, in terms of potential health effects, of initially, complex effluents and, later, finished drinking water. Parallel efforts are required to develop concentrates which are representives of raw water.

6. Develop new quality criteria for use for a variety of purposes of water reclaimed and recycled through advanced wastewater treatment processes, including land treatment processes.

7. Develop new short-cut and screening tests for freshwater biological and ecological effects.

8. Move from acute tests with single species to chronic or entire life cycle of indicator species. Criteria for effects now emphasize sublethal rather than strictly lethal ones.

9. EPA is beginning a systematic evaluation of health and ecological implications of widely used organic compounds. Focus is on the problems to be addressed by the Toxic Substances Control Act.

10. Develop a handbook to provide decision criteria for assessing the limnological, social, and economic impact of various lake restoration techniques.

FOREIGN PROGRAM

Country/Organization	Program/Project	Completion Date	Total
Bilateral Agreements			
US-USSR	Comprehensive Analysis of the Environment	1979	--
Multilateral Agreements			
Federal Republic of German and Commission of the European Communities	Symposium on biological monitoring and specimen banking with emphasis on ecological samples	1978	$50,000

See HERL-RTP, HERL-Cincinnati, ERL-Corvallis, ERL-Duluth, ERL-Gulf Breeze and ERL-Narragansett for additional projects.

REGIONALLY RELATED PROJECTS

REGION IX - Determining the economic benefits of pollution control in the South Coast Air Basin of California.

DELBERT S. BARTH

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for Health and Ecological Effects

Washington, D. C.

Education: West Point, B.S. (Military Engineering), 1946
Ohio State University, M.S. (Nuclear Physics), 1952
Stevens Institute of Technology, M.S., (Solid State Physics), 1960
Ohio State University, Ph.D. (Biophysics), 1962

Professional Experience:
Deptuy Assistant Administrator for Health and Ecological Effects, EPA, 1976-Present
Director, National Environmental Research Center, EPA, Las Vegas, Nevada, 1972-1976
Director, National Environmental Research Center, EPA, Research Triangle Park, N. C., 1971-1972
Director, Bureau of Air Pollution Sciences, Research Triangle Park, N. C., 1971
Director, Bureau of Criteria and Standards, Durham, N.C. 1969-1971
Chief, Bioenvironmental Research, Southwestern Radiological Health Laboratory, DHR/NCRH, Las Vegas, 1963-1969
Investigator and Staff Officer, Experimental Radiobiology Program, DHR, Rockville, Maryland, 1962-1963
Outside the service training, Ohio State University, 1961-1962
Staff Officer, Evaluation and Planning Section, DCR, Rockville, Maryland, 1960-1961
Officer, Chemical Corps, U.S. Army, 1946-1960
Assitant Professor, Department of Physics and Chemistry, USMA, West Point, New York, 1956-1960
Various assignments within speciality of Nuclear Effects Engineer, 1952-1956
Outside the service training to become qualified Nuclear Effects Engineer, Ohio State University, 1949-1952
Health physics trainee, Oak Ridge National Laboratory, 1947-1949

Professional
Affiliations: American Physics Society
Biophysics Society
Sigma XI
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Honors: PHS Distinguished Service Medal (1973)

OFFICE OF AIR, LAND, AND WATER USE

WASHINGTON, D. C.

OFFICE OF AIR, LAND, AND WATER USE

WASHINGTON, D. C.

MISSION

Determine relationships between pollution sources and the quality of air and water as basis for attaining media quality goals.

- Develop methods and instruments for detecting, identifying and characterizing pollutants, including toxic substances, in all media.
- Provide safe drinking water supplies.
- Investigate pollution and other deleterious environmental impacts from agriculture, silviculture and community sources.
- Disposal and management of hazardous and other waste material.
- Develop practical means for implementing environmental quality objectives through the development of incentive mechanisms.
- Develop methods for carrying out integrated environmental planning and analysis.

RESEARCH PROGRAM RESOURCE SUMMARY

($1,000's)

	Program Area	FY-77 In-house	FY-77 Extramural	FY-78 In-house	FY-78 Extramural
1.	Air	4,781	12,601	5,040	12,698
2.	Water Quality	6,387	9,040	7,591	9,910
3.	Water Supply	2,050	5,002	2,314	6,701
4.	Solid Waste	964	1,834	942	6,705
5.	Interdisciplinary	1,688	4,577	995	1,958
6.	Toxic Substances	70	250	270	250
7.	Energy	155	3,569	270	4,729
8.	Program Management/ Support	776	83	1,002	0
	Total	16,871	36,956	18,424	42,951

Total Full-time EPA Personnel = 589

- Professional = 297
- Non-Professional = 292

Professional Staff

Discipline	Bachelors	Masters	Doctorate	Total
Biology	2	2	5	9
Chemistry	42	23	44	109
Engineering	18	58	21	97
Environmental Science	6	2	6	14
Mathematics	3	7	6	16
Meteorology	4	4	8	16
Physical Science	3	0	2	5
Physics	3	4	3	10
Other	5	12	4	21
	86	112	99	297

RESEARCH PROGRAM

The OALWU Research Program is implemented by the OALWU Laboratories located in RTP, North Carolina; Cincinnati, Ohio; Ada, Oklahoma; and Athens, Georgia.

1. Air Quality - Develop qualitative and quantitative methods for predicting and describing air quality from emission sources; determine atmospheric effects due to air pollutants; determine exhaust products from mobile sources; develop methods for gaseous and particulate pollutants in ambient air and stationary and mobile source emissions.

2. Water Supply - Determine, quantify and manage pollutants entering and traversing groundwater resources; develop most beneficial and economical methods for water supply treatment and management of distribution systems; develop analytical techniques for concentration, separation, identification and measurement of drinking water contaminants; determine health effects resulting directly or indirectly from contaminants in drinking water; develop criteria for promulgating drinking water standards.

3. Waste Management - Includes: municipal wastewater control and treatment; prevention, control, treatment and management of pollution caused by urban runoff; alternative municipal wastewater sludge management systems involving processing, utilization and disposal; development of comprehensive approaches for managing the water pollution abatement requirements for the total community system; treatment and utilization of municipal wastewater and sludges through application to the soil; solid and hazardous waste management systems for disposal and utilization.

4. Water Quality - Identify, characterize and quantify pollutants, including development of measurement techniques (instrument designs, etc.); research the transport and transformation of pollutants in water; analyze and control their sources.

5. Renewable Resources - Develop and evaluate total management systems to control pollution from the production and harvesting of food and fiber, and from their related residual wastes. Assess probable trends in production of renewable resources to determine environmental and socio-economic impacts. Additionally, develop and demonstrate integrated pest management strategies to reduce usage and runoff of agricultural chemical pesticides.

6. Toxic Substances - Develop test methods and evaluative 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.

7. Environmental Management - Evaluate comparative feasibility of, and analyze means for, implementing alternative means for accomplishing environmental quality objectives, with emphasis on means other than direct regulation and enforcement. Develop and demonstrate methods for use in integrated planning, analysis, design and implementation of urban multimedia environmental management systems.

RECENT ACCOMPLISHMENTS

1. Verified that long range transport of SO_X, ozone and their precursors can produce significant air quality deterioration hundred of miles downwind. Characterized gaseous and particulate emissions from power plants and other sources that burn residual oil containing various amounts of sulfur and vanadium. Sulfate emissions as high as 10% of total SO_X emissions were found.

2. Completed research on Kepone regarding the thermal stability of the molecule, the degradation products, and necessary conditions for complete destruction. Pilot plant results demonstrate that Kepone can be safely destroyed with destruction efficiency routinely reaching 99.999% or greater. The technology is being used for a prototype installation of Hopewell, Virginia.

3. Completed comprehensive approach to implement salinity control measures for irrigation return flows. Approach will meet environmental goals as well as address the socio-economic aspects of gaining acceptance among local water users. Three reports deal with: (a) the methodology of implementation of a "total package" salinity control program; (b) evaluation of irrigation management/control methods on improved water quality; and (c) defining best management practices (BMP) for salinity control in the Grand Valley area. This approach can serve as a protocol for other irrigated areas in the West.

4. Developed protocol for analyzing industrial wastewaters for organic compounds identified as "priority pollutants." The protocol (requested by Effluent Guidelines Division) is needed to gather information on the levels of "consent decree" organic pollutants contained in untreated and treated industrial wastewaters.

5. Completed series of guideline manuals to help field professionals select appropriate, cost-effective controls for pollution from agriculture and silviculture non-point sources. Also completed comprehensive non-point source loading function manual for use by 208 planners for multiple level use load situations and problem definition.

6. Prepared the document, Impact of Abandoned Wells on Ground Water, required by Section 1442 of the Safe Drinking Water Act. Document includes abandonment procedures and methods for evaluating impact of these potential pollution sources (Requested by Office of Water Supply.)

7. Distributed Manual of Treatment Techniques for Meeting the Interim Primary Drinking Water Regulations to Regional Offices and the water supply industry.

8. Completed the data gathering phase of the Regional Air Pollution Study in St. Louis, thus providing a data base for validating urban air quality simulation models (AQSMs).

9. Evaluated facultative and aerated lagoon system utilizing carefully controlled series of on-site field studies. Results will contribute to improved operating practices for the 4,000 lagoons existing in the country, and offer guidance to new lagoon construction.

10. Developed electron microscope procedure to determine asbestos fibers in water. Procedure has gained almost universal acceptance by government and industry laboratories.

11. Demonstrated that trihalomethanes are not produced when chlorine dioxide is used as an alternate disinfectant to chlorine, provided there is no excess chlorine present. Even if excess chlorine were present, the trihalomethane production would be less than the amount formed if chlorine were present.

12. Produced comprehensive Areawide Assessment Procedures Manual to aid 208 planning agencies. Fifteen hundred copies have been distributed to State, local and regional planners.

13. Developed computer-assisted high-probability spectral library for the rapid identification of compounds frequently encountered in waters and wastewaters was developed. System restricts initial phase of computerized matching of unknown mass spectra with library spectra to those spectra of compounds most frequently encountered in the recent past. This minimizes time and computer costs for conducting search to identify organic compounds found in water and wastewater samples.

See Laboratory reports for ESRL-RTP, MERL-Cinn, ERL-Ada, and ERL-Athens for additional accomplishments.

RESEARCH PROGRAM TRENDS

1. Transport of toxics in the aquatic environment - Shift in Agency emphasis toward control of toxic chemicals will result in increasing need for rapid and inexpensive methodologies to assess longer-term impacts of discharges of existing or proposed new toxic chemicals into surface waters to determine adequacy of BAT at site-specific locations.

2. Exposure Assessment Methods - Control of toxic chemicals will require rapid and inexpensive methods to assess potential environmental pathways of movement, persistence, and bioaccumulation of existing or proposed new toxic chemicals to adequately assess the risks associated with their production, use, and disposal.

3. Multipollutant Analyses - Control of toxic polluants will require cost-effective methods for the simultaneous scanning of waters (and commerical products) for a variety of toxic chemicals that may be present in the environment or in commercial products as trace impurities.

4. Model Verification and Validation - Increased emphasis on model verification and validation is needed. As point and nonpoint source dischargers increasingly resist enforcement actions taken against them, they are learning to identify and exploit weaknesses in EPA's position on the benefits of higher levels of pollution control. A significant and exploitable weakness is the widespread use of improperly or non-validated models for demonstrating that water quality benefits will be commensurate with the higher levels of control being imposed.

5. Sediment and Water Quality - Increasing emphasis on the control of nonpoint source pollution by local and state agencies and by EPA is focusing greater attention on the control of sediment. Sediment also serves as a carrier of pesticides and other toxicants, including lead and other heavy metals contained in urban storm runoff. Increasing attention to modeling of sediments is needed to identify and justify proposed NPS control measures and to adequately understand their role in the transport of toxic chemicals.

6. Control of Groundwater - To date, groundwater quality problems have been largely ignored. Recent drinking water and solid waste-related legislation has focused attention on this area and increased attention is expected in the future. Need exists for an integrated research program dealing with all major facets of the problem: problem identification; pollutant transport, transformation, and fate; and pollution prevention/control techniques.

7. Nonpoint Source Controls - The great emphasis by local and state agencies on control of NPS pollution is already raising questions regarding the effectiveness of existing NPS control techniques. NPS dischargers are beginning to resist implementing controls because governmental agencies are unable to indicate what, if any, benefits the control measures will have on pollutant reduction or receiving water uses. Increasing need to provide local and state agencies with this type of information and the methodologies for applying it.

8. Regional transport of sulfates - Anticipated increases in coal-fired power plants pose the potential for creating hot spots of concentrations of ambient sulfates owing to long range transport. Future avoidance or control of the problem requires extensive research to understand adequately the long-range transport problem.

9. Visibility - Increased coal combustion presents the potential for creating visibility problems. Develop measurement methods to measure and characterize visibility and visibility models to predict and control visibility problems.

10. Groundwater Contamination - Many activities have the potential for polluting actual or potential groundwater supplies for drinking water. Develop methods to control contamination sources through technology and siting approaches.

11. Operation and Maintenance of Wastewater Treatment Plants - Conduct research to improve the poor performance of treatment plants.

12. Toxic substances in municipal wastewaters - Characterize substances in influents and effluents; develop strategies for controlling such substances.

13. Disinfection by other than chlorine - Chlorination can have detrimental effects upon wastewaters; develop and evaluate alternative disinfection techniques.

14. Pollution from Small Wastewater Flows - Develop new cost-effective technology to control this persistent problem.

FOREIGN PROGRAM

See ESRL-RTP, MERL-Cinn, ERL-Ada, and ERL-Athens.

REGIONALLY RELATED PROJECTS

See ESRL-RTP, MERL-Cinn, ERL-Ada, and ERL-Athens.

THOMAS A. MURPHY

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Office of Research and Development
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Education: Knox College, B.A. 1959
Yale University, M.S.
Yale University, Ph.D. (Biology) 1964

Professional Experience:
- Deputy Assistant Administrator for Air, Land, and Water Use, EPA, 1975-Present
- 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

OFFICE OF ENERGY, MINERALS, AND INDUSTRY

WASHINGTON, D. C.

OFFICE OF ENERGY, MINERALS, AND INDUSTRY

WASHINGTON, D. C.

MISSION

- Assess environmental and socio-economic impacts of energy and mineral resource extraction, processing, conversion, and utilization systems, and of other industrial operations.
- Develop and demonstrate cost-effective methods for control and management of operations with environmental impacts associated with the extraction, processing, conversion, transmission and utilization of energy (except transportation utilization), and mineral resources, and with industrial processing and manufacturing facilities.
- Identify and evaluate alternatives, including conservation measures, for these systems and operations.
- Coordinate intra- and inter-agency research activities associated with environmental aspects of energy and mineral resources extraction, processing, conversion and utilization.

RESEARCH PROGRAM RESOURCE SUMMARY

($1,000's)

	Program Area	FY-77 In-house	FY-77 Extramural	FY-78 In-house	FY-78 Extramural
1.	Air	931	4,069	1,240	3,760
2.	Water Quality	1,303	5,197	1,266	5,434
3.	Energy	6,876	72,804	7,099	73,239
4.	Toxic Substances	0	0	120	0
5.	Program Management Support	100	0	100	0
	Total	9,210	82,070	9,825	82,433

PERSONNEL

Total Full-time EPA Personnel = 199

- Professional = 141
- Non-Professional = 58

Professional Staff

	Bachelor	Master	Doctorate	Total
Chemistry	9	2	7	18
Engineering	47	35	17	99
Other	10	9	5	24
	66	46	29	141

RESEARCH PROGRAM

The OEMI Program is implemented by the OEMI Laboratories located in Research Triangle Park, North Carolina and Cincinnati, Ohio.

1. 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. 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 waste-as-fuel, 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 one(s) is environmentally preferable.

3. Health and Environmental Effects of Energy Development

- Health Effects - (Interagency pass-through program)

  - Determine qualitative and quantitative effects of energy-related agents on human health

  - Assess risks (health) to human populations associated with all aspects of energy production and utilization.

  - Provide guidance for energy-systems-related control and abatement programs to the extent that such programs are dependent upon health effects data.

  - Provide data base necessary for establishment of exposure standards for energy-related hazardous agents.

- Ecological Effects - Provide ecological information required for regulatory policy decisions concerning coal, oil, oil shale, geothermal development and facility siting decisions. Determine toxicological effects on freshwater, and terrestrial organisms and resultant ecosystem impacts from pollutants (singly and in combination) released from energy extraction, conversion, and use. Study dynamics of energy-related pollutants in marine systems.

- Transport Processes - Determine origins, loads, transport pathways, transfer rates, and fates for pollutants (singly and in combination) released to the aquatic environment (primarily from coal, oil shale, and geothermal fuel cycles.)

- Monitoring - Provide an environmental data base from which future environmental standards and decisions on regional energy development can be determined. Develop monitoring techniques and methods to determine on a regional basis significant levels and cause/effect relationships between energy-related pollution and media quality. Provide environmental quality baseline data in those geographical areas where environmental impacts of new energy development are (or expected to be) significant.

- Instrumentation - Provide measurement methods and analytical techniques for known and anticipated environmental pollutants from expanding and emerging energy technologies. Initially, emphasis is on elemental and inorganic pollutants from existing, expanding energy technologies for which adequate measurement methods do not exist. Later emphasis will be on sampling, measurement and analysis of potentially hazardous organic and metallorganic compounds (special attention on emerging fossil fuel technologies). Primary concern is with ambient air and water pollutant levels.

4. Industrial Processes - Air, Water and Toxics

- Materials Processing - Develop technologies to eliminate discrete point sources of air, water and residuals pollution from manufacturing and service industries; e.g., those primarily devoted to processing chemicals and other raw materials into intermediate and final products (e.g., petrochemicals, agrichemicals, electroplating and metal products, textiles, inorganic chemicals, pulp and paper and food products). Of special concern are toxic chemicals and hazardous pollutant control.

- Materials Production - Develop technologies to eliminate discrete point sources of air, water and residuals pollution from extraction of raw material and its processing into intermediate products from the iron and steel, non-ferrous petroleum refining and general mining (other than fuel sources) industries. Special emphasis is on toxic and hazardous residuals control.

- Areawide - Combined Industrial Point Sources - Develop means to eliminate release of pollutants for the areawide or combined point source where industrial sources are the predominant contributor. Of concern are all industrial point sources (e.g., manufacturing, mining, electric and water service establishments) which manage their pollution on an areawide or combined basis with other point source. Develop and demonstrate pretreatment, residual and refractory treatment and control technology; also, areawide treatment and control technology for combined sources.

- Hazardous Materials Spills - Develop and demonstrate new/improved technologies for prevention, detection, identification, containment, control removal, cleanup, recovery and disposal of spills and acute releases of hazardous polluting substances. Primary efforts are on those technologies to protect and minimize damages to the water, land and air milieu from sudden discharges of those substances.

RECENT ACCOMPLISHMENTS

1. Ohio River Basin Energy Study (ORBES)

   - Completed initial assessment of potential environmental, economic and social impacts that would result from increasing power plant development in the Ohio River Basin.

   - Demonstrated utility of a regional technology assessment as a focal point for cooperation involving state and Federal agencies (operation within a basin), and as a forum in which mutual problems can be mitigated or resolved.

2. Teknekron 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.

   - The impact assessment and policy analysis method developed in this study are currently demonstrating practical applicability in two areas:

     - They are being used to perform the environmental and economic impact analysis required to support revisions of the New Source Performance Standards for emissions of sulfur oxides, particulates and nitrogen oxides from fossil fueled utility boilers.

     - They are being used to analyze the potential effects of the President's National Energy Plan on atmosphere sulfate concentrations.

3. Midwest Interstate Sulfur Transformation and Transport Study (MISTT)

   - Established that SO_2 in single power plant plumes does convert to sulfate at significant rates. Such conversion has been observed up to 300 km downwind and 12 hours after SO_2 emission.

   - Established that regionally pervasive summertime haze in the Eastern United States correlates with high sulfate levels. Low visibility sulfate "blobs" associated with weather systems can travel and remain coherent over the Eastern United States for up to one week.

     - Tall stacks lead to increased regional sulfate.

     - Present AQCR's are not adequate to control these pollution

See Laboratory reports for IERL-RTP and IERL-Cinn. for additional accomplishments.

RESEARCH PROGRAM TRENDS

1. The Interagency Energy/Environment program (created in FY 1975) is a continuing program to assure environmental protection as the Nation's energy systems change. Initially, SO_2 control technology was given major emphasis with scrubber demonstrations funded. Recently, the SO_2 program has decreased and the NO_x program increased.

2. Assessment of environmental consequences of advanced energy technologies, particularly synthetic fuels derived from coal, has increased.

3. The initial health and ecological effects studies concentrated on criteria pollutants and sulfates. Increased interest is on organics, particularly POM's and nitrates.

4. The industrial pollution control program has focused almost entirely on toxic waste streams. Industries, such as food processing, have been de-emphasized.

5. Increased attention is on identifying unsolved industrial pollution problems - particularly toxic material emissions. Multi-media assessment has been stressed. Demonstration of cost and capabilities of control options has been decreased.

FOREIGN PROGRAM

Organization	Program/Project Title	Completion Date	Amount
NATO-CCMS (West Germany and Norway)	Flue Gas Desulfurization Study Task I	1973	$30,000
The United Nations Economic Commission for Europe	Air Pollution Working Group of the U.S. Senior Advisor for Environment Sub projects: - Fine Particulate Task Force - Inorganic Chemicals Task Force - Organic Chemicals Task Force, etc.	On-going	$15,000

See IERL-RTP and IERL-Cinn for additional programs.

REGIONALLY RELATED PROJECTS

REGIONS III, IV, V

- Ohio River Basin Energy Study (ORBES) - Initially focused on the Lower Ohio River Basin - all of Kentucky, and major portions of Ohio, Indiana and Illinois. During Phase II (starting September 1, 1977) study has been broadened to add the upper Ohio River Basin to the study (most of West Virginia and Western Pennsylvania).

  Completed initial assessment of potential environmental, economic and social impacts that would result from increasing power plant development in the Ohio River Basin.

  Demonstrated utility of a regional technology assessment as a focal point for cooperation involving state and Federal agencies (operation within a basin), and as a forum in which mutual problems can be mitigated or resolved.

REGIONS VIII, IX

- Technology Assessment of Western Energy Resource Development - Completed assessment of environmental, economic, and social impacts from the development of coal, oil shale, and other energy resources in the Northern Great Plains and Southwest. Disseminated the findings in a much-in-demand set of reports (Energy from the West) and an unusually wide ranging series of briefings for Federal, state and local governments and their supporting agencies.

- Western Energy/Environment Baseline Atlas - Developing an integrated baseline for air quality, water quality, and land character information on a broad scale throughout the Western region. Emphasis is on those areas whose environment will bear the major new burden of energy development. Greatly increased strip mining of coal along with the construction of large conventional power plants and coal gasification plants is expected throughout the presently pristine plains and deserts throughout the West. Oil shale and geothermal tracts in the central area of the Rocky Mountains Province are under consideration for at least limited development of synfuels demonstration plants. It is extremely difficult to plan the types, patterns, and magnitude of energy developments which are environmentally acceptable in these regions and to factor such energy development into national and regional environmental planning and maintenance guidelines.

- Western Energy/Environment Atlas - All data obtained will be integrated into a document which will display local area energy development within the perspective of the multi-media Western regional environmental quality baseline. This atlas will enable planners to place local energy-related environmental trends in a balanced regional context.

See IERL-RTP, IERL-Cinn. for additional projects.

STEVEN R. REZNEK

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

Professional Experience:
Acting Deputy Assistant Administrator for
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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
Amenueunsis with Professor Saermark
1968-1969
Research Associate, MIT, Cambridge, Massachusetts
1967-1968

Professional Affiliations: Sigma Xi

OFFICE OF MONITORING AND TECHNICAL SUPPORT

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WASHINGTON, D.C.

MISSION

Provide ongoing support functions to the Agency's Program and Regional Offices.

Specific activities are:

- Development of measurement techniques and equipment; application of monitoring systems, including sample analyses, to assess pollutant exposure of man and other receptors in the environment.

- Quality control to assure that all data generated by the Agency are statistically valid and legally defensible.

- Provision of additional support services including

  - expert testimony at Agency hearings, participation in development of mandated criteria documents, standards, effluent guidelines, etc.;

  - dissemination of technical information and the transfer of technology evolving from all research programs;

  - Regional liaison between the Regional Offices and all ORD components;

  - grants activity, directed at minority institutions, which promotes the Agency's research objectives.

RESEARCH PROGRAM RESOURCES SUMMARY

($1,000's)

Program Area	FY-77 In-house	FY-77 Extramural	FY-78 In-house	FY-78 Extramural
1. Air	3,830	515	3,562	656
2. Water Quality	2,329	669	2,685	962
3. Water Supply	0	200	0	200
4. Interdisciplinary	7,335	4,893	7,437	4,294
5. Toxic Substances	0	0	610	0
6. Energy	654	1,791	1,189	1,816
7. Program Management/ Support	997	0	1,077	0
Total	15,145	8,068	16,560	7,928

PERSONNEL

Total Full Time EPA Personnel = 395*

- Professional = 243
- Non-Professional = 152

*Includes 105 EPA positions reimbursed by the Department of Energy.

Professional Staff

Discipline	Bachelor	Master	Doctorate	Total
Biological/Agriculture	6	15	8	29
Chemistry	62	19	19	100
Engineering	19	18	6	43
Environmental Sciences	5	7	0	12
Health	0	4	3	7
Mathematics	3	8	0	11
Physics	5	3	0	8
Other	12	11	10	33
Total	112	85	46	243

RESEARCH PROGRAM

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

1. Technical Support

- Technical services to Agency components

  - Provide assistance by applying knowledge gained from on-going research programs, expertise of ORD personnel, specialized monitoring systems and techniques, and a sophisticated analytical capability.

  - Demonstrate and implement newly designed systems such as the ENVIRO-POD. This system provides photo acquisition capability at the Regional and state level.

  - Implement an emergency oil spill and spill prevention compliance and control program for the Office of Water Programs.

  - Identify methods for monitoring criteria and non-criteria air pollutants.

  - Assure rapid response to Agency requests for air monitoring services, assist in design and conduct of field studies, perform instrument calibration, and provide direct support to OAQPS.

- ORD Scientific and Technical Information

  Assure ready access by ORD personnel to data required to support Agency programs. Assure findings and products developed through ORD's research programs are appropriately documented, packaged, and disseminated in a timely manner.

- Grant Assistance to Minority Institutions

  Identify research capabilities within minority institutions; encourage their development of proposals to perform research which must support the Agency's research objectives.

- Regional Liaison

  Assure interactions between ORD Laboratories and all Regional Offices through personal daily contacts.

2. Research

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

  - statistically validate and standardize total measurement systems (development of site selection and validation criteria, flow measurements, sample collection and preservation, analyses and data output);

  - 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 laboratory management systems (application of minicomputers to laboratory instruments, data screening, computerized statistical quality control);

  - develop and participate in Regional quality control workshops, conferences and seminars.

- Development and Demonstration of Instruments, Methods, Systems and Networks for Measuring and Monitoring Pollutants - Characterize and quantify movement and fate of environmental pollutants from the source(s) through the several media. Determine magnitude of insult to receptor caused by exposure to individual pollutants, singly or in combination. Develop equipment and methods that are accurate, simple, standardized, cost-effective and that fulfill environmental monitoring requirements of Federal, state and local governments and the private sector. Monitoring R&D includes:

  - Design and optimization of monitoring systems and networks
  - development of airborne and remote sensing techniques
  - development of automated laboratories and data handling systems
  - development of environmental monitoring instrumentation.

  Conduct state-of-the-art reviews, prototype instrumentation development and pioneering research studies related to new or improved analytical methods or instrumentation. Approach in development of both air and water monitoring methods is to adapt or modify known measurement technology to meet field requirements.

RECENT ACCOMPLISHMENTS

1. Revised and published guidelines for test procedures for the analysis of pollutants in water. Revision made approval of alternate test procedures for nationwide use part of the regulatory language. Previously, only case-by-case applications for alternate test procedures had been approved.

2. Developed five-year quality assurance research plan and expanded the Agency-wide quality assurance program including: issuance of Volumes I and II of the Quality Assurance Handbook for ambient air, development and distribution of quality control and reference materials, conduct of laboratory evaluations, and evaluation and standardization of methods for measuring pollutants.

3. Completed national surveys of all existing water quality and air pollution indices which, respectively, documented the water quality index usage of the States, the Interstate Commissions, and the EPA Regions and led to joint development of Pollutant Standards Index in cooperation with the Office of Air Quality Planning and Standards.

4. Revised approved test procedures for NPDES testing in those areas where problems and/or interferences had been encountered. Examples include: development of the ADMI color method, identification and elimination of an interference in the cyanide method, re-write of the suspended solids method, and evaluation of several techniques for residual chlorine.

5. Demonstrated applications of the Enviro-Pod for use at the EPA Regional level. Enviro-Pod is a cost effective light aircraft Cessana 172 sensor system with cameras designed to obtain forward oblique and vertical imagery of point targets or small geographic areas. The POD is easily transportable and is fully FAA certified. The film provides high resolution color, color infrared or black and white products.

6. Developed ground water monitoring methods which will be demonstrated near Tyler, Texas, where effects of lignite mining are the primary pollutants of concern. These pollutants include acids, heavy metals and phenols which develop as a result of insitu mining procedures. The area of concern covers four counties of about 100 x 50 miles. This effort is in cooperation with the State Geologist whose staff is developing the background data. This will be the first operational demonstration of the EPA/ORD ground water quality monitoring strategy.

7. Developed the Manual for the Interim Certification of Laboratories Involved in Analyzing Public Drinking Water Supplies. Preparation of this document included reviews and inputs from States, EPA Regions and Program Offices, and private Laboratories and organizations.

8. Prepared: a sampling and analysis protocol for use by contractors in determining BAT; interim sampling and analysis procedures for determining the priority pollutants in fish and sediments; and methods for the determination of trihalomethanes in drinking water.

9. Provided technical support including environmental monitoring of asbestos in Maryland, kepone in Virginia, ozone in National forests, and polynuclear organic matter in Pennsylvania; analysis of lead, phosphorus and manganese in fuel; and development of best available technology for measurement of vinyl chloride, PCB's, and benzene.

10. As an integral part of the Western Energy/Environment Monitoring Study, published an Atlas containing the integration and synthesis of the totality of monitoring data from all available sources. The Atlas relates pollution levels to energy resource development activities in the western region. The document allows planners to view, in perspective, local and regional energy-related environmental quality and trends.

11. Completed feasibility study on the use of the Oklahoma State Cooperative Extension Service as a mechanism for disseminating environmentally related information. In FY-78 the project will be expanded to one State in each Region to provide a model for determining whether such information dissemination should be applied nationwide.

See Laboratory reports for EMSL-RTP, EMSL-Cinn, and EMSL-Las Vegas for additional accomplishments.

RESEARCH PROGRAM TRENDS

1. As pollutants from energy development and chemicals distribution become more ubiquitous and pervasive, economical methods for surveillance of pollutant transport and effects over large geographical areas must be developed and applied. Demand will increase for surveillance and measurement techniques to determine the presence and effects of pollutants from remote locations--aerial or ground-based platforms. These methods will enable synoptic surveillance over very large areas at very low cost per unit area, and will enable surveillance of areas not accessible for conventional contract monitoring.

2. The Toxic Substances Control Act has introduced a trend towards toxic materials control regulations instead of control technology-oriented regulations. Over the next decade, many regulations will be issued governing the production and use of chemicals potentially hazardous to people and their environment. OMTS must establish the precision and accuracy of the measurement systems which will generate data to assess the impact of toxic substances on public health and welfare. Also required will be the development of sensitive, reliable analytical procedures for monitoring these substances in public water supplies, industrial effluents, and surface waters.

3. As the Agency further implements its regulatory mission and with increased enforcement of waste discharge limitations, EPA and State laboratories must maintain high performance standards with use of documented quality control systems and continual attention to the legal defensibility of results. To assure this, the following needs must be met:

   - development of a comprehensive methods standardization and quality control effort to support the water supply program, including laboratory certification.

   - validation and approval of test procedures, promulgated under Section 304(g) of the Federal Water Pollution Control Act Amendments of 1972, for guidelines, regulations and development of an interlaboratory quality control program to support the validity of the Discharge Monitoring Reports.

   - development and expansion of quality assurance efforts for non-criteria air pollutants, research monitoring programs, Consent Decree Pollutants, and toxic substances

   - development of quality assurance training and establishment of improved coordination between EPA Program Offices, Regional Offices, and Laboratories.

- development of guidance manuals for siting and validating monitoring stations and optimizing environmental monitoring networks.

4. The above trends will bring a corresponding increase in technical support activities to respond to the Agency's requirements for:

   - monitoring water, air and land to detect and measure pollutants

   - special surveys, e.g., identification of wetlands

   - specialized analyses of samples

   - expert testimony for court cases

   - scientific and technical inputs during development of standards and regulations

   - dissemination of ORD's research results.

FOREIGN PROGRAM

Country	Project Title	Completion Date	Amount
International Organization for Legal Metrology	Administration of Pilot Secretariat for pollution measurement.	Continuing	$30,000
International Standards Organization Technical Committee 146 on Air Quality	Develop international standards for measuring air pollutants from stacks, in ambient air, and in work place atmospheres.	Continuing	5,000

See EMSL-RTP, EMSL-Cinn, and EMSL-LV for additional programs.

REGIONALLY RELATED PROJECTS

REGIONS I-X

- Revision of 40 CFR 136, Guidelines for Test Procedures for the Analysis of Pollutants, required by Section 304(g) of the Federal Water Pollution Control Act Amendments of 1972. All Regional programs involved in the National Pollution Discharge Elimination System (NPDES) permits programs use the Guidelines as basic enforcement implementation regulation for surveillance and analysis purposes.

- Development of the Quality Assurance Research Plan. Plan identifies quality assurance tools, services, etc., which can be provided to EPA Regional Program and Offices.

- Development of Water Supply Laboratory Certification Manual. Manual provides guidance to Regional Offices for evaluating and approving state/other laboratories engaged in analyzing public drinking water supplies.

- See EMSL-RTP, EMSL-Cin., and EMSL-LV for additional projects.

ALBERT C. TRAKOWSKI, Jr.

Deputy Assistant Administrator
Monitoring and Technical Support
Washington

Education: University of Illinois, B.S., 1942
Air Force Technical School, M.S., 1943
Massachusetts Institute of Technology,
Sc.B. (Engineering Physics) 1951

Professional Experience: Deputy Assistant Administrator for
Monitoring and Technical Support
ORD, EPA, 1975-Present

Acting Assistant Administrator for
Research and Development
May-December 1974

Deputy Assistant Administrator for
Environmental Engineering
1973-1974

Deputy Assistant Administrator for
Program Operations, 1971-1973

Vice President, E.G.&G. Inc.
Wolf R&D Division
Staff Executive for Initiatives in
Environmental Control, 1968-1970
Program Director, National Space Data Center
1967-1970
Director of Corporate Development, 1964-1967

Program Manager, Aerospace Physical Sciences
Headquarters, U.S. Air Force, 1960-1963

Director, Physics Division
European Office, Air Research and
Development Command, U.S. Air Force
1956-1960

Assistant to Director of Development
Assistant to Director of Research
Headquarters, Air Research and
Development Command, U.S. Air Force
1951-1956

Director of Geophysical Research
U.S. Air Force
Cambridge Research Laboratories
1946-1949

Laboratory Section Chief, Meteorological Instrumentation
Radio Direction Finding and Radar
Army Signal Corps, Engineering Laboratories
1943-1946

Professional Affiliations:
American Geophysical Union
Fellow, American Association for the Advancement of Science

Honors:
University Honors (Scholastic)
University of Illinois
Phi Eta Sigma (Scholastic Honorary)
Pi Mu Epsilon (Mathematics Honorary)
Tau Beta Pi (Engineering Honorary)
Air Force Commendation Medal (Awarded twice)
Medal of the Legion of Merit

CARCINOGEN ASSESSMENT GROUP

WASHINGTON, D. C.

CARCINOGEN ASSESSMENT GROUP

WASHINGTON, D. C.

MISSION

The Carcinogen Assessment Group is a small group of senior scientists established in July 1976 to advise the Administrator and Agency program officials on the health risks associated with suspect carcinogens.

- Provide EPA with a firm scientific foundation on carcinogenic health hazards on which to base regulatory actions.
- Assure a uniform approach throughout the Agency for estimating the potential risk from suspect carcinogens and for use of this data in regulatory actions.

RESEARCH PROGRAM

- Assess the oncogenic potential of specific agents.
- Assess the carcinogenic risk presented by specific agents

RESEARCH PROGRAM RESOURCE SUMMARY

($1,000's)

FY-77		FY-78	
In-house	Extramural	In-house	Extramural
309 (9)	100	550 (11)	150

( ) Permanent positions

RECENT ACCOMPLISHMENTS

1. Established in July, 1976 as a review group for all Agency decisions involving cancer risks. (i.e., Water Quality, Water Supply, Air, Pesticides, Radiation and Toxics).

2. Prepared 23 preliminary reports on the potential carcinogenicity of pesticides in the environment. This information provided the basis for the Office of Pesticides to issue several Rebuttable Presumptions Against Registration (RPAR's).

3. Completed 14 risk assessments on such chemicals as Dibromochloropropane, Kepone, Coke Oven emissions, and Benzene. Many of these risk assessments have provided the impetus for regulatory action; for others these assessments have triggered the standard setting process.

4. Established close working relationships with The National Cancer Institute, The National Center for Toxicological Research, and the National Institute for Environmental Health Sciences.

5. Prepared a risk assessment on Chlordane/Heptachlor for use in the Agency's administrative concellation hearings. This document was considered a major part of the EPA's case during the hearings. It was subsequently supported by a National Academy of Sciences' review.

6. Provided guidance and comment on several proposed Agency standards and regulations involving carcinogenicity; e.g., Pesticide Testing Protocols, Guidelines on Transuranium Elements, Vinyl Chloride Standards, and the Drinking Water Standards for Haloforms.

7. Participating in the Interagency Regulatory Liaison Group, a cooperative effort by Federal regulatory agencies to base their regulations on some shared scientific principles. The CAG representative has been asked to chair the Sub-Committee on Criteria for Determining Carcinogenicity.

REGIONALLY RELATED PROJECTS

REGION I - Prepared a health risk assessment due to a Trichloroethylene discharge.

REGION II - Preparing full analysis of the possible cancer risk from the uses of PBB's.

REGION III - Analyzed data and reported on the potential health risk involved from contamination of Philadelphia wastewater.

REGION V - Evaluated nitrosamine discharge levels for their potential health risk.

REGION IX - Prepared risk assessment and commented on a proposed enforcement action resulting from vinyl chloride plant emissions.

ELIZABETH L. ANDERSON

Executive Director
Carcinogen Assessment Group
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: Executive Director, Carcinogen Assessment Group, EPA, 1976-Present
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

HEALTH EFFECTS RESEARCH LABORATORY

RESEARCH TRIANGLE PARK

NORTH CAROLINA

HEALTH EFFECTS RESEARCH LABORATORY

RESEARCH TRIANGLE PARK, NORTH CAROLINA

MISSION

Provide the health intelligence necessary for 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 chemical pollutants. Specifically, the Laboratory's function is to:

- Conduct toxicological, clinical, and epidemiological research to identify health effects of environmental pollutants.
- Develop and revise air quality criteria documents on pollutants for which national ambient air quality standards exist or are proposed.
- 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.

RESEARCH PROGRAM RESOURCE SUMMARY
($1,000's)

	Program Area	FY-77 In-house	FY-77 Extramural	FY-78 In-house	FY-78 Extramural
1.	Criteria Pollutants	1,802	3,313	2,310	1,770
2.	Non-Criteria Pollutants	1,473	2,032	1,567	1,968
3.	Transportation-Pollutants	710	644	829	235
4.	Non-Pesticides	712	263	705	190
5.	Criteria Documents	541	389	382	388
6.	Environmental Carcinogens	0	290	185	608
7.	NCTR	0	4,000	0	4,000
8.	Pesticides	2,464	1,212	2,768	964
9.	Substitute Chemicals	500	1,265	791	959
10.	Energy	0	3,734	40	2,415
11.	Toxic Substances	477	443	540	380
12.	Radiant Energy	722	48	758	72
13.	Environmental Assessment	100	0	40	60
14.	Quality Assurance	240	110	280	95
	Total	9,740 (252)	17,743	11,195 (251)	14,104

( ) Manyears

PERSONNEL

Total Full-time EPA Personnel = 248

- Professional = 157
- Non-Professional = 91

Professional Staff

	Bachelor	Master	Doctorate	M.D.	Total
Biology	16	10	11	0	37
Chemistry	16	6	13	0	35
Engineering	9	2	4	0	15
Health	1	4	10	7	22
Mathematics	7	5	5	0	17
Meteorology	0	2	0	0	2
Other	8	7	14	0	29
Total	57	36	57	7	157

RESEARCH PROGRAM

1. Criteria Pollutants

Obtain additional data concerning the criteria air pollutants (NO_2, SO_2, CO, TSP, O_3 and HC) to close research gaps existing when National Ambient Air Quality Standards (NAAQS) were promulgated; provide scientifically adequate health data base for refining existing criteria. Emphasis is on evaluation of exposure averaging times for the NAAQS and of the existing safety margins.

2. Non-Criteria Air Pollutants

Determine whether restricting exposure to particular pollutants, such as sulfates, nitrates, and vapor phase organic material, is necessary to protect health; if so, to what degree exposure should be restricted.

3. Regulated and Non-Regulated Pollutants Specifically Associated with Transportation

Provide a scientific basis for regulatory decision-making regarding the future status of mobile source emission control. Primary emphasis is on the evaluation of non-regulated emissions from advanced automotive control systems. Coordinate this program among other participating ORD laboratories.

4. Non-Pesticide Organic and Inorganic Substances Commonly Reaching Man Through Multiple Routes

Determine threat to human health from exposure to heavy metals including lead, copper, zinc, and other non-pesticide substances. Develop protocols and analytical procedures for the National Environmental Specimen Bank.

5. Criteria Documents

Prepare documentation which critically reviews, evaluates, and interprets pertinent scientific and technical literature concerning environmental pollutants. Compile latest data on the sources, prevalence, and manifestations of recognized air pollutants, thus providing basis for National Ambient Air Quality Standards.

6. Contribution of Environmental Carcinogens to Cancer Incidence in the General Population

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. National Center for Toxicological Research (NCTR)

NCTR, through mutual DHEW and EPA agreement, provides a collaborative toxicological research program in carcinogenesis, mutagenesis, teratogenesis, comparative metabolism, and improved toxicological testing methodology addressing EPA priority needs in those research areas.

8. Pesticides

Collect data required by the Office of Pesticides Program (OPP) in the general areas of registration, label review, hazard classification, and tolerance setting. Program is conducted through multidisciplinary approach involving: investigation of effects of commonly used pesticides in laboratory animals, examination of potential human hazards of "new generation" pest control agents, analysis of pesticides and their transformation products in human and environmental samples, evaluation of human population exposure.

9. Substitute Chemicals

Review scientific literature and execute toxicity studies to fill gaps in health effects data base. These studies involve both examination of human exposure to various compounds, and analysis of controlled laboratory animal studies. This research supports EPA's responsibility to identify hazards associated with use of substitute chemicals that have replaced certain cancelled substances; and subsequent proposal of acceptable alternate substances for those compounds deemed hazardous to human health.

10. 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.

11. Toxic Substances

Determine potential hazards to human health from exposure to new chemicals for commercial use. Develop methods to rapidly screen various classes of toxic substances for specific biological activity; develop methods to predict persistence, disposition, and biological activity for these pollutants.

12. Radiant Energy

Determine need for establishing an environmental standard for non-ionizing radiation. Study chronic and acute exposures to 100 MHz (FM-radio frequency), 425 MHz (UHF-TV frequency), 2450 MHz (microwave oven frequency), and 9000 MHz (search radar frequency) to evaluate their effects on neurobiologic, developmental, biochemical, immunologic, and genetic systems.

13. Environmental Assessment Program Interface

Provide the Industrial Environmental Research Laboratory - RTP with necessary input regarding the potential health effects of individual effluents and effluents arising from the development and utilization of alternate sources of energy.

14. 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: Epidemiologic Studies Laboratories, National Human Monitoring Program, other related OPP programs.

RECENT ACCOMPLISHMENTS

1. Demonstrated that exposure to 1200 $\mu g/m^3$ (0.6 ppm) of ozone for one hour results in significant impairment of lung function in humans. Impairment is greater after 2 hours exposure and a suppression of lymphocyte (white blood cell) function persists in these subjects for as long as eight weeks.

2. Conducting baseline studies in clean air to demonstrate the effective operation of the CLEANS facilities prior to pollution studies. Thirty subjects have been tested for baseline pulmonary function. Data analysis is in progress; however, it appears that the quality of the data resulting from computer control will be a major asset in detecting small changes resulting from pollutant exposures.

3. Conducting studies to determine a possible need for a short-term NO_2 standard. Exposure to NO_2 has demonstrated that mechanisms and degrees of toxicity are dependent upon the concentration of NO_2, and the length and specific pattern of exposure, indicating the continual need of conducting studies which mimic the actual ambient pollution profile.

4. Demonstrated a significant increase in the incidence of meningo-encephalocele in microwave irradiated mouse fetuses near term. This anomaly is a protruding brain resulting from failure of the skull to close. Pregnant mice were repeatedly exposed to low-medium power density (2450 MHz) microwave radiation during gestation.

5. Established an important facility and capability for short-term bioassay of cytotoxic, mutagenic, and carcinogenic environmental chemicals. The program is the most extensive of its kind within the Agency and involves a strong intramural and extramural applied research effort in bioassay methodology as well as extramural implementation of a flexible system of hierarchical tests.

6. Conducting study involving 2 hours exposure to twenty human volunteers to 100 $\mu g/m^3$ of sulfuric acid mist (H_2SO_4) (0.1 micron). Spirometric and plethysmographic measurements were evaluated along with exercise stress.

7. Showed that exposure to ozone at urban environment levels (0.1 ppm, 196 $\mu g/m^3$) prolongs the effectiveness of a drug (sodium pentobarbital) in mice. Results possibly implicate health effects associated with metabolism of other chemical compounds.

8. Conducted a collaborative study with Center for Disease Control to determine the extent and severity of heavy metal absorbtion around 19 non-ferrous smelters throughout the country. Results indicate no additional problems of the severity of those previously reported. There were, however, lesser elevations in tissue concentration around several of the smelters. Further studies are underway to determine route of exposure and possible biologic significance of chronic low level community exposure, particularly to lead, arsenic, and cadmium.

9. Delayed neurotoxity was produced in hens following daily oral sub-neurotoxic doses of leptophos and EPN. A dose-clinical-response relationship was shown with leptophos, EPN, DEF, and morphos. The latter three compounds are under rebuttable presumption against re-registration.

10. ETU (ethylene thiourea), a metabolite of the EBIS fungicides was shown to be teratogenic in the rat but not the mouse. Pentachlorobenzene (a toxic substance) was shown to have an effect upon reproduction in rats. Off-spring of PCB-treated mothers developed tumors and had reduced survival rate.

11. Preliminary evidence shows no cytopathic effects of insect virus (NPV) on mammalian cells in culture; however, the virus can adsorb to the cells, perhaps penetrate the cell and cannot be removed by available techniques.

RESEARCH PROGRAM TRENDS

1. Systematic evaluation of health and ecological implications of widely used organic compounds remains very inadequate. EPA is not focusing its resources on the problems meant to be addressed by the Toxic Substances Control Act.

2. There is no coordinated approach to environmental carcinogenesis. Increased awarenesss of the implications of carcinogens in the general environment requires more research and better coordination of research in this area.

FOREIGN PROGRAM

Country/Organization	Program/Project	Completion Date	Amount
Commision of European Committees	Epidemiological Data Exchange	1978	$100,000
	Lead in Fuel Study		
International Union of Pure and Applied Chemistry	Terminal Pesticide Residue Commission	1979	--
World Health Organization	Joint Expert Committee on Pesticides	1980	--
	Collaborating Center for Environmental Pollution Control	Continuing	$12,000
	Environmental Health Criteria Program		
BILATERAL AGREEMENTS			
US-Federal Republic of Germany	Comparison and Coordination of Major Items of Environmental Research - Specimen Bank	Continuing	$300,000
US-Japan Environmental Agreement	Health Effects of Pollutants	Continuing	--
US-USSR	Biological and Genetic Effects of Environmental Pollution (EPA, HEW, NIEHS)	Continuing	--
	- Biological and Genetic Effects		
	- Subcommittee on Epidemiology		
	Health Exchange Agreement (Problem 1: Methodological bases for the assessment of the biological effects of inhaled chemicals)	1981	$10,000
	(Problem 4: Biological effects of physical factors in the environment-microwave)	Continuing	--
	Environmental Protection Agreement (Project 8: Biological and genetic effects of pollutants oil shale technology)	1983	$9,000

Country/Organization	Program/Project	Completion Date	Amount
	Development of Methods for the Qualitative Evaluation of the Biological Effects of Environmental Chemical Agents (Topic 1: Comparative assessment of the effects of continuous and intermittent exposure to atmospheric pollutants)	1982	--
SPECIAL FOREIGN CURRENCY PROGRAM (PL-480)			
Egypt	A Study of Health Hazards of Pesticides in Egypt	1978	$27,520
	Levels of Toxicants in the Egyptial Environment	1978	$21,000
	Effects of Insecticides on Animals and Plants	1978	$21,080
	Evaluation of the Impact of Environmental Factors on Human Tolerance to Pesticides	--	--
	Chronic Respiratory Diseases and Ambient Air Quality in Alexandria	--	--
Poland	Protection of the Environment from Toxic Effects of Combustion Gases Released by Boilers	1976	$125,696
	Investigations Upon the Toxic Effect of NO_x Depending on Dosage and Period of Exposure	1979	$120,562
	Effects of Chronic Treatment with Lead or Cadmium on the Behavior, Internal Organs, and Reproduction of Rats	1979	$225,730
	Biological Incorporation of Tritium	1980	$538,295
Yugoslavia	Neurologic Disfunctions Resulting from Pesticides Intoxication	1977	$349,971
	Study into the Biological Effects of Manganese	1978	--
	Study of Children's Blood Lead Levels within Families	1978	--

Country/Organization	Program/Project	Completion Date	Amount
INTERNATIONAL GRANTS/CONTRACTS			
Canada	Cancer and Birth Defects in a Population Living Near a Polyvinyl Chloride Manufacturing Plant (Feasbility Study)	1978	$ 15,000
Sweden Karolinska Institute, Stockholm	Review of Occupational and Community Toxicity of Metals	1977	$ 60,000
Sweden and Japan	Distribution of Cadmium Levels in Biologic Samples	1977	$119,000
Yugoslavia	Toxicology of Pesticides	1980	$ 75,000
World Health Organization	Effects of Long-term Exposure to DDT	1982	$ 75,000

REGIONALLY RELATED PROJECTS

REGION II

- Puerto Rico - Provided technical consultation to Puerto Rico health officials concerning a possible health problem related to atmospheric sulfates. Funded a re-analysis of health and pollution data.

REGION III

- Frederick, Maryland - Investigating, with the Center of Disease Control, the possibility of a study to assess health effects related to fluoride emissions from the Eastalco Aluminum Plant near Frederick, Maryland.

- Hopewell, Virginia - Assisted Regional staff in the investigation of the kepone incident and subsequently in legal proceedings against Allied Chemical Company and Life Sciences Corporation.

REGION IV

- Troy, Alabama - Collecting and analyzing lead exposure data from six sites. Data will be used in designing a small epidemiologic study to assess health effects associated with lead emissions from a scrap smelter.

REGION V

- Chicago, Illinois - Designed and initiated study to assess possible microbiological exposures resulting from aerosols generated with a sewage treatment plant. This effort was subsequently transferred to HERL-Cincinnati.

- Pittsburgh, Pennsylvania - Conducted two studies of effects from air pollution episode.

REGION VI

- Bartlesville, Oklahoma - Conducting study of metal exposures and health effects in the vicinity of a zinc smelter.

REGION VIII

- Montana - Provided consultation to the State of Montana in connection with an epidemiologic study to be conducted by the State.

- Montana - Collaborating with the State of Montana on a study of excess mortality due to cancer and chronic lung disease in three Montana counties. The Laboratory designed the study and will process, analyze, and interpret the data. Data are being collected by the Montana State Health Department.

REGIONS I-X

- Provided testimony in connection with numerous hearings or litigations; e.g., St. Louis, Honolulu, Birmingham, Los Angeles, Denver.

- Pesticides Quality Assurance Program - As part of this program, Laboratory performed for the Regional Offices maintenance procedures on electronic insturments, consultation in analytical methodology, and provision of analytical standards.

F. GORDON HUETER, PH.D.

Director
Health Effects Research Laboratory
Research Triangle Park, North Carolina

Education:	Baltimore Polytechnic Institute, 1944-1948 University of Maryland, 1948-1952, B.S. University of Maryland, 1954-1956, M.S. University of Maryland, 1956-1958, Ph.D. (Animal Science, Physiology, Biochemistry)
Professional Experience:	Director, Health Effects Research Laboratory, ERC, EPA-RTP, 1978-Present Associate Director, Health Effects Research Laboratory, ERC, EPA-RTP, 1975-1978 Director, Special Studies Staff, ERC, EPA-RTP, 1973-1975 Deputy Director, Office of Criteria Development, ERC, EPA-RTP, 1972-1973 Special Assistant, Office of the Director, ERC, EPA-RTP, 1971-1972 Assistant Director, Division of Effects Research, ERC, EPA-RTP, 1969-1971 Chief, Biological Research Branch, Division of Health Effects Research, NAPCA, 1968-1969 Chief, Physiology Section, Division of Health Effects Research, NAPCA, 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

U.S. EPA representative as official member of Secretariat for Environmental Workshop on Biological Monitoring and Tissue Banking. This workshop is cosponsored by the Environmental Protection Agency, World Health Organization and Commission on European Communities

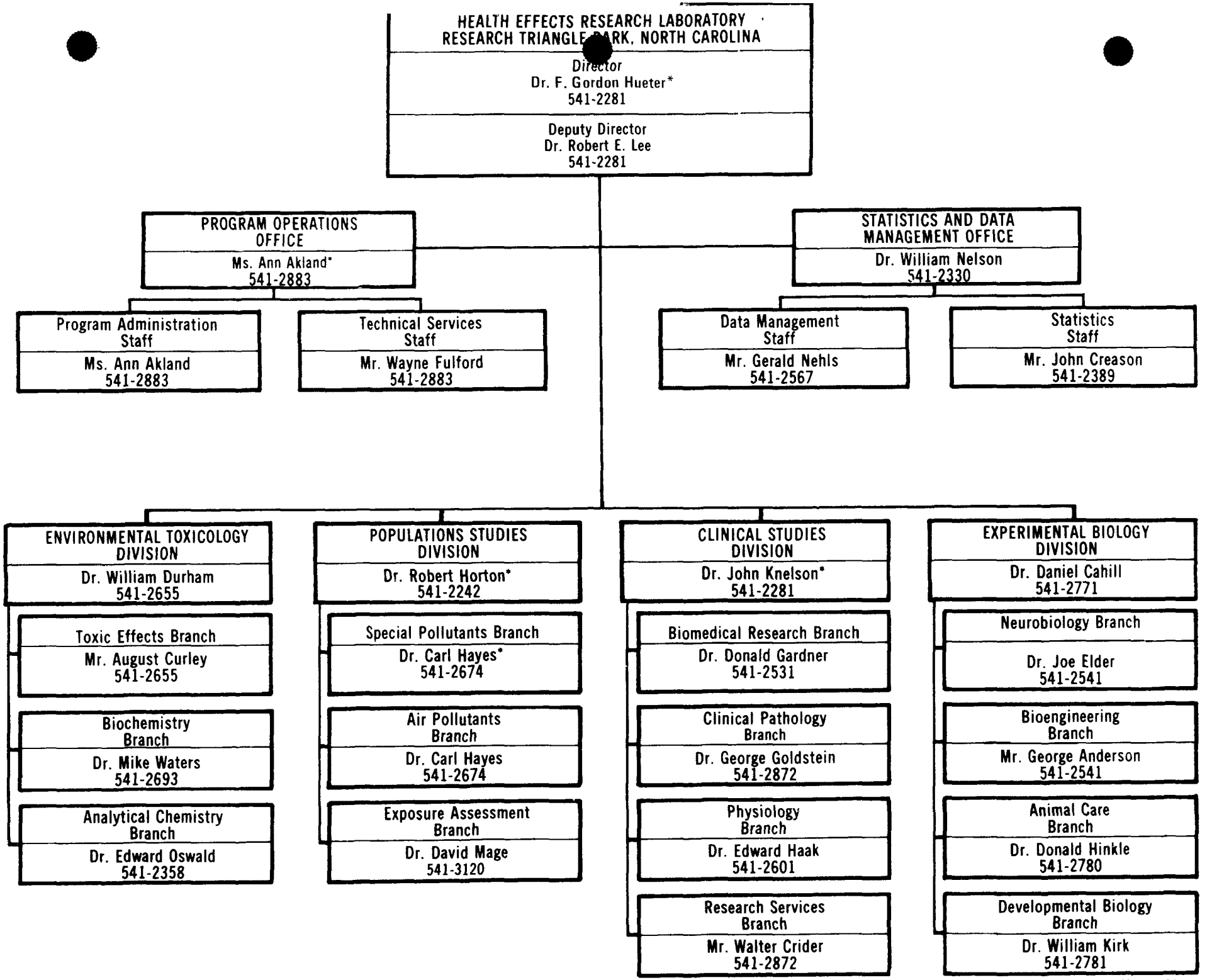
Author or co-author on 11 scientific papers addressing subjects in the area of environmental health

Membership in: American Association for the Advancement of Science
The Smithsonian Associates
National Audubon Society

Honors:

Borden Agricultural Scholarship Award, 1952

Society of the Sigma Xi, 1959



FTS TELEPHONE NO 629 + EXTENSION

March 1978
*Acting

ENVIRONMENTAL SCIENCES RESEARCH LABORATORY

RESEARCH TRIANGLE PARK

NORTH CAROLINA

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 tehcnical 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, and developing air quality simulation models.
- Assess effects of airborne pollutants on visibility, materials, weather and climate.
- Develop and apply dispersion, transport, and concentration models used for relating source emissions and air quality, and for forecasting potential pollution crises.

RESEARCH PROGRAM RESOURCE SUMMARY

($1,000's)

Program Area	FY-77 In-house	FY-77 Extramural	FY-78 In-house	FY-78 Extramural
1. Atmospheric Processes and Effects	1960	7542	2089	8512
2. Air Pollution Characterization and Measurement	2235	3445	2328	3306
3. Air Exposures and Their Effects: Pollutants Associated with Transport	262	1163	375	790
4. Transport and Fate of Energy-Related Pollutants	36	1380	115	2279
5. Energy-Related Pollutant Measurement and Instrument Development	58	377	120	510
6. Air Exposure and Their Effects: Environmental Carcinogens	55	150	0	140
7. Criteria Development	0	100	0	0
8. Toxic Substances	0	0	150	0
Total	4606 (176)	14157	5177 (176)	15537

( ) Manyears-EPA

PERSONNEL

Total Full-time EPA Personnel = 98

- Professional = 72
- Non-Professional = 26

Total Full-time NOAA Personnel = 32

Total = 130

Professional Staff (Including NOAA Personnel)

Discipline	Bachelor	Master	Doctorate	Total
Biology	1	0	0	1
Chemistry	10	14	20	44
Engineering	3	4	3	10
Mathematics	0	3	0	3
Meteorology	0	16	5	21
Physics	3	4	5	12
Other	1	1	2	4
	18	42	35	95

RESEARCH PROGRAM

1. Atmospheric Chemical and Meteorological Processes and Effects

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

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

   - Determine the atmospheric chemical and physical processes for describing the formation and decay of gaseous and particulate air pollutants.

   - Quantify the effects of air pollutants on weather, visibility, climate, and materials.

2. Air Pollution Characterization and Measurement

   - Develop new and/or improved methodology and instrumentation technology for measuring 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.

3. Air Exposures and Their Effects: Refinement Risk Assessment of Pollutants Associated with Transport

   - Characterize emissions from advanced automotive catalyst systems and alternate power systems (diesels, etc.).

   - Develop and evaluate sampling and analytical techniques for measuring catalyst-pollutants from mobile sources and in the ambient air.

   - Improve the highway air quality simulation model and the commuter exposure model.

4. Transport and Fate of Energy-Related Pollutants in Ecosystems

   - Assess the effect of petroleum complex emissions on oxidant transport.

   - Conduct smog chamber studies to assess the atmospheric chemistry of emissions from new energy sources.

   - Study the chemical, physical, and meteorological aspects of coal-fired plant plumes.

- Assess the transport, diffusion, and transformation of SO_x and NO_x from a power plant located in a complex terrain.

- Develop power plant plume models for use in complex terrains.

5. Energy-Related Pollutant Measurement and Instrument Development

   - Develop analytical methods and instrumentation for measuring energy-related pollutants (organic and inorganic compounds, carcinogenic vapors).

   - Identify, measure, and characterize the inorganic compounds, high molecular weight organic compounds, and hydrocarbons in emissions from power plants, oil refineries, coal gasification, and liquefaction plants.

6. Air Exposure and Their Effects: Contribution of Environmental Carcinogens to Cancer Incidence

   - Identify 20 carcinogens that are emitted into the atmosphere in relatively large amounts; develop an analytical system for these carcinogens and a screening technique to analyze various chemical class categories.

   - Develop personal monitors to assess exposure to carcinogens, precarcinogens, and cofactors existing in micro-environments.

7. Criteria Development for Selection of Stationary Source Measurement Strategies, Methodologies, and Instrumentation

   - Develop performance criteria and specification for various monitoring techniques

RECENT ACCOMPLISHMENTS

1. Completed the data gathering phase of the Regional Air Pollution Study in St. Louis, thus providing a data base for urban air quality simulation modeling.

2. Characterized the gaseous and particulate emissions from power plants and other sources that burn residual oil containing various amounts of sulfur and vanadium, and found sulfate emissions as high as 10% of total sulfur oxide emissions.

3. Verified that long range transport of SO_x and ozone and their precursors can produce significant deterioration of air quality hundreds of miles downwind.

4. At the request of the House Subcommittee on Public Health and Environment, issued a status report that discussed the potential problem of ozone depletion in the stratosphere resulting from the release of Freons and other halogenated hydrocarbons.

5. Completed a comprehensive field measurement study of the emissions from and meteorological variables in the vicinity of a power plant facility located in a complex terrain.

6. Evaluated impact of various catalytic control systems for automotive exhaust emissions (regulated pollutants and sulfuric acid); defined potential problems associated with advanced catalytic control systems.

7. Developed analytical techniques for toxic pollutants that subsequently have been used to investigate human and animal exposure incidents.

8. Solved long-standing-problems concerning the accurate measurement of sulfates, free acid, and nitrates in ambient aerosols.

9. Developed second generation models relating emissions to photochemical air quality.

10. Developed finite difference mathematical highway models for evaluating the environmental impact of new and existing highways and changing automobile emission patterns.

11. Documented air pollution potential climatologies for the United States.

12. Developed methodology to research the formation and transport of ambient sulfates.

RESEARCH PROGRAM TRENDS

1. Determine impact of fine particles and sulfate (from increased use of coal) on emission factors for various plant designs, fuel uses, operating conditions, and types of control equipment.

2. Explore potential impact of diesel automobile emissions on air quality, annoyance (odors), and health.

3. Determine roles played by environmental pollutants in cancer.

4. Study global air pollution including tropospheric-stratospheric systems, and acid precipitation.

5. Extend air quality simulation modeling so that the output can be used on total environmental systems.

6. Develop sulfate control strategy that reliably reflects both the complex interactions of point sources and urban plumes, and the diffusion, transformation, interaction, transport, and decay of pollutants.

7. Assess impact of air pollution on visibility, weather and climate to better evaluate potential control strategies.

FOREIGN PROGRAM

Country	Project Title	Completion Date	Amount
Austria	Studies on Aerosols of Sizes Down to 0.05 micron	1977	$ 9,300
France	Simultaneous Comparison of EAA and Diffusion Battery for Atmospheric Aerosols	1978	$21,925
Federal Republic of Germany	Design and Performance of an Aerosol Mass Monitor	1978	$71,700
Union of Soviet Socialist Republics	Natural Aerosol Study	1980	$50,000

REGIONALLY RELATED PROJECTS

REGION I

- Conducted Northeast Oxidant Transport Study, to assess the long range transport of oxidant and its precursors for input to regional transportation control strategies. Study confirmed the long range transport of oxidant and its precursors over distances of several hundred kilometers.

REGION II

- Boundbrook, New Jersey - High concentrations of aromatic amines (1-napthylamine, 700 ng/m^3; anilines, 300,000 ng/m^3) were measured in the atmosphere.

- Edison, New Jersey - Several potentially dangerous organic compounds were identified and measured in the ambient air over and near a chemical dump. Chloroform (74,000 ng/m^3), classified as a carcinogen, and benzene (1,550,000 ng/m^3), classified as a human leukemogen, were among the compounds found. Average urban air concentration for benzo(a)pyrene is 2 ng/m^3, for comparison.

- New Jersey - Provided expert testimony before the New Jersey Special State Senate Commission on organic air pollutants in nothern New Jersey.

- New Jersey - Provided two panel members for a discussion of organic vapors in the air in northern New Jersey, held by the New Jersey Clean Air Council.

- New York, Puerto Rico - Conducted emissions characterization studies at oil-fired power plants in the State of New York and at a plant in Puerto Rico. Preliminary results confirmed earlier findings at other plants of high sulfate emissions and their reduction wit the use of ESP controls. The emissions data from the Puerto Rico plant, burning oil with 2% sulfur at 4.4% excess oxygen, showed a sulfate to total sulfur ratio of 3-5% by weight. Available aerometric data from Puerto Rico indicate relatively high sulfate levels (10-20 μg/m^3) in heavily populated areas.

- Buffalo, New York - Conducting field measurements to assess the effect on air quality of chemicals escaping from Love Canal disposal area.

REGION III

- Maryland - Samples from two rock quarries and from an elementary school playground were quantitatively analyzed for asbestos. The school sample contained 0.6% chrysotile asbestos; the two quarry samples contained 0.35% and 0.36% asbestos, respectively.

- Baltimore, Maryland - Completed nitrosamine sampling study verifying the existence of nitrosamines (as high as 36 $\mu g/m^3$) in the ambient air near a rocket fuel plant.

- Virginia - Provided dispersion model estimates of air concentrations of sulfuric acid to the State of Virginia, in the event of a spill from a barge incident in Chespeake Bay.

- Alexandria, Virginia - Collected samples for trace metal analysis at a municipal incinerator. Principal occurring elements were Pb, Br, S, Na, K, Cl, Zn, Cu, Fe, Ca, and Sn. Only platinum and fluorine, out of 27 elements, were not found in at least one of 47 samples.

- Clinch River Power Plant, Virginia - Concluded 16-month measurement phase for field study of the plant. Aircraft and ground-based measurements of air quality (mostly sulfates and nitrates) and methodology were taken to assess plume dispersion in complex terrain.

- Portsmouth-Norfolk, Virginia - A multiple source dispersion model was used to estimate the impact on the area of primary sulfate emissions from two sulfuric acid plants and from a number of other facilities. Emissions data obtained from stationary source emissions characterization studies were used.

- Belle, West Virginia - Measured ambient air samples for nitrosamines. N-nitrosodimethylamine, at concentrations ranging from a trace to 0.73 g/m^3, was measured.

- Waverly, West Virginia - The ROSE (remote optical sensing of emissions) system was used in a series of measurements at a carbon black plant to evaluate the effectiveness of the plant off-gas flare in converting CO to CO_2.

REGION IV

- Conducted several emissions characterization studies at both oil- and coal-fired power plants in Florida, Louisiana, North Carolina, South Carolina, and Kentucky. Studies included gas and particulate

emissions characterization from the burning of domestic residual fuel and Venezuelan oil. Sulfate conversion levels ranging from 0.7-1.6% of the total sulfur oxides were determined from a coal-fired power plant. Data obtained from a coal-fired plant burning high sulfur coal with ESP controls but no gas scrubber controls for flue gas desulfurization are being analyzed.

- Tampa Bay, Florida - Natural hydrocarbon pollutant concentration measurements were made in the Tampa Bay area. Studies indicate that natural sources of hydrocarbons are a minor contributor to ambient hydrocarbon concentrations. Highest concentration measured was 7 ppb C-isoprene, in an orange grove.

- Bartow, Florida - The ROSE system was used to measure gaseous fluoride concentrations in the vicinity of gypsum ponds at two phosphate fertilizer plants. Preliminary results show HF concentrations over ponds to be in the range of 50 ppb; upwind measurements show no HF. SiF_4 was below detection limits (<0.5 ppb).

  The ROSE system was also used to make measurements of jet engine exhaust products at Tyndall AFB, Florida.

- Atlanta, Georgia - Conducted a one-day workshop on air quality simulation modeling.

- Macon, Georgia - Collected air samples from simulated foest-fires at the Southeastern Forest Experiment Station. Analyses showed high concentrations of olefins, aldehydes, and furan derivatives.

REGION V

- St. Louis, Missouri - Conducted final field experiments of the Regional Air Pollution Study (RAPS).

- Cleveland, Ohio - Loaned odor van to the City of Cleveland, Ohio to assess odor problems associated with various industries.

- Columbus, Ohio -Conducted emissions characterization studies at a coal-fired power plant. Studies are to assess the emissions from the burning of high sulfur coal with ESP controls, but no gas scrubber controls for flue gas desulfurization.

REGION VI

- Arkansas - The ROSE system was used to assist in the preliminary characterization of emissions from plants producing bromine compounds; methanol was the only substance measured in any appreciable concentration.

- New Mexico - Provided technical assistance in diffusion modeling methodologies to the State.

- Houston, Texas - Completed 25-day study of oxidant transport. High ozone levels were measured in the air above the Houston ship channel; the high concentrations were attributed to high hydrocarbon emissions in the area.

- Houston, Texas - Nitrosamine samples were collected in the vicinity of several large chemical plants. Concentrations were much less than those measured at Baltimore or Belle, West Virginia.

REGION VII

- La Cygne, Kansas - Initiated source emissions characterization study at the Kansas City Power and Light power plant station. The facility is equipped with an SO_2 scrubber. This study will investigate the sulfate and hydrogen chloride emissions from the combustion of coal containing high amounts of sulfur and chlorine. The question of sulfate penetration through the scrubber will be examined.

- St. Louis, Missouri - The Regional Air Pollution Study (RAPS), initiated in July 1972, consisted of a comprehensive field study centered in and around St. Louis. The RAPS data acquisition system consisted of a detailed emissions inventory and a ground-based network within 50 km radius of downtown St. Louis, measuring air quality and meteorological parameters; routine measurements were made at 25 stations. Periodic intensive field studies including aircraft measurements were carried out throughout the 5-year period; the last intensive was conducted in the winter of 1976-1977. The RAPS data base is being used in the development, evaluation, and validation of air quality simulation models.

- Provide expert testimony for a public hearing on the Missouri State Implementation Plans, information on in-stack monitoring of the opacity of particulate emissions.

REGION VIII

- Salt Lake City, Utah - Completed visibility-pollutant relationships by examining visibility data from the National Climatic Center and air quality data from the NASN. Sulfates and nitrates were the most predominant pollutants. The analysis indicates that the industry-wide copper strike from July 1967 to March 1968 was associated with depressed sulfate levels and improved visibility.

REGION IX

- Phoenix, Arizona - Completed atmospheric sampling program to measure aerosol mass flux and to characterize the aerosol. Results show that minerals are the primary components of Phoenix aerosol; automobile-related particles ranged from 5% of the sample mass in outlying areas to 50% in the central city on some sampling dates.

- Phoenix, Arizona - The ROSE system was used to make path-averaged CO concentration measurements in runway and taxi areas around Williams AFB, Arizona.

- Phoenix, Arizona - Completed visibility-pollutant relationships as part of 16 Southwest urban sites analyzed for long-term visibility trends. Analyses of visibility data from the National Climatic Center show a worsening of visibility by about 10-20% at most of the sites from 1954 to 1971.

- Southern California - Analyzed air quality and meteorological data for the seven county area in southern Califonria for February 25 - March 4, 1975 period of observed high levels of photochemical oxidants. The analysis shows that a combination of relatively high ultraviolet radiation and meteorological stagnation caused the high oxidant concentration.

- Las Vegas, Nevada - Provided asbestos analyses on samples from a home. Asbestos (chrysotile) was found in the disposable furnace filter and in the acoustical ceiling spray.

REGION X

- Portland, Oregon - Completed a 2-month field study to determine the sources of aerosols in the area.

REGIONS I, III, VI, VIII, IX

- Arrangements made for the transfer of complete air monitoring systems from the St. Louis RAPS site to the respective Regions.

REGIONS III, V, VII

- Aircraft measurements over widely scattered midwestern areas, Ohio Valley and eastward to the Virginia coast were made to assess ozone-precursor relationships and the causes of high rural ozone concentrations; limited sampling was conducted at several ground-level sites.

REGIONS VI, VIII, IX

- The first field study to assess visibility reduction due to pollutants from (a) a power plant, (b) a smelter, and (c) an urban area in the Southwest was carried out in the Four Corners area of New Mexico and Arizona.

AUBREY PAUL ALTSHULLER

Director
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Education: University of Chicago, B.S., 1948
University of Cincinnati, M.S., 1950
Ph.D. (Physical Chemistry), 1951

Professional Experience:
- Director, Environmental Sciences Research Laboratory, EPA-RTP, 1974-Present
- Director, Chemistry and Physics Laboratory, EPA-RTP, 1971-1974
- Director, Division of Chemistry and Physics, National Air Pollution Control Administration, 1968-1971
- Chief, Chemistry and Physics Program, National Center for Air Pollution Control, 1967-1968
- Chief, Chemistry Section in Division of Air Pollution, 1961-1966
- U.S. Public Health Service Commissioned Officer (Senior Assistant Scientist to Scientist Director, 1955-1963 in Federal Air Pollution Program)
- Aeronautical Research Scientist, Lewis Research Center, Cleveland, Ohio, National Advisory Committee Aeronautics (now NASA), 1951-1955

Professional Affiliations:
- Chairman, American Chemical Society Committee on Air Pollution, 1965-1967
- Member, Committee on Air Pollution and Health of American Thoracic Society, 1964-1966
- U.S. Representative, OCED Meeting on Fundamental Studies in Air Pollution, 1965

Member, air pollution panel of American Chemical Society Committee preparing report on Science and Technology of Environmental Improvement

Member, Executive Committee, 1968-1971, and Chairman, 1970, of Division of Water, Air and Waste Chemistry, American Chemical Society

EPA delegate on Joint Planning Coordination Committee for U.S.-Japan scientific activities on environmental control

Member, Editorial Board, "International Journal of Air Pollution", 1964-1966

Associate Editor, "Atmospheric Environment", 1967-present

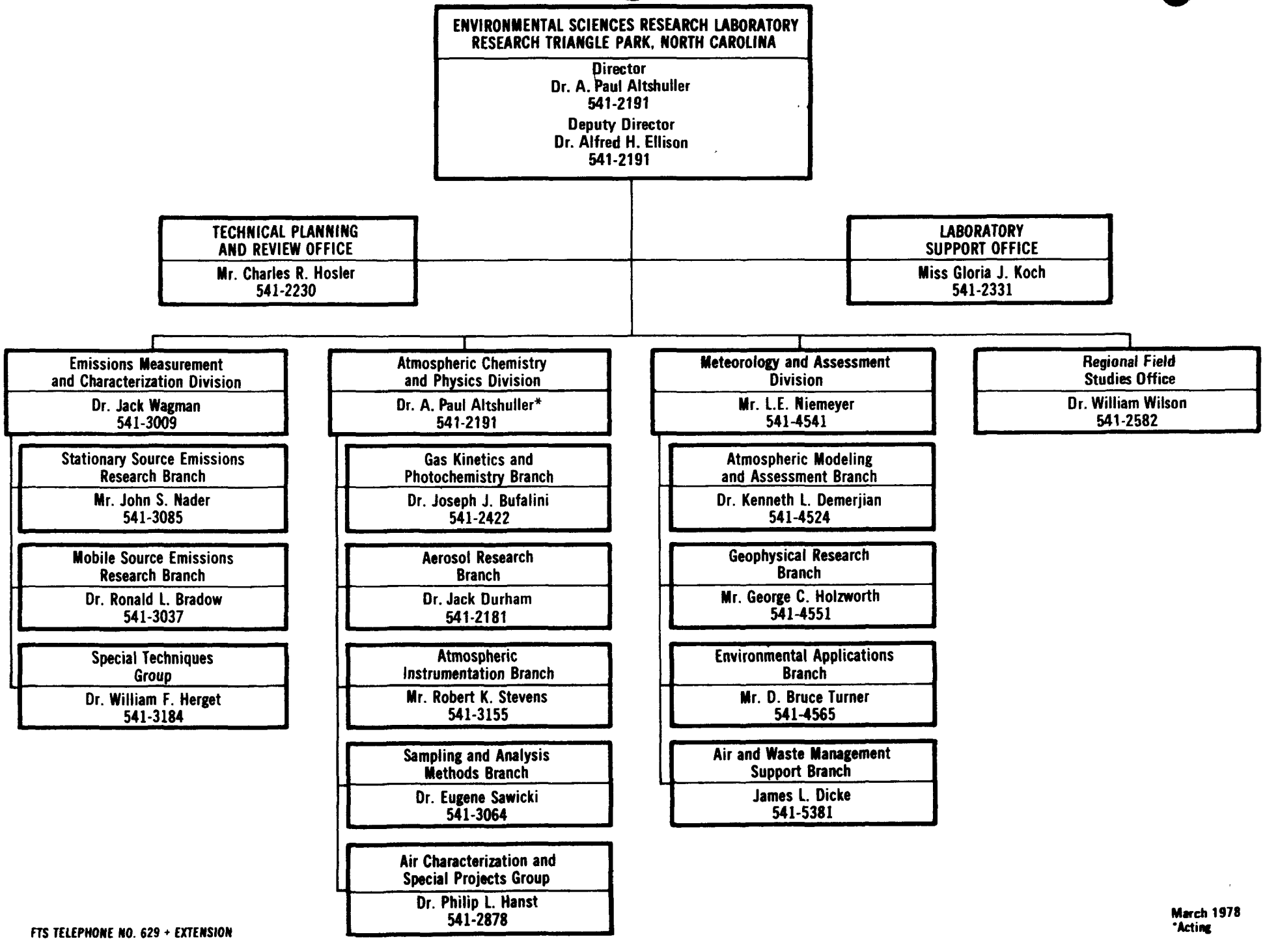
Member, Editorial Board, "Environmental Science and Technology", 1967-1968

Honors: Cincinnati Chemists Award - 1967, Cincinnati Section of the American Society for "important fundamental contributions to chemical knowledge and its application in theoretical and experimental physical chemistry, in analytical chemistry and photochemistry of gas mixtures, and especially in the scientific evaluation of photochemical air pollution"

Frank A. Chambers Award - 1970, Air Pollution Control Associations for outstanding achievement "in developing methods of measurements for air pollution control"

Silver Medal for Superior Service - Environmental Protection Agency - 1971 - for significant achievements and impressive service in directing an important program of research on the chemical and physical properties of air pollutants, their reactions and measurement

The American Chemical Society Award in Pollution Control - 1975 - for his conception and implementation of the comprehensive research program within the Federal Government, which provided the scientific basis for the abatement of photochemical air pollution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March 1978
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INDUSTRIAL ENVIRONMENTAL RESEARCH LABORATORY

RESEARCH TRIANGLE PARK

NORTH CAROLINA

INDUSTRIAL ENVIRONMENTAL RESEARCH LABORATORY

RESEARCH TRIANGLE PARK, NORTH CAROLINA

MISSION

- Assess the environmental impact of energy and industrial processes
- Insure development of control technology and process modifications. This will allow for establishing and meeting standards for air, water, solid waste, thermal discharge, pesticides, and energy-conserving aspects of environmental pollution in a timely and cost-effective manner
- Support the Environmental Protection Agency's enforcement and regulatory activities.

RESEARCH PROGRAM RESOURCE SUMMARY

($1000's)

		FY 77	FY 78
1.	Flue Gas Cleaning - Including Waste and Water Control Program	4,916	4,500
2.	Particulate Control	3,937	3,820
3.	Thermal	658	300
4.	Combustion Pollutant Assessment	948	1,900
5.	Fluid Bed Combustion	3,693	4,000
6.	Coal Cleaning	2,503	2,900
7.	Synthetic Fuels	3,712	3,400
8.	Advanced Oil (CAFB)	1,512	1,150
9.	Combustion Control (NO_x)	7,054	6,750
10.	Metallurgical	1,198	1,420
11.	Chemical Processes - Petrochem, Agrichem, Textiles, Petroleum	2,771	2,660
12.	Support Services	2,661	3,120
13.	In-house	4,059	4,110
	TOTAL	39,622 (89)	40,030 (86)

( ) Manyears

PERSONNEL

Total Full-Time EPA Personnel = 86

- Professional = 62
- Non-Professional = 24

Professional Staff

	Bachelor	Master	Doctorate	Total
Chemistry	4	0	3	7
Engineering	23	13	11	47
Mathematics	3	2	1	6
Other	2	0	0	2
Total	32	15	15	62

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 demonstration of control technologies where needed
- technology transfer - dissemination of knowledge gained and of technologies developed by EPA and by the scientific community.

1. Flue Gas Cleaning

- develop and demonstrate technology to prevent or abate sulfur dioxide pollution from utility and industrial power sources.
- provide near-term technology to meet emission standards for sulfur dioxide
- liberate high-sulfur fuels for use
- investigate disposal or utilization of solid wastes from power plants with emphasis on FGD sludge
- minimize or eliminate liquid discharges from power plants with emphasis on water recycle and reuse
- evaluate need for and develop processes for the control of nitrogen oxide and simultaneous control of nitrogen oxide/sulfur oxide.

2. Particulate Control

- develop and demonstrate control technologies to remove large fractions of particles $\leq 3\mu$
- 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 high temperature/high pressure process for cleanup of advanced energy processes

3. Thermal Pollution

- develop advanced cooling technology for waste heat rejection from power plants
- develop waste heat utilization techniques for agricultural applications
- demonstrate treatment methods for waste water streams from cooling systems.

4. Combustion Pollutant Assessment

- Provide a qualitative definition of the environmental risks associated with the multimedia effluents from various conventional combustion systems processes, which is expected to provide data for standards setting, and to enable the Laboratory to make decisions on the need for and extent of process control required for a wide range of multimedia pollutants.

5. Fluid Bed Combustion

- environmental assessment of fluidized bed combustion technologies
- development of environmental goals through environmental assessment
- determination of the best control/disposal technologies for FBC in light of multimedia considerations
- develop and demonstrate technology for control of sulfur oxide, nitrogen oxide emissions, solid wastes and other multimedia pollutants from fluid bed combustion systems as needed.

6. 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.

7. Synthetic Fuels

- assess environmental impact of the emerging coal-based synthetic fuels industry
- develop and demonstrate appropriate multimedia control technology

8. Advanced Oil

- conduct multimedia environmental assessments of existing and projected processing and utilization technologies for residual oil use
- develop control technology for chemically active fluid bed processes for sulfur, metals and nitrogen oxide, to permit utilization of high-sulfur fuels in existing gas- and oil-fired power plants
- develop advanced control techniques.

9. NO_x Combustion Control

- develop and demonstrate modification technology to control nitrogen oxide and related pollutants generated by combustion (utility boilers, commercial boilers, industrial boilers, residential heating systems, industrial process furnaces, stationary engines, advanced processes)
- evaluate effects by environmental assessment.

10. Metallurgical Processes

- identify major multimedia pollution sources, particularly in iron and steel industries
- conduct environmental assessments on identified sources
- conduct engineering studies to demonstrate technology applicability
- develop and demonstrate control technology for priority sources

11. Chemical Processes

- identify and characterize chemical industry pollution emissions, particularly in agricultural chemicals, petroleum refineries, petrochemicals, shipboard incinerators, textiles
- conduct multimedia assessments as needed
- develop and demonstrate control technology as needed.

RECENT ACCOMPLISHMENTS

1. Demonstration of effectiveness and reliability of Lime and Limestone Flue Gas Desulfurization Technology; large scale commercial application of this technology is such that over 50,000 MW of generating capacity are now controlled, under construction or planned.

2. Conducting multimedia environmental assessment program of emerging energy technologies. Have developed independent problem definition and test facilities for control technologies for synthetic fuels conducted through a coordinated grant program involving the University of North Carolina, North Carolina State University and the Research Triangle Institute.

3. Extended combustion technology to coal-fired utility boilers, reducing nitrogen oxide emissions to 50 percent of uncontrolled levels.

4. Demonstrated SO_x removal of over 90% in both atmospheric and pressurized fluid bed combustion (FBC) systems (should enable most coals to meet new source performance standards for SO_2 from large coal boilers); demonstrated that NO_x emissions from atmospheric and pressurized FBC systems will be well within new source performance standards for large coal-fired boilers.

5. Conducting large demonstration of physical coal cleaning at Homer City, PA to meet NSPS and State standards. New chemical cleaning approach (Meyer's Gravichem) shows higher cleaning potential and reduced environmental impact from plant operations.

6. Extended combustion technology to coal-fired utility boilers, reducing NO_x emissions to 50% of uncontrolled levels.

7. Demonstration and development of other advanced FGD processes: Double Alkali Process - Demonstrated (20 MWE), Demonstration Program (280 MWE); Magnesium Oxide Process - Demonstrated (155 MWE and 100 MWE); Citrate Process - Demonstration Program (50 MWE).

8. Completion of acceptance tests on a 115 MWE coal-fired, sulfur-producing demonstration of the Wellman-Lord FGD System.

9. Successful operation of chemically active fluidized bed pilot plant (0.75 MW) with 90% sulfur removal, complete Vanadium removal, 75% Nickel removal, and reduction of NO_x emissions.

10. Demonstration of fabric filter systems (baghouses) as efficient and reliable fine particulate control devices on both utility and industrial boilers.

11. Developed feasible method on pilot scale for major hydrocarbon reductions from ethylene dichloride petrochemical facilities.

12. Provided basis from shipboard incineration tests for permits to burn chlorinated hydrocarbon wastes in the Gulf of Mexico. Participated in burning of Air Force's remaining herbicide orange in Pacific Ocean.

13. Established test programs to develop basis for 1983 guidelines in textile industry. Zero discharge was demonstrated for fiberglass manufacturers.

14. Demonstrated significantly reduced emissions from unique coke oven charging system variations of this system are in commercial operation.

RESEARCH PROGRAM TRENDS

1. Greater emphasis on presently unregulated pollutants, particularly those named in 1977 Clean Air Act Amendments.

2. Greater participation with regulatory and enforcement programs as they implement more stringent requirements of recent air, water, solid waste and toxics legislation.

3. Shift from hardware programs to collecting, assessing, and transferring information. Environmental assessment of energy and industrial sources will continue to be emphasized.

4. Renewed emphasis on control technology that will accelerate environmental acceptable use of coal.

5. Demonstration of many second generation processes which are more complex and costly to evaluate.

6. More emphasis on adapting and packaging results obtained under ORD's Multimedia Program to specific media-oriented requirements of Agency's program offices.

FOREIGN PROGRAM

Country/Organization	Program/Project	Completion Date	Amount
England	Contractual Agreements:		
	Chemically Active Fluid Bed Study	1980	$1,700,000
	Fluid Bed Combustion Study	1978	70,000
	Synthetic Fuels - Coal Gasification	1982	600,000
Federal Republic of Germany	Bilateral Agreement for the study particulate control devices and of chloroysis technology	(not yet active) 1980 est.	
International Energy Agency	Synthetic Fuels - Coal Gasification Study	1979	100,000
Japan	Bilateral Agreement for the Study of Stationary Sources, iron and steel pollution, flue gas desulfurization, and flue gas treatment	(not yet active) 1980 est.	
North Atlantic Treaty Organization	Membership in the Committee on the Challenges of Modern Society	Completed	
Organization for Economic Cooperation and Development	Coal Cleaning Study	1977	16,000
Poland	Coal Cleaning Study (PL-480)	Completed	
	Fabric Filtration Study (PL-480)	1978	
	Textile Waste Water Treatment Study (PL-480)	1977	
Union of South Africa	Synthetic Fuels - Coal Gasification Study	1980	200,000
Union of Soviet Socialist Republics	US/USSR Agreement on Cooperation in the Field of Environmental Health - Subtopic 2. Stationary Source Air Pollution Control Technology	1982	--

REGIONALLY RELATED PROJECTS

REGION II

- New Jersey - A Survey of the Use and Emission of Selected Carcinogens in New Jersey - Survey of approximately 10,000 industrial facilities in New Jersey. Results of this project will be the compilation of the usage and emissions of approximately 80 carcinogenic materials by these industrial facilities.

- New York - Demonstration of a Polychlorinated Biphenyl Processing and Manufacturing Plant Waste Treatment System - Develop cost-effective alternative to activated carbon treatment. Catalytic reduction technology has been tested and found to be inadequate and current efforts are direct at UV-ozonolysis technology. Project is related to Regional Office concern over discharges of PCB's into the Hudson River by General Electric Company's capacitor manufacturing plant in New York State. While PCB's are currently not being used, run-off from plant property contaminated because of past spills continues to be a problem.

REGION III

- Assessment of the Uses and Jobs of Lubricants, Oils, Greases, and Hydraulic Fluids - Projects nearing completion.

- At Sea Incineration: Sampling, Analysis and Environmental Assessment - Conduct sampling, analysis, and assessment of an incinerator ship burning liquid organochloride waste and solid wastes to provide supporting information to be used by EPA in establishing regulations governing waste incineration at sea. Evaluate this disposal technique for possible application to the Kepone problem in Virginia.

REGION IV

- Florida - Effects of Gypsum Pond Seepage in Ground Water Quality Evaluate the problem posed by the presence of extremely contaminated gypsum ponds overlying previous strata in Central Florida. This contamination presents a potential serious threat to the Florida Aquifer. The effect of over a thousand acres of unlined ponds containing several thousand milligrams per liter of fluoride and phosphorus, ph less than 2, and over 100 picocuries per liter radium 226 is still unknown. The new work scope will be implemented in December.

- At-Sea Incineration of Organochlorine Wastes Onboard the M/T Vulcanus - The incineration of 4100 tons of organochlorine waste by the M/T Vulcanus was monitored by IERL-RTP in an EPA-designated burn area in the Gulf of Mexico. Incinerator efficiencies of at least 99.9% were observed at waste feed rates of 22 tons/hour.

- Memphis, Tennessee - Chlorinated Hydrocarbon Pesticide Removal from Wastewater - Project (grant with Velsicol Chemical Company, Memphis) is to develop control technology to meet the more stringent Toxic Pollutant Standard for Endrin. The resin sorption technology developed is routinely achieving 3 parts per billion of endrin in pilot plant effluent; it appears that with further work it will be capable of achieving the toxic pollutant standard. Region IV has been involved in a lawsuit over the failure of Velsicol to meet National Pollution Discharge Elimination System requirements.

REGION V

- Sodium Conditioning Demonstration - Provided technical assistance to Regional office on the effects on ESP performance of switching from high sulfur coal to low sulfur coal. This was a question in a suit filed by EPA to force a utility to switch to low sulfur coal to meet NSPS for SO_x. The Laboratory agreed to conduct a sodium conditioning demonstration in cooperation with Region V on the utility. Presently, availability of the utility is questionable so that it may be necessary to go to a different site for the demonstration.

REGION VIII

- Sampling and Analysis of Organic Materials in Power Plant Emissions - An existing contract between Region 8 and Radian Corporation provided for sampling trace metals in emissions from two power plants. Region 8 and IERL-RTP were both interested in determining organic emissions from these plants and in testing the new Source Assessment Sampling System (SASS). IERL funds were added to provide for the additional sampling and analysis costs, and a SASS train was loaned to Radian by IERL-RTP for the project. Sampling has been completed and Region 8 will receive a full report on the organic emissions.

REGION IX

- The Use of Electrostatically Charged Fog for Control of Dust from Open Sources - It has been demonstrated that fugitive industrial particulate emissions and redispersed dusts acquire an electrostatic charge as they are formed. If these charged airborne particles are exposed to oppositely charged fog, there is an enhanced agglomeration, causing the particles to rapidly settle. This technique has been used around a number of particulate sources in Region IX including a cement plant and a smelter. The lowering of dust concentrations by an order of magnitude has been demonstrated.

MULTI-REGIONAL PROJECTS

- Fugitive Emissions in the Iron and Steel Industry - A Study of fugitive emissions in the Iron and Steel Industry is directly supporting all Regions containing iron and steel plants. Although the final report has not been received, the data has already been used in some litigation.

REGIONS III, IV

- Iron and Steel Plant Zero Discharge Study - The subject study is of special interest to Regions 3 and 4. Results will help support Regional office activities.

REGIONS III, IV, V

- Iron and Steel Waste Water Treatment System - The portable waste water treatment sytem for support of BATEA in the iron and steel industry has received significant interest from several Regional offices.

JOHN K. BURCHARD

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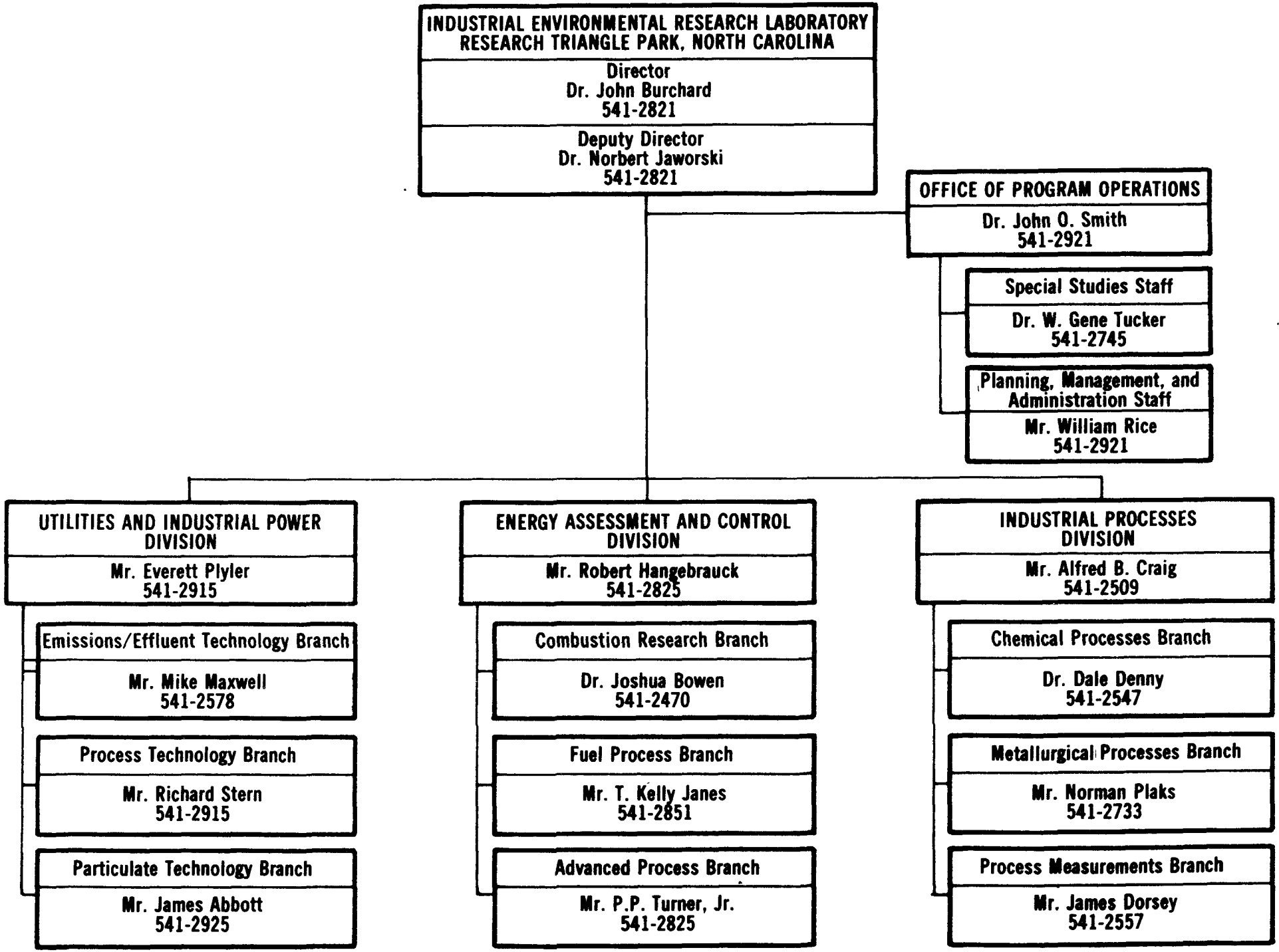
Education: Carnegie Tech - B.S.
Carnegie Tech - M.S.
Carnegie Tech - Ph.D. (Engineering) 1962
Federal Executive Institute

Professional Experience:
- Director, Industrial Environmental Research Laboratory, 1974-Present
- Senior ORD Official, EPA-RTP, 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, Calif., 1968-1970
- Staff Scientist, United Technology Center, Sunnyvale, Calif., 1961-1968

Professional Affiliations:
- American Institute of Engineering
- Sigma Xi



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March 1978

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY

RESEARCH TRIANGLE PARK

NORTH CAROLINA

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY

RESEARCH TRIANGLE PARK, NORTH CAROLINA

MISSION

- Provide specialized monitoring and analytical support to EPA programs and to other national and international air pollution control organizations
- Operate EPA Air Pollution Quality Assurance Program for both ambient air and stationary source measurements
- Provide analytical methods, standardization evaluations and development of monitoring methods for the sampling and analysis of pollutants in ambient air and in emissions sources
- Perform analyses of samples from environmental monitoring networks, e.g., the non-criteria pollutant networks, the National Air Surveillance Network (NASN) and the National Fuel Surveillance Network (NFSN).
- Provide special techniques and/or rapid response for collection and analysis of air samples in support of emergency episodes and enforcement
- Evaluate commercially available air monitoring instrumentation including that for equivalency determination of ambient air pollution methods
- Conduct mathematical and statistical evaluations and report internally generated data, including network data
- Conduct the EPA Fuels and Fuel Additive Registration Program

RESEARCH PROGRAM RESOURCE SUMMARY

($1,000's)

	Program Area	FY-77 In-house	FY-77 Extramural	FY-78 In-house	FY-78 Extramural
1.	Quality Assurance	1,405	363	1,795	65
2.	Technical Support	1,809	241	1,732	-
3.	Catalyst	1,025	125	825	171
4.	Fuel & Fuel Additive	165	-	265*	-
5.	Energy	5	220	225	200
6.	Toxic Substances	-	-	90	-
	TOTAL	4,409 (86)	949	4,932 (86)	436

*Includes methods techniques development for source emission measurements

( ) Manyears

PERSONNEL

Total Full-time EPA Personnel = 86

- Professional = 63
- Non-Professional = 23

Professional Staff

	Bachelor	Master	Doctorate	Total
Biology	0	2	0	2
Chemistry	31	5	8	44
Engineering	6	4	0	10
Mathematics	1	5	0	6
Other	0	1	0	1
Total	38	17	8	63

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 support the development of SRM's.

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 non-criteria pollutant monitoring network, National Fuels Surveillance Network (NASN) 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 plan and control strategy developments; e.g., NO_2 monitoring in large urban areas and O_3 monitoring in natural forests; vinyl chloride and benzene monitoring at suspected major sources of emissions.

- Conduct special studies to support Regional air pollution investigations; e.g., arsenic determination near the Tacoma smelter; BaP determination around a coke oven in Pennsylvania; asbestos monitoring in Maryland; kepone monitoring in Virginia; PCB monitoring near a special incinerator in Arkansas.

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

3. Catalyst Evaluation

- 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.

4. Fuel and Fuel Additives

- Register fuel and fuel additives in accordance with Federal regulations and coordinate the activities of the Fuel/Fuel Additive Registration Screening Committee concerned with flagging fuels and additives having the potential for adverse effects.

5. Energy

- Provide quality assurance support to the Western Energy program and in contract monitoring for the indoor/outdoor pollutant characterization/ health effects assessment study.

6. Toxic Substances

- Prepare state-of-the-art measurement method reviews for pollutants of concern to Office of Toxic Substances.

RECENT ACCOMPLISHMENTS

1. Initiated implementation of Agency-wide quality assurance program including: issuance of Volume I and Volume II of the Quality Assurance Handbook, development of reference materials, conduct of laboratory evaluations, evaluation of standardization of methods measurement methods for pollutants in air and emission sources, promulgation of reference methods.

2. Continuing study of impact on air quality of roadway emissions from catalyst-equipped cars: issued study reports, conducted symposium on study results, published symposium proceedings.

3. Provided technical support to the Regional Offices, OAQPS, and other arms of the Agency in the area of environmental monitoring, e.g., monitoring of asbestos in Maryland, kepone in Virginia, ozone in national forests, and polynuclear organic matter in Pennsylvania; analysis of lead, phosphorus and manganese in fuel; providing best available technology for measurement of vinyl chloride, PCB's, and benzene.

4. Implemented regulations on equivalency of methods and on fuels and fuel additives. Registered as of July 1, 1977 were 2,236 fuel additives, 511 brands of motor vehicle gasoline and 259 brands of motor vehicle diesel fuel.

RESEARCH PROGRAM TRENDS

1. Evaluation, implementation, and transfer of technology of monitoring systems for non-criteria pollutants including improvement in methodology for monitoring for asbestos. Present methodology results in a wide variability in laboratory performance.

2. Expansion of implementation of a nation-wide data quality assurance program.

3. Implementation of a centrally-controlled national air pollution monitoring network and reporting of a uniform air quality index.

4. Measurement of carbon monoxide in sustained-use vehicles.

5. Development and implementation of new regulations on testing of fuels and fuel additives.

FOREIGN PROGRAM

Country/Organization	Program/Project	Completion Date	Amount
Commission of European Communities	Assistance in the conduct of particulate study	1977	1,000
Norwegian Institute For Air Research, Oslo, Norway	Assistance in ambient air monitoring study	Continuing	5,000
World Health Organization	Collaborating Center for Environmental Pollution Control	Continuing	7,000
	Operate International Aerometric Data Bank	Continuing	30,000
	Lead in Development of Methods Manual	2nd edition 1978	2,500
	Interlaboratory Comparison Study for SO_2 & Suspended Particulates in Air	1978	2,000
	Prepared Guideline for Consultation on Air Quality Monitoring in Urban and Industrial Areas	1977	1,000
	Provide training to PAHO, WHO Fellows, provide consultation to a number of countries, participate in conferences.	Continuing	5,000
World Health Organization (25 countries)	International Reference Center on Air Pollution Control Data and particulate in ambient air. (Compile data and prepare reports for publication by WHO Headquarters)	continuing	$12,000
World Meteorological Organization	Collaborating Center on Background Air Pollution Data	Continuing	8,000
	Provide precipitation reference materials and conducted inter-laboratory comparison study on precipitation samples	1977	30,000

FOREIGN PROGRAM

Country	Project Title	Completion Date	Amount
	Maintain precipitation network and provide analytical support	Continuing	$45,000
	Conduct training courses on precipitation chemistry and analysis	1977	3,000
	Provide Chairman of the Air Pollution Working Group of CIMO	1977	1,000
World Meteorological Organization (49 stations)	Collaborating center on background air pollution data. Precipitation chemistry (compile, process and store data; prepare annual reports, documents published in cooperation with NOAA)	Continuing	no funds provided

REGIONALLY RELATED PROJECTS

ALL REGIONS

- Provide high quality glass-fiber filters for national use in SIP monitoring of particulates in ambient air. Develop specifications for filters and perform acceptance testing.

- Conducted extensive research study to develop an adequate method for temperature controlling the SO_2 bubbler for the Reference SO_2 Method.

- Conduct semiannual audit among approximately 150 state and local agency laboratories for SO_2, NO_2, CO, HiVol Flow, sulfate, nitrate and lead. Problems identified through this external quality assurance mechanism were corrected by the appropriate state/local agency. These audits also serve to corroborate the validity of measurements performed.

- National Air Surveillance Network - Each Regional office continually submits air particulate samples which are cataloged, cut and composited, and analyzed for up to forty metals, benzo(a)pyrene, and non-metal inorganics.

- Unleaded Gasoline Sampling Program - An average of 150 samples per month of unleaded gasoline are analyzed for lead content (a quality assurance effort for the Regional office laboratories) and for phosphorus content (used for enforcement actions by Regional Offices). Manganese is also being analyzed in these samples.

- Development of criteria to evaluate state and local agency laboratories (ambient and source monitoring). Conducted workshop for Regional Quality Control Coordinators (RQCC's) to instruct in use of criteria.

- Provide information on newly designated reference and equivalent methods for use in air quality monitoring for criteria pollutants.

REGIONS I, II, IV, VI, VIII, IX

- Continuous monitoring of ambient concnetrations of NO_2 to assist in the development and reevalation of SIPs.

REGIONS III, V, VI, VIII, IX

- Provide on-site consultation on calibration procedures, status of evaluation of calibration procedures and reference methods and on methods for measurement of non-regulated pollutants in sources of emission and ambient air.

REGIONS III, VI, VII, VIII

- Provided assistance, including performance of monthly field audits, for a period of three months during a study of the extent and magnitude of ozone transport.

REGIONS II AND VIII

- Trained chemists in the use of the Technicon II Autoanalyzer and Dionex ion chromatograph at Research Triangle Park for two weeks. Assisted state of Utah in establishing their laboratory.

REGION II

- New York - Continued on-going project to analyze unleaded gasoline from State of New York vehicles for eleven physical and chemical parameters. Collaborated in a comparative sulfate analysis study with the State of New York.

- Performed over twenty-five analyses for benzo(a)pyrene on a spill in a sewage treatment plant.

REGION III

- Washington, DC - Conducted instrument calibration and field audits at 17 state and local sites in the AQCR 047 for 37 continuous monitoring instruments to insure valid data during bicentennial activities.

- Montgomery County, MD - Conducted monitoring study to measure possible asbestos concentrations during various activities which could cause the entrainment of asbestos into the atmosphere.

- Clairton, PA - Supported extensive study involving benzo(a)pyrene analyses of air particulate samples taken around and in the plume of the U.S. Steel coking ovens. Data were used in EPA's enforcement action to curtail coke oven emissions, resulting in U.S. Steel Corporation decision to build a new coking facility.

- Pittsburgh, PA - Conditioned, weighed and shipped hi-vol filters for Air Stagnation Episode.

- Hopewell, VA - Initiated project to measure ambient air at various distances from Life Science Product's Plant to determine if kepone was re-entrained into the atmosphere during daily vehicular activities.

- Provided standard fuel oils to Regional Office laboratories to calibrate their analytical insturments.

REGION IV

- Gulfport, Miss. - Conducted monitoring at various distances from an experimental herbicide orange reclamation operation to determine if p-dioxin was emitted into atmosphere during extraction and incineration of tetrachlorodibenzodioxin (TCDD).

- South Carolina - Provided high volume glass-fiber filters to State of South Carolina during an emergency.

- Conducted a series of special audits of air quality monitors measuring NO_x and O_3.

REGION VI

- El Dorado, Ark. - Conducted study to measure possible emission of PCB during a test grinding of electrolytic capacitors. Three field sampling methods were evaluated to determine collection efficiencies of PCB's.

- Tulsa, Oklahoma - Provided support during a three month extensive ozone and other related pollutants. Part of the study consisted of auditing the State and local monitoring sites in the vicinity.

- Conducted a special audit of air quality monitors measuring SO_2, O_3, and NO_x.

- Conducted a special intercomparison study of ozone calibration procedures among three agencies.

REGION VII

- Conducted a special audit of monitors measuring SO_2.

REGION VIII

- Utah - Performed Benzo(a)pyrene analysis of air particulate matter collected around coking ovens. Submitted chain of custody samples submitted for possible litigation.

REGION X

- Fairbanks, Alaska - Analyzed High-Volume filters for non-metal inorganics (SO_4, NO_3, NH_4) and lead.

- Performed fuel oil analysis for Puget Sound Air Pollution Control Agency.

- Conducted field study to determine if concentrations of gaseous and particulate arsenic can be distinguished. This encompassed evaluation of prototype sampling equipment, methodology and a field study conducted with the assistance of Region X personnel.

THOMAS R. HAUSER

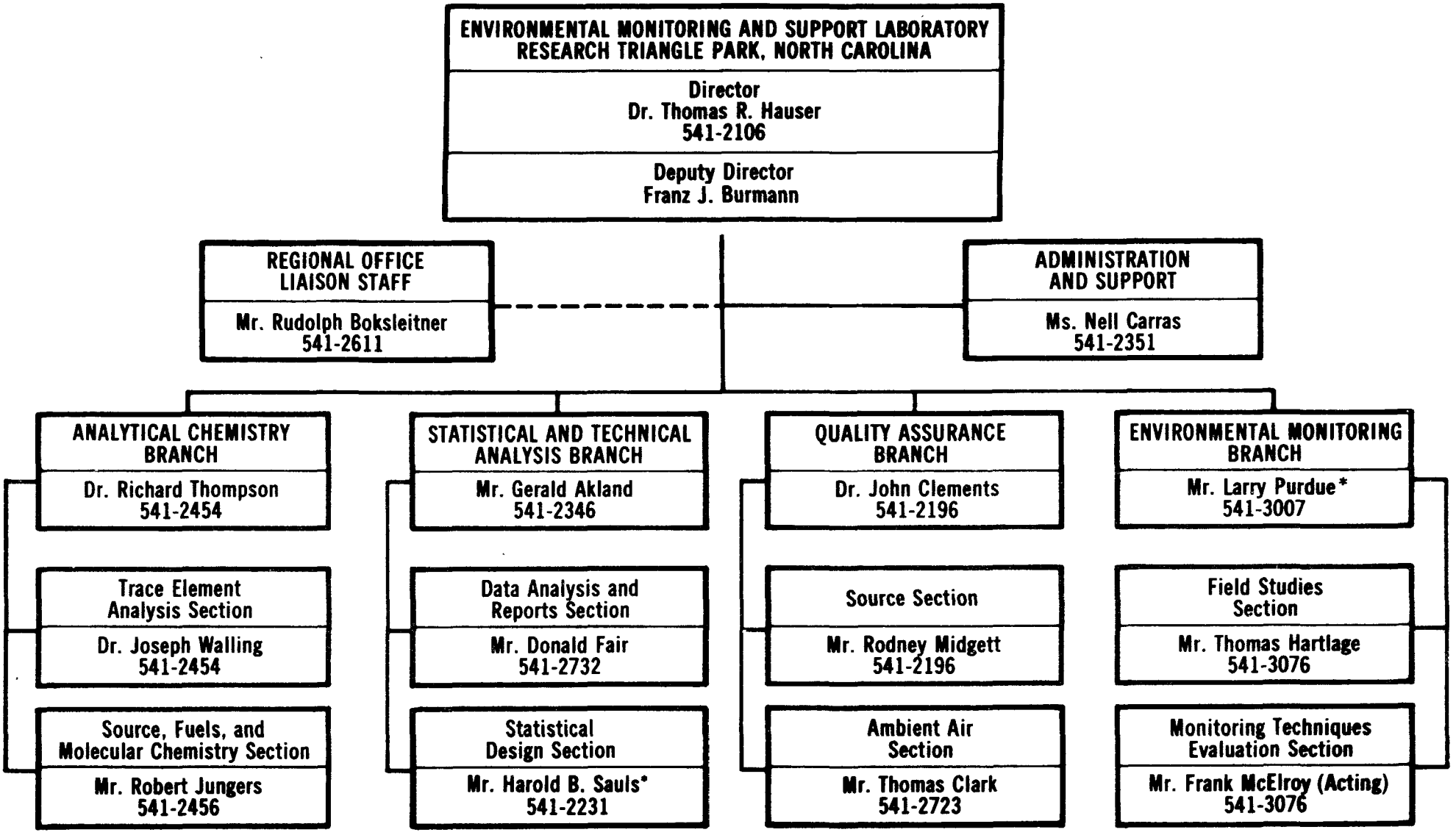
Director
Environmental Monitoring and
Support Laboratory

Research Triangle Park, N. C.

Education: Xavier University - B.S.
Xavier University - M.S.
University of Cincinnati - Ph.D.
(Environmental Engineering) 1971

Professional Experience:
Director, Environmental Monitoring and Support Laboratory, EPA, 1977-Present
Deputy Director, Environmental Monitoring and Support Laboratory, EPA, 1971-1977
Supervisory Research Chemist, Health Effects Research Program, National Air Pollution Control Administration, 1969-1971
Research Chemist, National Air Pollution Control Administration, 1958-1968
PHS Commission Corp, HEW, 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



FTS TELEPHONE NO. 629 + EXTENSION

March 1978
*Acting

HEALTH EFFECTS RESEARCH LABORATORY

CINCINNATI

OHIO

HEALTH EFFECTS RESEARCH LABORATORY

Cincinnati, Ohio

MISSION

Provide health effects data base to support regulatory activities of the Agency. Identify, characterize, and quantitiate harmful effects that may result from exposure to biological or chemical agents found in the evironment. Present these data in a form consonant with the decision-making responsibilities to Agency policy makers.

Specific activities are to:

- Conduct field and laboratory studies of the effects on human health and welfare associated with:

  - automotive emissions
  - chemical and biological contaminants in drinking water
  - pollutants in recreational and shellfish growing waters
  - pollutants emitted from wastewater-treatment plants
  - land treatment and disposal of wastewater and sludge
  - non-pesticide pollutants typically reaching man through multiple routes

- Develop models and test systems for predicting human mutagenesis and carcinogenesis.

- Prepare critical reviews of the health and environmental effects of multimedia exposure to pollutants.

- Provide technical assistance to the Office of Water Supply and Regional Offices on the health effects of water contaminants.

RESEARCH PROGRAM RESOURCE SUMMARY
($1,000's)

Program Area	FY 1977 In-House	FY 1977 Extramural	FY 1978 In-House	FY 1978 Extramural
1. Water Supply Health Effects Research	$1,878	$4,422	$2,525	$4,475
2. Pollutants Posing a Health Risk Related to Water Quality	706	1,649	670	3,190
3. Risk Assessment of Pollutants Associated with Transportation	1,101	120	1,060	120
4. Health Effects from Pollutants Associated with Energy Development	25	1,030	25	505
5. Identification of Health Effects of Non-Pesticide Substances	229	241	224	70
6. Criteria Development and Special Studies	220	205	75	125
7. Environmental Carcinogens	0	100	0	160
8. Identification of Health Effects of Toxic Substances	0	0	60	0
9. Technical Assistance	91	0	91	0
TOTAL	$4,250 (134)*	$7,767	$4,730 (154)*	$8,645

( ) Manyears
* Includes 4 MY for Technical Assistance

PERSONNEL

Total Full-Time Personnel = 108
- Professional = 75
- Non-Professional = 33

Professional Staff

Discipline	Bachelor	Master	Doctorate	Total
Biological Sciences	14	12	19	45
Chemistry	11	1	5	17
Engineering	5	4	0	9
Other	2	2	0	4
TOTAL	32	19	24	75

RESEARCH PROGRAM

1. Water Supply Health Effects Research

   - Develop scientific basis for establishing, evaluating, and revising drinking water stadnards 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 casues 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 dieseses 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 policy makers. 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, and for shellfish-growing waters.

3. Risk Assessment of Pollutants Associated with Transportation

- Assess impact on public health of use in automobiles of alternative engines, fuels, fuel additives, and emission 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 plan(with IERL-RTP), and on the health risks to people using water supplies in areas used for coal extraction.

5. Identification of Health Effects of Non-Pesticide Substances

- Assess toxicity of non-pesticide contaminants which commonly reach man through multiple routes of exposure. Emphasis is on the relative importance of different routes of exposure to metals (manganese, cadmium, mercury, rhodium, ruthenium). Research outputs are used by the Office of Toxic Substances and other program offices.

6. Criteria Development and Special Studies

- Develop criteria documents on selected pollutants or groups of pollutants. This program generates Pollutant Environmental Assessment Reports to provide predictive baseline data to the Agency on new pollutants.

7. Environmental Carcinogens

- Develop experimental animal model for rapid assessment of carcinogenic and co-carcinogenic potential and carcinogenic potency of environmental pollutants. An innovative *in vivo*/*in vitro* system for the measurement of DNA damage and repair is under development but will require extensive validation. System has potential for predicting of carcinogenicity of latency periods in different animal species, indication of target molecules and biochemical lesions, and exploration of the concepts of threshold *vs*. no-threshold.

- Assess hazards of vinyl chloride to non-worker populations. Emphasis is on transplacental carcinogenesis and the significance of cofactors in carcinogenesis.

8. 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.

RECENT ACCOMPLISHMENTS

1. Demonstrated with epidemiological and other health studies a correlation between chlorination of drinking water, production or trihalomethanes, and excess cancer incidence.

2. Investigated waterborne disease outbreaks in eleven states and Puerto Rico in collaboration with the Center for Disease Control. Several outbreaks in 1977 have been found to involve the protozoan Giardia lamblia. Findings are summarized in a continuing series of annual reviews.

3. Results of epidemiological study of aerosols from an activated sludge plant showed no significant public health effects.

4. Conducted studies involving exposure of experimental animals to diluted automobile exhaust. Results indicate platinum/palladium catalytic converter successfully reduces biological effects of exhaust emissions despite an increase in sulfuric acid emissions.

5. Determined that toxic effects can result from using alternative disinfectants to chlorine; e.g., chlorine dioxide has an effect on red blood cell survival.

6. Conducted one of the most comprehensive surveys for trace elements in drinking water ever attempted. Over 5,000 samples were collected from 120 homes and drinking water treatment plants in each of 35 geographical areas (at least one in each EPA Region). Analyses were performed for 77 elements.

7. Conducted first phase of study in Connecticut to assess toxic potential of asbestos-cement pipe used for water distribution systems. Results dispell concern that the pipe may lead to gastrointestinal tract cancer.

8. Completed 9-year study of the effects of auto exhaust exposure on beagle dogs. Irreversible physiological and pathological sequellae (emphysema) were found in the lungs.

9. With development of sensitive analytical procedure, detected number of polynuclear aromatic hydrocarbons, some known carcinogens, in representative drinking waters.

10. Laboratory has led in application of state-of-the-art glass capillary column gas chromatography -- mass spectrometry to the analysis of organics in drinking water. Analysis of a single sample resulted in identification of 468 compounds, 393 of which had not previously been detected in finished drinking water.

11. Showed that lead in Boston drinking water contributes significantly to children's blood lead levels.

12. Developed large volume water sampling technique for detecting viruses in drinking water. Following a disease outbreak in Puerto Rico, this technique was successfully applied in recovering viruses from drinking water. No viruses have been detected in the United States, based on a survey of 170 samples from 30 water supplies.

13. Established through pathological and clinical chemical studies that vinyl chloride and ethanol have a synergistic effect in the development of cancer (Hemangiosarcomas).

14. Completed case study of two open treated drinking water reservoirs. Delineated potential health effects of open storage and evaluated alternative control measures.

15. Results from evaluation of drinking water standard for nitrates indicate there is little basis for liberalizing the current standard.

16. Showed that ammonia produced endogenously in the respiratory tract is capable of neutralizing sulfuric acid in air at concentrations far in excess of those occurring under ambient conditions.

17. Complexation of manganese in drinking water with polyphosphate compounds satisfies esthetic objectives, but unless carefully controlled, may result in depletion of tissue manganese and probably other trace nutrients.

18. Developed bioassay procedures for toxicologic evaluation of emissions and effluents from major industries.

19. Published symposium proceedings, Biochemical Effects of Environmental Pollutants.

20. Completed comprehensive review of health and ecological effects of asbestos.

21. Completed 2-year summary report on biochemical effects of energy related gaseous pollutants (O_3, NO_2, and SO_2). Data show detrimental effects occurring at low levels; the effects are age related and are reduced by Vitamin E. New sensitive biochemical techniques were developed to demonstrate low-level effects.

22. Exposure of rats to lead during the neonatal developmental period has been demonstrated to lead to functional changes in the central nervous system which persist after blood lead levels have returned to normal.

23. Developed sensitive biochemical screening method using lung organ culture. Method was used to examine biochemical effects of trace metals (Hg, Cd, Ru, Cu, Zn, Pt, Pd, etc.) on collagen metabolism and pulmonary fibrosis.

24. Used reverse osmosis to obtain residual organics in sequental samples of drinking water from 5 cities representative of different sources. Samples from all the cities produced dose-related mutagensis using the Ames Salmonella strains. Mutagenic patterns showed city-specific characteristics.

25. Completed mobile-emissions animals exposure facility which is the only installation of its type in the country.

RESEARCH PROGRAM TRENDS

1. Develop new quality criteria for water reclaimed and recycled through advanced waste water treatment processes, including land treatment processes.

2. Develop health effects intelligence required to establish safe practices for land application of municipal sludge.

3. Continue effort to identify drinking water contaminants and to establish their significance as contributors to chronic disease, including cancer and cardiovascular disease, in the human population.

4. Develop rapid and simple bioassay procedures for characterization, in terms of potential health effects, of initially complex effluents and, later, finished drinking water. Parallel efforts will be required to develop concentrates which are representative of raw water.

5. Evaluate public health impact of introduction of alternative automobile engines and fuels.

6. Investigate impact on public health of substitution of fuels (e.g., coal for oil or natural gas) in power plants and industries, and of construction and operation of coal conversion plants.

7. Continue development of toxicological testing techniques for incorporation into protocols recommended for use under TSCA, etc.

FOREIGN PROGRAM

Country	Project Title	Completion Date	Amount
Egypt	Relationships of Microbial Indicators to Health Effects at Alexandria Bathing Beaches	1979	$226,000
Yugoslavia	Factors Influencing Lead Absorption from the Intestine	1976	$250,000
	Epidemiological Study of Methemoglobinemia	1976	$350,000
	Role of Silicates in the Etiopathogensis of Endem Nephorpathy	1976	$250,000
	Effect of Environmental Pollutants in Relation to Age and Dietary Influence 1. Toxic Trace Elements	1980	$175,000
	Early Neurotoxicological Effects of Environmental Exposure to Lead in Air	1976	$ 20,000
	Health Effects of Nitrates in Water	1977	$200,000
	Epidemiological Study of Disease Associated with Wastewater Sprinkler Irrigation	1979	$106,629

REGIONALLY RELATED PROJECTS

REGION I

- Connecticut - Conducted first phase study to assess toxic potential of asbestos-cement pipe used for water distribution systems. Results dispell concern that the pipe may lead to gastrointestinal tract cancer.

- Boston, Mass. - Showed that lead in drinking water contributes significantly to children's blood lead levels.

REGION II

- Puerto Rico - Developed large volume water sampling technique for detecting viruses in drinking water. Following a disease outbreak this technique was successfully applied in recovering viruses from drinking water. No viruses have been detected in the United States, based on a survey of 170 samples from 30 water supplies.

REGION III

- Completed case study of two open treated drinking water reservoirs. Delineated potential health effects of open storage and evaluated alternative control measures.

REGION V

- Results of epidemiological study of aerosols from an activated sludge plan showed no significant public health effects.

REGIONS I - X

- Conducted one of the most comprehensive surveys for trace elements in drinking water ever attempted. Over 5,000 samples were collected from 120 homes and drinking water treatment plants in each of 35 geographical areas (at least one in each EPA Region).

REGIONS I, II, III, V, VIII, X

- Investigated waterborne disease outbreaks in eleven states and Puerto Rico in collaboration with the Center for Disease Control. Several outbreaks in 1977 have been found to involve the protozoan *Giardia lamblia*. Findings are summarized in a continuing series of annual reviews.

REGIONS I, II, III, V, VIII, X

- Investigated waterborne disease outbreaks in eleven states and Puerto Rico in collaboration with the Center for Disease Control. Several outbreaks in 1977 have been found to involve the protozoan Giardia lamblia. Findings are summarized in a continuing series of annual reviews.

REGIONS III, IV, VI, VII, X

- Used reverse osmosis to obtain residual organics in sequental samples of drinking water from 5 cities representative of different sources. Samples from all the cities produced dose-related mutagenesis using the Ames Salmonella strains. Mutagenic patterns showed city-specific characteristics.

R. John Garner

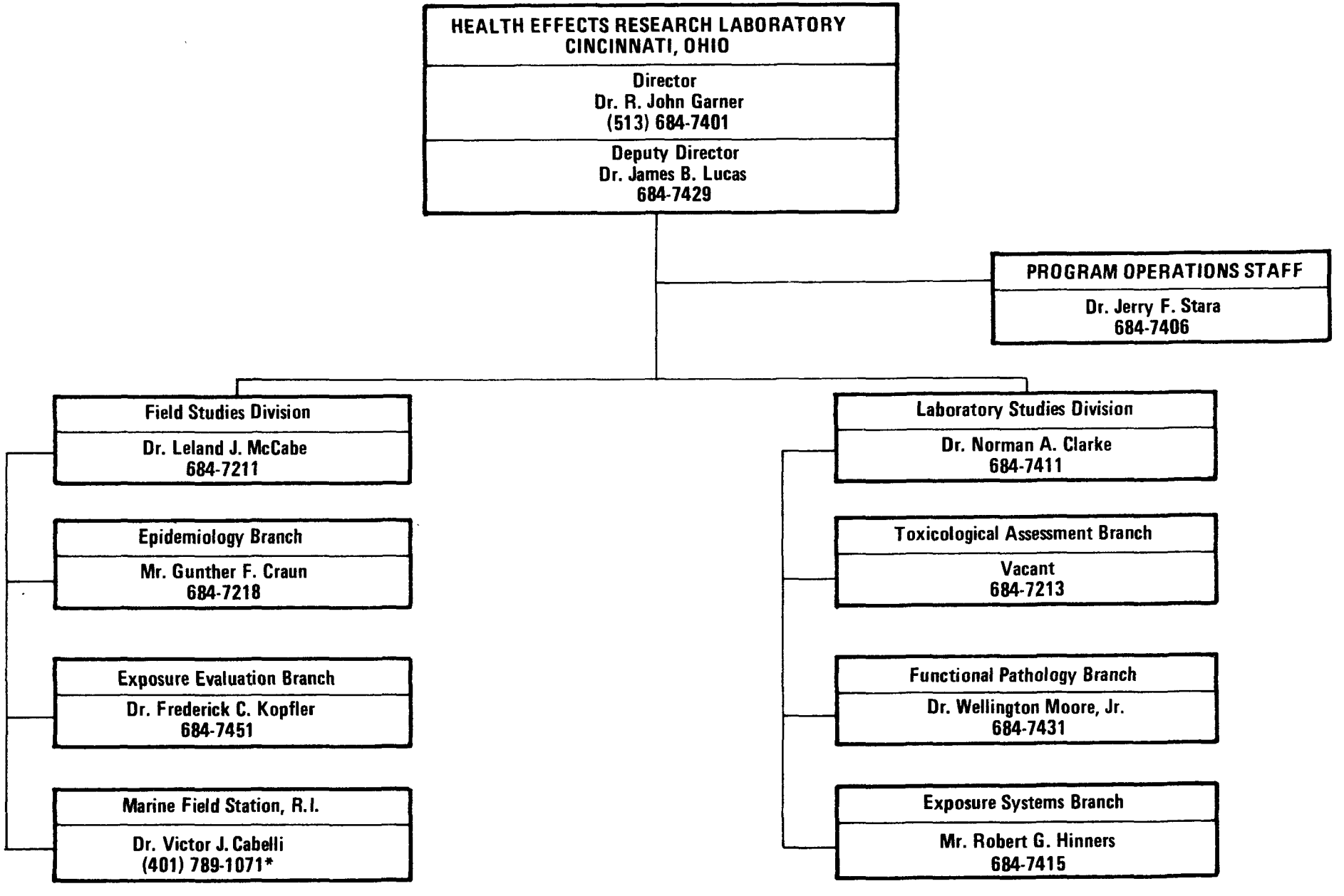
Director
Health Effects
Research Laboratory
Cincinnati

Education: Downing College, Cambridge University
B.A. (Hons.), Natural Sciences 1942
M.A. (Hons.), 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
Cincinnati, EPA, 1975-Present
Director, Experimental Biology Laboratory
Research Triangle Park, EPA, 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, United Kingdom, Atomic Energy
Authority 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



FTS TELEPHONE NO. 684 + EXTENSION

*FTS 838-4843

March 1978

MUNICIPAL ENVIRONMENTAL RESEARCH LABORATORY

CINCINNATI

OHIO

MUNICIPAL ENVIRONMENTAL RESEARCH LABORATORY

CINCINNATI, OHIO

MISSION

Develop technology, systems and processes 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, public drinking water supplies and community environmental management.

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 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.

- Assess multi-media (air, water, solid waste) environmental issues and develop methodologies for the pursuit of alternative solutions.

RESEARCH PROGRAM RESOURCES SUMMARY
($1,000's)

Program Area	FY 1977 In-House	FY 1977 Extramural	FY 1978 In-House	FY 1978 Extramural
1. Wastewater Treatment Technology	$2,937	$ 4,661	$3,000	$ 4,457
2. Water Supply Treatment and Systems Management	1,600	3,831	1,700	4,911
3. Solid and Hazardous Waste Management	662	3,244	700	6,705
4. Environmental Management	150	829	150	505
5. Urban Runoff Pollution Control	250	793	275	1,176
6. Flue Gas Cleaning Waste Disposal	0	200	0	100
7. Wastes as Fuels	0	850	0	925
TOTAL	$5,635(200)	$14,408	$5,825(200)	$18,779

( ) Manyears

PERSONNEL

Total Full-Time Personnel = 161
- Professional = 106
- Non-Professional = 55

Professional Staff

Discipline	Bachelor	Master	Doctorate	Total
Chemistry	19	5	5	29
Engineering	9	36	9	50
Physics	5	4	9	18
Other	1	4	0	5
	34	49	23	106

RESEARCH PROGRAM

1. Wastewater Treatment Technology

- 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.

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

- 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.

- Potable Water from Municipal Wastewater Effluent. Demonstrate feasibility and practicability of reusing wastewater, emphasizing direct reuse, surface and groundwater recharge, and source substitution to conserve high quality supplies.

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

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

2. Water Supply - Water 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 efforts on the water and its distribution system. Emphasis is on entiric viruses, Giardia lamblia, alternate disinfection methodology, and growth of microorganisms in storage and distribution systems.

3. Solid and Hazardous Waste Management

- Landfilling Solid Waste. Develop information on disposal site location, and design, operation, and closing 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.

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

- Recovery and Reuse of Waste Materials. Develop and evaluate applications of recovered waste materials to surmount economic and institutional barriers of technological, economic, and institutional uncertainties, and by reduction of potential risks. Technical approaches have been made to such problems as SW quantity/composition and various processing methods.

4. Environmental Management

- Comprehensive Planning. Through the Environmental Systems Analysis Program (ESA) collect technological, planning, and assessment information for regional use. Establish an ESA Region to foster integrated research by various EPA organs, and to serve as a "control test area." Prepare Environmental Management manuals and specific technological guidance to educate regional, state, and federal authorities and consultants.

- Incentive Program for Environmental Quality Management. Conduct pilot studies to evaluate the effectiveness of such a program; prepare a user handbook to summarize the results. This program includes effluent charges and permits, and product charges.

5. Urban Runoff Pollution

- Combined Sewer Overflows. Improve problem assessment techniques and determination of the relative sensitivity of various receiving waters. Obtain from other projects performance and cost data.

- Urban Stormwater Impact Quantification and Technology Development. Assess and determine relative sensitivity of various receiving waters. Evaluate low cost structural methods and non-structural management practices.

6. Flue Gas Cleaning (FGC) Waste Disposal

- Attentuation of the migration of FGC wastes on land disposal sites; evaluation of landfill liner materials; leachability studies; establishment of a data base for future development of disposal standards.

7. Wastes-As-Fuels

- Conduct pollutant studies, waste surveys, technical assistance, materials recovery, fuel and feedstock preparation, combustion and co-firing, waste co-incineration, biological conversion, and pollution controls.

RECENT ACCOMPLISHMENTS

1. Pilot plant results demonstrated Kepone can be safely destroyed with destruction efficiency routinely reaching 99.999% or greater. The technology is being used for a prototype installation at Hopewell, Virginia.

2. Prepared a comprehensive three-volume Areawide Assessment Procedures Manual to aid "208" planning agencies. Fifteen hundred copies have already been distributed to state, local, and regional planners.

3. Prepared and issued Interim Treatment Guide for Control of Chloroform and Other Trihalomethanes. It provides guidance for public water utilities to reduce trihalomethane levels in public drinking water supplies.

4. Developed inexpensive, low-maintenance regulator device for combined sewer overflows. Named Swirl, it is an effective pollution control for stormwater discharges, combined sewer overflows, and runoff from construction projects. The device also has potential for grit removal and primary treatment of dry weather flows.

5. Completed long-term studies to characterize, treat and control landfill leachate. Results show aerobic or anaerobic biological treatment processes as the most effective treatment methods for recently leaching landfills, and physical-chemical treatment for stabilized landfills or in further removing organic matter in the effluent from biological units treating leachate.

6. Compiled and published a two-volume report, The Cost of Water Supply and Water Utility Management. The report emphasizes economics of water treatment and delivery for large public water utilities throughout the Nation.

7. Demonstrated that addition of lime is effective stabilizer for raw sludge. The liming process economically produces sludge with odors controlled and pathogenic organisms attenuated for ultimate disposal. Process is useful as an alternative to digestion as a supplemental or standby system, or for upgrading an inadequate stabilization process.

8. Demonstrated that scrap tires can be processed as an additive to asphalt for highway construction and resurfacing. The studies, conducted in the States of Texas, Arkansas, Idaho, Montana, Wyoming, South Carolina and Georgia, indicate that rubberized asphalt is significantly more durable than conventional materials, and is economical.

9. Demonstrated that trihalomethanes are not produced when chlorine dioxide is used as an alternate disinfectant to chlorine, provided there is no excess chlorine present. Results show that, even if excess chlorine were present, the trihalomethane production would be less than the amount formed if chlorine were present alone.

10. Completed evaluation of facultative and aerated lagoon systems through a series of on-site field studies. Results will improve operating practices for the 4,000 lagoons existing in the United States and offer guidance to new lagoon construction.

RESEARCH PROGRAM TRENDS

1. Municipal wastewaters have changed from relatively uncomplicated discharges from households, treated effectively by conventional methods, to a complex society's discharges that contain a host of exotic metals and organic compounds. Research is needed to answer questions about the presence of toxics and metals in municipal wastewater, source determinations, capability of current treatment processes, and the development of new and effective removal processes.

2. The Resource Conservation and Recovery Act has mandated the establishment and EPA approval of solid waste management plans. Developing effective statewide plans will require research to improve the monitoring of existing sites, control technology for new landfills for prevention, containment and treatment of generated pollutants, development of site selection criteria, alternative methods to landfilling, and remedial measures to control pollutants from existing landfills.

3. The problem of the smaller water utilities complying with the "Interim Public Drinking Water Regulations" is going to be an explosive one. Many of the small communities cannot implement adequate treatment because of limited funds. We need to conduct research to develop affordable unit processes and innovative new treatment methods for the small water utility.

4. Critical reasons for additional sludge research efforts include: concern for possible adverse environmental impacts and health effects caused by past sludge disposal practices; public desire for conservation and recycling of potential resources contained in sludge; need to avoid energy-consuming sludge treatment and disposal methods. Particular needs are to develop (1) feasible means of producing sludge of biological and chemical quality that is satisfactory for unrestricted use as a soil conditioner and fertilizer, and (2) economical, effective and low-energy-consuming sludge disinfection techniques.

5. The disposal of specific hazardous compounds in an environmentally safe and cost-effective manner is an issue that requires a research solution. The need for information concerning the disposal of specific compounds is already large and will increase. The role of research will be to identify available technologies, develop new technologies, and make them available to the user community.

6. The billions of dollars being spent for the planning, construction and operation of the Nation's municipal sewage treatment plants do not provide maximum payoff because many plants are performing ineffectively. A greater research effort must be mounted to increase performance efficiency, primarily through operator training in relation to process control and adequate design.

7. There is a growing concern for the potential health impacts from the use of chlorine to disinfect water supplies and wastewater containing a variety of organic materials. The public and the Regions are asking for convincing evidence, on full-scale studies, that alternatives to chlorine, such as ozone and ultraviolet light, are environmentally acceptable and cost-effective.

8. The water supply distribution system, engineered and constructed to protect drinking water as it moves from the plant to the consumer, is sometimes a source of contamination. Additional research is needed to prevent lead dissolution in older distribution systems, and for further identification and control of leachates from plastic pipe and common plumbing.

9. Pollution from urban runoff will require a massive financial commitment to control if present high structural cost methods are utilized. A substantial research effort to examine low structural cost methods and management practice alternatives is necessary to reduce the potential pollution control costs to a scale more economically acceptable to the Nation.

10. While water quality is the major water issue in many parts of the Nation, some areas are drought-stricken and/or water short. For those areas where the issue is the availability of water, there is a need to research and promote effective conservation measures. Non-potable source substitution, in particular, appears to have potential for significant impact on the problem but requires additional investigation and demonstration.

FOREIGN PROGRAM

Country	Project Title	Completion Date	Amount
Canada	Participation in Research Advisory Board, International Joint Commission on the Great Lakes	1979	N/A
France	Participation in Organization for Economic Cooperation and Development (OECD) Activities (Management Panel on Specific Water Pollutants and Control Technology)	1977	N/A
Japan	US/Japan Cooperative Studies on Sewage Treatment Technology	Ongoing	N/A
Public Law 480 Projects:			
Poland	Investigations of Biodegradability and Toxicity of Organic Compounds	1978	$230,000
Poland	Water Renovation Processes of Biologically Treated Sewage (Final Report Pending)	1977	$ 63,500
Committee on the Challenges to Modern Society:			
Belgium	Pilot Study on Drinking Water Supply Studies	1979	N/A
England	Advanced Wastewater Treatment Group	1978	N/A

REGIONALLY RELATED PROJECTS

REGION I

- Manchester, N. H. - Project to reactivate granual activated carbon beds and treatment to remove organics. Results will be applied nationally for our water supply organics efforts.

- Lawrence, Mass. - Improve methods for removing organics from drinking water.

- Falmouth, Maine - Pilot test of alternatives for treating and disposing of septage (waste removed from septic tanks).

- University of Lowell, Mass. - Evaluate disposal of septage in municipal treatment facilities.

REGION II

- East Bergen County, N. J. - First site in the United States to install an ultraviolet system for disinfection of the entire wastewater treatment plant flow.

- Edgewater, N. J. - Project has provided experience on converting a primry wastewater treatment facility to secondary treatment by installation of rotating biological contactors in existing tankage.

REGION III

- Beltsville, Md. - Developed and demonstrated the composting of sewage sludge. Project is especially relevant to Region III because of constraints imposed on alternative treatment and disposal methods. This method is relevant to other regions with limited land available for landfilling or landspreading or with strict air quality standards.

- Hopewell, Va. - Successfully demonstrated a pilot scale thermal destruction technique to destroy Kepone in an environmentally acceptable manner. The Kepone is stored in large amounts and also intermixed in thousands of tons of sewage sludge. The State of Virginia will use the technique to design and build an incinerator to handle the problem.

REGION IV

- Hillsborough County and Sarasota County, Fla. - Research on multi-stage nitrogen and phosporus control treatment plants has shown that rigid State effluent standards can be achieved.

- Miami, Fla. - Determine the effects of various types of effluents on marine life, using marine bioassay techniques. The information and methodology developed will be useful in formulating policy on the quality of wastewater discharged to the open ocean.

REGION V

- Muskegon County, Mich. - Developed solution for renovation of wastewater through a very cost effective operational system. The land treatment system has nearly eliminated industrial and municipal pollutants from the twenty seven million gallons of wastewater treated each day. Benefits have been cleaner lakes and streams, and bountiful corn crops grown on previously unproductive land.

- Pewaukee, Wisc. - Demonstrated that rotating biological contactors can provide acceptable process efficiency to meet federal secondary standards at a savings in power costs.

REGION VI

- New Orleans and Jefferson Parish, La. - Conduct research to produce effective and economically attractive systems and methods to remove trace organic materials from water supply sources. Both granular and powdered activated carbon are being used for removal.

REGION VII

- Ames, Iowa - Energy recovery from solid waste looms as an important technique, not only from the standpoint of the ultimate disposal of wastes, but also as an energy resource recovery system. Evaluate the impacts of refuse-derived fuel in both stoker-boilers and a tangentially fired boiler. Focus is not only on emission problems, but also on corrosion, burnout, boiler operation, and trace element measurement.

- University of Kansas, Iowa - Conducted pilot studies on the rock filter method for improving lagoon effluent. Lagoon treatment of municipal wastewaters is common in Region VII and solids discharge from many lagoons is often excessive. This research has led to several large-scale installations now being monitored.

REGION VIII

- Upper Thompson Sanitation District, Colo. - Sewage treatment plant, employing advanced waste treatment, is providing excellent data on the use of ozone for effluent disinfection. Data include solutions to operational problems, equipment selection and documented costs.

- Logan, Utah - Research performed at the wastewater lagoon system have provided data on lagoon performance and the results of a variety of upgrading techniques.

REGION IX

- Orange County, Calif. - Conduct studies which monitor a 15 mgd municipal wastewater treatment system to establish systems performance and reliability for injection of effluent to replenish ground water supplies. Ground water injection and recharge is of primary importance to drought-stricken areas of Region IX, and is also important to other areas including Nassau County, N. Y. and the greater Chicago, Ill. area.

REGION X

- Bend, Ore. - Evaluate vacuum and pressure sewers as alternatives to gravity sewers. Because these novel systems require narrower trenches for installation than conventional systems and do not require constant slope, they have a potential for significantly reduced installation costs.

- Seattle, Wash. - Demonstrated feasibility of utilizing liquid and dewatered sludge for established forest fertilization or reforestation. The potential use of forests for sludge disposal is not limited to the Northwest.

FRANCIS T. MAYO

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Professional Experience:
Director, Municipal Environmental Research Laboratory, 1976-Present
Regional Administrator, Region V
USEPA
1970-1976
Director, Division of Planning and Interagency Programs, FWQA
1968-1970
Regional Enforcement Representative
San Francisco Regional Office, FWPCA
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, IJC
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
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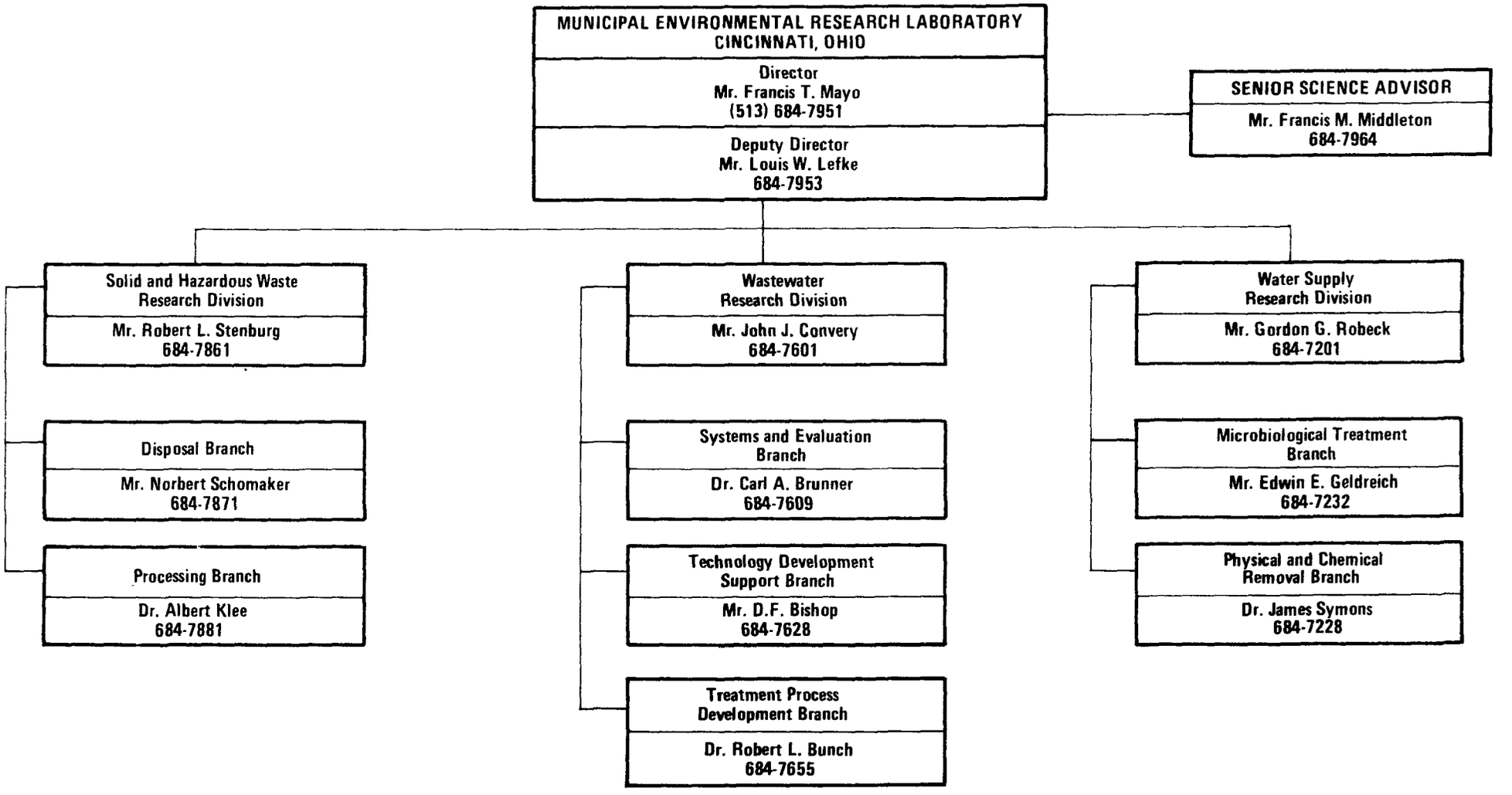

FTS TELEPHONE NO. 684 + EXTENSION

March 1978

INDUSTRIAL ENVIRONMENTAL RESEARCH LABORATORY

CINCINNATI

OHIO

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CINCINNATI, OHIO

MISSION

Develop cost effect 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 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.

RESEARCH PROGRAM RESOURCES SUMMARY
($1,000's)

Program Area	FY 1977 In-House	FY 1977 Extramural	FY 1978 In-House	FY 1978 Extramural
1. Environmental Aspects of Energy Conservation and Advanced Energy Systems	$ 600	$ 4,361	$ 678	$ 4,047
2. Energy Resource Extraction and Handling, Solid Fossil Fuels	637	2,731	773	2,627
3. Materials Processing	830	2,389	1,095	2,135
4. Energy Resource Extraction and Handling, Oil and Gas Production	395	1,715	603	1,667
5. Materials Production	378	924	359	1,421
6. Energy Control Technology-Fuel Processing	197	678	188	1,552
7. Hazardous Material Incidents	445	1,441	408	1,192
8. Energy Integrated Assessment	0	400	0	400
TOTAL	$3,482(83)	$14,621	$4,104(79)	$15,042

( ) Manyears

PERSONNEL

Total Full-time EPA Personnel = 79

- Professional = 55
- Non-Professional = 24

Professional Staff

Discipline	Bachelor	Master	Doctorate	Total
Chemistry	5	1	3	9
Engineering	18	17	6	41
Other	0	4	1	5
TOTAL	23	22	10	55

RESEARCH PROGRAM

1. Environmental Aspects of Energy Conservation 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.

2. Energy Resource Extraction and Handling, Solid Fossil Fuels

   - Assess multi-media environmental damages from active and abandoned mining operation, transportation, and beneficiation processes. Develop and demonstrate economic pollution control technology for these operations.

3. Materials Processing

   - Develop and demonstrate technology necessary to eliminate the discharge/emissions of all pollutants (with special emphasis on toxic pollutants) from the materials processing industry point sources. Included are industries involved in the production of machinery, transportation equipment, metal finishing and fabricating; inorganic chemicals and products; pulp, paper, wood products, food products, rubber, plastics, other organic chemicals and asphalt manufacturing and paving; and miscellaneous industries such as laundries.

4. Energy Resource Extraction and Handling, Oil and Gas Production

   - Assess adverse multi-media environmental impacts from oil and gas production, storage and transportation facilities; develop and demonstrate economic pollution control technology for these operations.

5. Materials Production

   - Develop manuals of practice (MOPs, best state of the art) to prevent and/or control environmental damage from the materials production industries (mining, smelting and refining of non-ferrous metals, mining and beneficiation of materials used in construction, in chemical fertilizers and in clay, ceramic and refractory products. These manuals will address the simultaneous control of air, water, land, and noise pollution and the environmentally acceptable recovery and utilization of industrial residues from these sources and will be in a form that meets the operational needs of both regulatory/enforcement agencies and industry. Various MOPs representing various stages of technology development will be required for each priority industry to be considered.

6. Energy Control Technology

- Identify and quantify environmental discharges from processes under development to evaluate alternative means of controlling these pollutants and to develop and demonstrate cost-effective control methods. Included are the oil shale, synthetic fuels from non-coal sources, and in situ coal gasification industries.

7. Hazardous Material Incidents

- Develop, and demonstrate new or improved equipment, and systems for the prevention, detection, identification, containment, control, removal, cleanup, recovery and disposal of spills or acute releases of toxic and hazardous substances. Define techniques for redevelopment and restoration of ecosystems that have been biologically damaged as a result of spills; assess the damages that have occurred. Determine the ecological effects and persistency of high concentration, short duration slugs (non-continuous discharges) of hazardous substances on the environment. (A special category of this program focuses on R&D technical assistance to Federal, State and local personnel for emergency spill response.)

8. Energy Integrated Assessment

- Identify environmentally, socially, and economically acceptable alternatives for energy development in the Appalachian Region. Achieve this by integrating results from two research areas -- socio-economic and environmental -- and from research on cost/benefit/risk evaluation and energy policy implementation.

RECENT ACCOMPLISHMENTS

1. Erosion and Sediment Control Manual - Provides an understanding of 1) the mechanics of soil erosion and sedimentation and the physical factors which determine the nature and extent of these processes; 2) erosion and sediment control rationale; and 3) basic control information concerning the design, construction, and utilization of control structures. Have distributed over 10,000 copies. Soil Conservation Service has furnished copies to their personnel in coal states and is using it as a training manual. Several state control agencies and technical colleges have adopted it as a textbook.

2. Organic and Inorganic Industrial-Chemical Data Bases - Developed computerized multi-media data bases on the production of the most important U. S. chemicals. The organics data program is a matrix of more than 400 petrochemical and intermediate-organic-chemical processes, representing more than 90% of the U. S. production of organic chemicals. The inorganic-data program includes 113 inorganic chemicals and their process flowsheets.

3. Trace Element Emissions Testing - Evaluating effectiveness of electrostatic precipitator designs and operating practices as applied to particulate emissions control in the non-ferrous metals production industry. Test results show that volatile trace elements, particularly arsenic, are not well controlled by hot ESP's.

4. Asbestos Emissions Control Options - Reviewed emissions control options used in other industries to determine potential options for reducing asbestos emissions. Completed and verified engineering estimates of the potential reduction of asbestos emissions for each option. Results are the groundwork for the utilization of these options by industry for control of asbestos emissions.

5. Hazard, Kentucky Conference - Cooperated with Region IV in presenting "Conference on Practical Aspects of Coal Mining Pollution Control." Conference was attended by more than 150 mine operators, state enforcement personnel, environmentalists and students.

6. User Manual on the Prevention and Control of Hazardous Material Spills Manual encompasses the state of the art/best practical technology for use by first-on-scene personnel for chemical spill control and cleanup.

7. Pollution Control Guidance Document for Geothermal Development - (Document based on need expressed by ERDA and the Interagency Geothermal Coordinating Council). Report describes environmental implications of geothermal development and presents preliminary guidance for anticipated multi-media environmental regulatory

requirements for new and expanding geothermal facilities in the United States. With concurrence of EPA Program Offices, the Document will accelerate environmentally-safe geothermal development by reducing uncertainty faced by geothermal developers regarding environmental restrictions. This approach, involving interagency acceptance of a preliminary regulatory course, is of major significance since it is adaptable to many emerging energy technologies.

8. Gelling Agent System for Hazardous Spills - Demonstrated trailer-mounted multi-purpose gelling agent system which pneumatically delivers the gel up to 200 feet through 2-inch hose at a rate of 50 lb/min. System immobilizes a variety of spilled hazardous liquids and prevents their penetration through the soil into ground water supplies. Delivered system to the Environmental Emergency Response Unit.

9. Foam Dike Backpack - Commercial Model - Research efforts resulted in commercial development of the foam dike backpack. Unit is used to halt the spread of spilling hazardous material by generating a polyurethane foam dike ahead of the flow. Unit can also cover sewer gratings to prevent spilled material from entering sewer lines.

10. Detection Kit for Hazardous Spills - Demonstrated two prototype, portable spill detection kits. Spill response personnel will use this type kit to detect and monitor location of chemical spills into waterbodies when the identity of the spilled material is known. Additional kits have been ordered for "Use Testing" by the Regional Offices. A supplementary identification kit will permit identification of unknown compounds, which can then be more simply followed (traced) by the detection kit.

11. Evaluation of Environmental Aspects of Industrial Process Changes for Energy Conservation - Completed study of environmental pros and cons of energy conservation related process changes within the 13 most energy-intensive U. S. industries. The study documents: (a) potential regulatory needs for EPA, (b) energy/environmental impacts for industrial and other Government users, and (c) suggested areas of concentration for environmental research programs.

12. Analysis of Toxic Compounds from Pulping and Bleaching Wastes - Analyzed effluents from 15 different pulp and paper mills for compounds known to be toxic to fish. Results show that existing waste treatment plants are capable of significantly reducing the concentration of those compounds. Also shown is that membrane processes, such as reverse osmosis and ultrafiltration, are capable of concentrating portions of most of these compounds prior to discharge. This information documents existing levels of non-criteria acutely toxic compounds.

13. 1977 National Oil Spill Conference - Conducted 5th National Conference (New Orleans, March 8-10, 1977) attended by over 1200 individuals representing 15 nations. A total of 130 technical papers were presented. 75 companies were represented at the technical exhibit.

14. Tank Truck Cleaning - Demonstrated full-scale process for the treatment of wastewaters generated during the internal washing of tank trucks. Determined economics and effectiveness of each unit operation. Results will provide essential input for development of Best Available Technology for the chemical transportation industry.

15. Environmental Evaluations of Waste-as-Fuel Processes - Conducted process and emission testing at several facilities to delineate specific requirements for control techniques being assessed for commercial waste-as-fuel facilities. Most comprehensive are those involving co-firing of processed municipal waste with coal; e.g. those at Ames, Io; St. Louis, Mo; Columbus, Oh; and Hagerstown, Md. Conducted additional emission tests on a wood waste co-combustion with coal process (Rolla, Mo.), on a waste processing plant (Houston), on the Union Carbide "Purox" Pyrolysis Plant (South Charleston, W.V.).

16. User Manual for Land Disposal of Oily Debris - Describes environmentally acceptable techniques for disposing of oil contaminated debris on land (for spill response personnel). Manual contains a rationale for selecting the most appropriate disposal method in any particular situation. A short summary film accompanies the manual.

17. Acid Mine Drainage Model - Developed mathematical model to optimize allocation of resources for reclaiming areas disrupted by abandoned mines. Model will assist Office of Surface Mining and the states to effectively plan the use of an estimated $330 million/year under the "Surface Mining Control and Reclamation Act of 1977" for the reclamation of abandoned mines.

18. Closed Process Water Loop in NSSC Corrugating Medium Manufacture - Demonstrated feasibility of eliminating discharges from NSSC corrugating mills by the use of reverse osmosis. Also showed that NSSC mills can attain BPT without external treatment.

19. Glass Emissions Testing - Completed an extensive emissions testing program for glass furnaces which provides an accurate characterization of gas stream constituents. Conducting demonstration of the feasibility of reduced energy consumption accompanied by decreased emissions.

20. Oil Shale Retorting, In-Situ Coal Gasification Processes Studied and Tested - Assessed environmental impacts of oil shale development. Findings indicate that available control techniques should solve some of the emerging industry's problems; e.g., clean-up of sulfur compounds in off-gas streams, but that some areas still need attention, e.g., storage disposal of spent shale. Conducted field sampling of emissions at the Paraho Oil Shale Project Pilot Plant at Anvil Points, Colorado.

21. The Eighth National Symposium on Food Processing Wastes - Co-sponsored symposium (Seattle, Washington, March 29 - April 9) for 200 people, including representatives from several foreign countries, Federal agencies and numerous industry and university personnel.

RESEARCH PROGRAM TRENDS

1. Shift in emphasis in mining pollution control and mine reclamation toward oil shale development and uranium mining. Slight reductions in the coal mining related efforts will compensate for this shift.

2. Orientation of all mining-related research to support and clarify new federal surface mining law, P.L. 95-87. Programs in technology assessment and abandoned mine pollution control will increase immediately to provide information required by the Act if support from Office of Surface Mining is forthcoming.

3. Continued increase in assessment and demonstration work for western mines, including treatment options for nonacid mine drainage. This shift will be at the expense of the demonstration projects previously carried out in support of eastern surface mining problems. Also, will continue de-emphasis of treatment methods for acid mine drainage.

4. Increased emphasis on oil spill recovery under cold weather conditions. Recent experience indicates complete lack of response capability in winter for areas such as the Hudson River and Buzzards Bay, Massachusetts.

5. Greater emphasis on shoreline protection as a result of tremendous escalation in cleanup costs. The St. Lawrence River oil spill cleanup costs exceeded $8 million primarily due to shoreline contamination.

6. Greater emphasis on economics of environmental damage from spills due to pending passage of $200 million spill liability and compensation fund. Fund will allow claims for ecosystem restoration.

7. Greater emphasis on offshore oil and gas development and resulting onshore impacts as new frontier fields are explored and developed.

8. Renewed emphasis on environmental impacts from advanced oil and gas recovery, especially on air and groundwater.

9. Substitution by our Laboratories of commonly handled solvents and other reagents now suspected carcinogens with safer materials. Substantial analytical methodology revisions are required.

10. Greater demand for spill cleanup and restoration techniques upon promulgation of hazardous material designation regulations. This demand should plateau as spillers recognize that cost of cleanup is much greater than good programs for spill prevention.

11. Increased level of technical assistance as a result of the continuing use of the Environmental Emergency Response Unit. Areas requiring such expertise include: evaluating prototype spill control devices for field use (during next three years over 40 separate devices will be evaluated and field-tested) and Agency response to toxic-and-hazardous-substance related incidents.

12. Present air and water pollution control technology development programs for waste-to-energy processes are expected to demonstrate pollutant removal capabilities of various control methods. Similar programs for leading oil shale processes are expected to be initiated as a result of FY-78 funding.

13. Emphasis on RD&D of control and treatment technology for "second generation" multi-media pollutants, such as arsenic, cadmium, specific organics, etc.

14. Greater participation of ORD with regulatory and enforcement programs, and with the Department of Energy, in developing environmental standards for new energy technologies.

15. More direct interface with industry in response to the President's Directive to develop joint research efforts with industry to solve difficult industrial pollution problems.

16. Greater emphasis on identifying and controlling toxic and hazardous pollutants for industrial sources.

FOREIGN PROGRAM

Country	Project Title	Completion Date	Amount
Canada	Chemical Toxicity Assay for Pulp Mill Effluents	1978	$144,600
Egypt	Water Renovation and Reuse in Poultry Processing	1980	$ 2,500
Pakistan	Evaluation of Industrial Waste Problems of Kala Shah Kaku, Muridke and Mandiali, Pakistan	1980	-0-
Poland	Optimization of Air Pollution Control From Copper Converters	1979	$ 20,000
	Studies of Treatment Methods for Wastewater Discharges for Coal Mines	1978	-0-
	Purification of Waters from Strip Lignite Mines	1978	$ 500
U.S.S.R.	Study of Procedures for Evaluating the Effectiveness of Oil Spill Dispersing Agents	1978	$ 5,400
Yugoslavia	High Temperature Gas Purification in Non-Ferrous Metallurgy	1980	$ 15,000

REGIONALLY RELATED PROJECTS

REGION I

- Electrochemical Treatment of Seafood Processing Wastewater - Demonstrated waste treatment efficiency, costs and applicability of a coagulation electrical purification system for fish and seafood processing plants. (Project was set up by New England Fisheries Steering Committee).

- Technical Assistance - Argo Merchant Oil Spill, Nantucket Island, Massachusetts; Barge F.E. Bauchard Oil Spill, Buzzards Bay, Massachusetts.

REGION II

- Asbestos and Indoor Air Quality - Evaluate the impact of asbestos ceiling coatings on indoor air quality.

- Technical Assistance - Mixed Chemical Waste Incident, Oswego, New York; Welland Tank Farm Oil Spill, Hackensack Meadows, Hackensack, New Jersey; No. 6 Fuel Oil Spill, St. Lawrence River, New York.

REGION III

- Elkins Project - Evaluate effectiveness of various surface and underground pollution control options and reclamation techniques.

- Technical Assistance - Kepone Incident, Hopewell, Virginia; Pentachlorophenol (PCP) Contamination, Haverford, Pennsylvania.

REGION IV

- Textile Industry Hyperfiltration of Hot Dye Waste - Evaluate (with DOE and IERL-RTP) feasibility of recovering heat, chemicals, and water from the textile industry.

- Technical Assistance - Mixed Chemical Waste Spill, Kernersville, North Carolina; Review Construction Plans for a Lead Smelter in Alabama and a Primary Zinc Smelter in Tennessee; Diesel Oil Spill, Tampa Bay, Florida.

REGION V

- Technical Assistance - Technical Assistance Regarding Two Metal Finishing Plants in Ohio.

REGION VI

- Assessment of Uranium Mining - Assess surface and groundwater pollution potential of surface uranium mines in the area.

REGION VII

- Wilton, Maine - Solar-Assisted Wastewater Treatment Plant - Evaluate (with DOE and MERL-Cinn.) the impact of using solar energy to heat an anaerobic digester. Results are also meaningful to Regions IV and IX.

- Technical Assistance - Mixed Chemical Waste Incident, Dittmer, Missouri.

REGION VIII

- Sampling and Analysis Research Program at the Paraho Oil Shale Demonstration Plant - Characterize pollution load from a major oil shale process currently under development. The Paraho Demonstration Plant was tested in early 1976 and will be tested again in a different mode of operation in late 1977.

- Montana, North Dakota, and Wyoming - Revegetation Efforts in the Northern Great Plains - Compare various surface and top soil configurations in practicality and success for reclaiming spoils in the semi-arid mined regions.

REGION IX

- Trace Element Emissions Testing - Evaluate effectiveness of electrostatic precipitator designs and operating practices as applied to particulate emissions control in the non-ferrous metals production industry. Test results show that volatile trace elements, particularly arsenic, are not well controlled by hot ESP's.

- Mobile Pyrolysis of Agricultural and Industrial Wastes - Investigate the pyrolytic conversion of various agricultural, forestry, and wood products industry wastes to transportable fuels such as fuel oil and char by utilization of a mobile unit which will take the pyrolytic converter (reactor) to various sites where waste has been accumulated. Results are of interest to all Regions.

- Technical Assistance - Oil Spill - Midway Island.

REGION X

- Impact of Solar and Conservation Technologies on Ambient Air Quality - Project impact of solar and conservation technology in selected AQCR's on the ambient air quality. Assess conservation in selected industries needed to support the AQCR studies and waste heat utilization technologies. Results are of interest to all Regions.

- Technical Assistance - PCB Spill, Seattle, Washington; Provide Expert Testimony Concerning the Bunker Hill Lead and Zinc Smelter in Region X.

REGIONS I-X

- Organic and Inorganic Industrial-Chemical Data Bases - Developed computerized multi-media data bases on the production of the most important U. S. chemicals. These and other planned data bases will allow the Agency to initiate better-focused, more-timely RD&D programs; to develop and enforce regulations more efficiently; and to better evaluate industry suggestions.

- Pollutant Characterization of Waste-as-Fuel Processes - Assess environmental implications of the major waste-to-energy process by conducting actual field/print monitoring tests.

REGIONS I, IV, and X

- Workshops - Onshore Impacts of Offshore Development - Presented six workshops (Newport, RI; Ocean City, Ma; Savannah, Ga; Otter Crest, Or; Biloxi, Miss; Anchorage, Alas.) to acquaint Regional, state and local planning officials with methodology for identifying social, economic and environmental offshore impacts of outer continental shelf petroleum development, and for siting onshore facilities associated with that development.

REGIONS II and III

- Glass Furnace Preheating with Emission Gases - Evaluating concept of preheating the glass furnace with emission gases. Preheating step will conserve energy and solve some of the pollution control problems associated with direct release of furnace emission gases.

REGIONS II, III, IV, and V

- Appalachia - Technology Assessment of Energy Development - Examine range of impacts associated with energy development in the 13-state Appalachian Region to the year 2000. Focus is on the options for managing impacts on social, economic, environmental, political and institutional life of the Region.

REGIONS III and IV

- West Virginia, Kentucky - Head of Hollow Fill - Examination of the new mining technologies of hollow fill and mountain-top removal.

REGIONS, III, IV, and V

- Feasibility of Dry Quenching of Coke for the Steel Industry - Cooperative effort among DOE, IERL-RTP, and IERL-Ci to develop a design for dry quenching of coke. This process will eliminate water pollution problems of conventional process and save energy.

- Acid Mine Drainage Treatment Options - Studies document effectiveness and full scale operability for treating typical acid mine drainage discharges from eastern coal mines.

REGIONS III, V, VIII, and IX

- Assessment of Coal Transportation - Investigate environmental impacts of various modes of coal transportation. Major considerations are right-of-way damages, spillage problems, and energy effectiveness of truck, rail, barge conveyor and pipeline transport systems.

REGIONS IV and VI

- Environmental Assessment of Geopressured Resources - Investigated deep geopressured reservoirs along the Texas and Louisiana Gulf Coast. These waters appear cleaner than other geothermal sources, and subsidence is expected to be the major environmental problem.

REGIONS VIII and IX

- Geothermal Assessment and Evaluation Activities - Following projects address environmental implications of geothermal energy development:

  - Assessment of Geothermal Environmental Regulations, Pollution and Potential for Development
  - Geothermal Field Site and Control Technology Study
  - Geothermal Pollution Control Guidance Document
  - Geothermal High Temperature Aqueous Chemistry
  - Geothermal Air Emissions Characterization
  - Geothermal Ponding Study
  - Contamination of Groundwater Resulting from Geothermal Energy Development
  - Cost of Geothermal Pollution Control
  - Demonstration of Hydrogen Sulfide Remove Technology

DAVID G. STEPHAN

Director
Industrial Environmental
Research Laboratory
Cincinnati

and

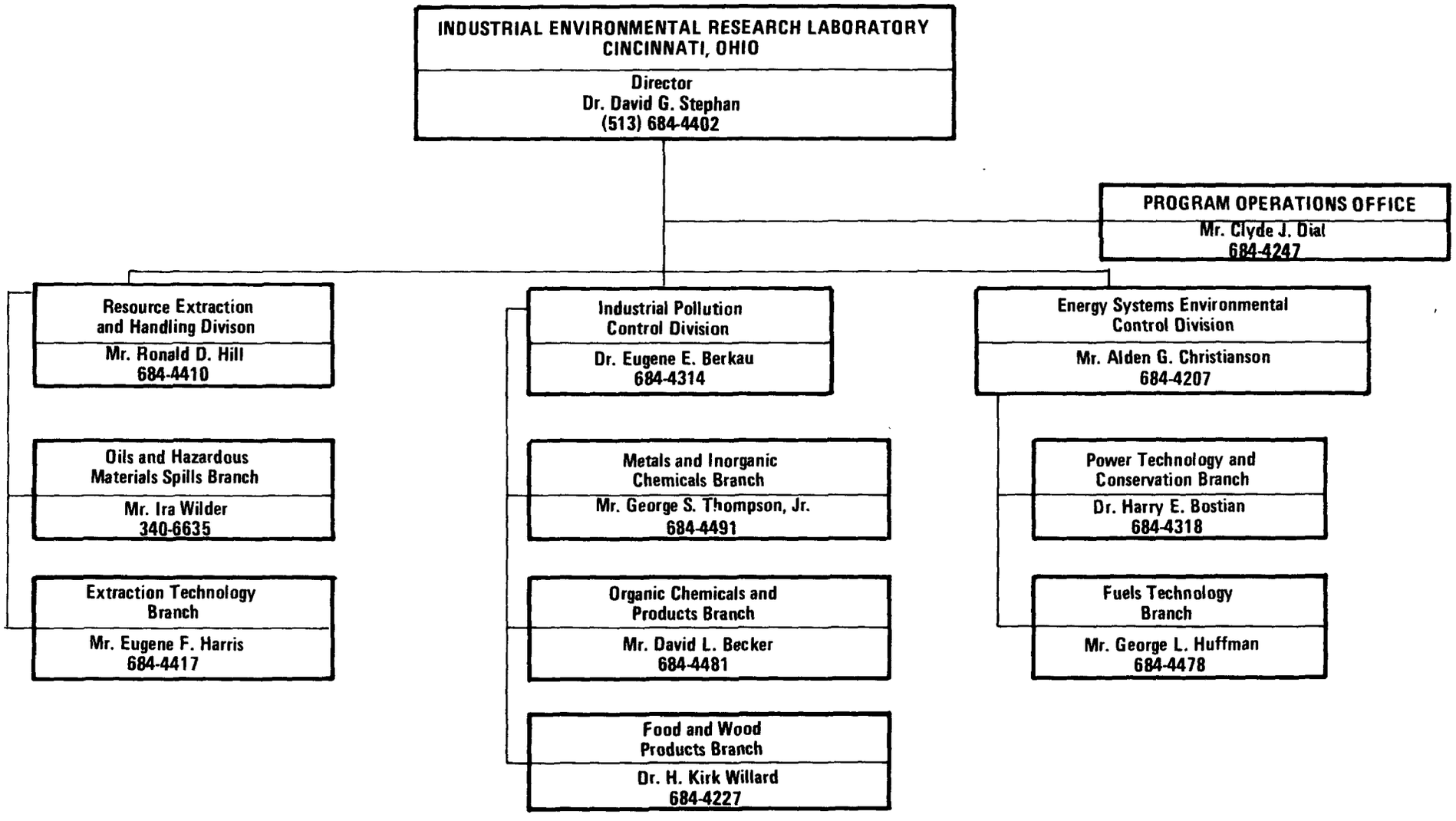
Senior Office of
Research and Development Official
Cincinnati, Ohio

Education: Ohio State University, Columbus, Ohio - B.S.
Ohio State University, Columbus, Ohio - M.S.
Ohio State University, Columbus, Ohio - Ph.D. (Chemical Engineering) 1955

Professional Experience:
- Director, Industrial Environmental Research Laboratory, Cincinnati, and Senior Official for Research and Development, 1975 - Present
- Director, Office of Program Management, Office of Research and Development, EPA, 1971-1975
- Assistant Commissioner for Research and Development, Federal Water Quality Administration, 1968-1970
- Director, Division of Research, Federal Water Pollution Control Administration, 1966-1968
- Deputy Chief, Basic and Applied Sciences Branch, Division of Water Supply and Pollution Control, PHS, 1965-1966
- Deputy Chief, Advanced Waste Treatment Research Program, PHS, 1960-1965
- Chief, Air Pollution Control Equipment Research, PHS, 1956-1959
- Technologist, National Lead Company of Ohio, 1955
- Research Associate, Battelle Memorial Institute 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: Diplomate
American Academy of Environmental Engineers
Registered Professional Engineer
Superior Service Award for Meritorious Achievement,
U.S. DHEW (April 1965)
Distinguished Alumnus-College of Engineering,
Ohio State University (March 1970)



FTS TELEPHONE NO. 684 + EXTENSION

March 1978

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY

CINCINNATI

OHIO

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 micro-organisms 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.

- Develop 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. These materials are 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.

RESEARCH PROGRAM RESOURCE SUMMARY

($1,000's)

	Program Area	FY-77 In-house	FY-77 Extramural	FY-78 In-house	FY-78 Extramural
1.	Monitoring Systems	905	1,276	1,504	200
2.	Quality Assurance	1,226	931	1,103	1,191
3.	Identification of Viruses	357	193	0	0
4.	Technical Support	160	0	20	80
5.	Water Supply	0	200	0	200
6.	Energy	0	205	0	405
7.	Effluent Standards	0	400	0	0
8.	Land Application	0	0	0	150
9.	Technical Support--Interdisciplinary	0	0	60	0
10.	Toxic Substances	0	0	90	0
11.	Toxic Substances--Technical Support	0	0	60	0
	TOTAL	2,648 (70)	3,205	2,837 (70)	2,226

PERSONNEL

Total Full-time EPA Personnel = 70

- Professional = 47
- Non-Professional = 23

Professional Staff

	Bachelor	Master	Doctorate	Total
Biology	2	7	6	15
Business	0	1	0	1
Chemistry	15	5	4	24
Engineering	2	4	0	6
Mathematics	0	1	0	1
	19	18	10	47

RESEARCH PROGRAM

1. Methods and Monitoring Techniques Development

- 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.

2. Quality Assurance

- Develop and distribute quality control check samples and materials needed to support the Consent Decree, water quality National Pollutant Discharge Elimination System (NPDES), water supply standards, 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 water supply and NPDES program laboratories.

- Evaluate performance of laboratories making waste measurements under NPDES, ambient water monitoring, and water supply examinations. Conduct collaborative studies to validate EPA's chemical, biological, and microbiological methods for waste discharges (NPDES), the Consent Decree, water supply standards, ambient monitoring, research and energy programs.

- 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 single-laboratory and multi-laboratory investigations and evaluations of field instrumentation systems for continuous measurement of water and wastes to determine utility of those instrumentation systems for regulatory or surveillance field application.

- 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.

3. Identification of Viruses

- Develop and identify standardized methodology by which waters may be sampled for small numbers of viruses. Establish procedures for transport of processed samples from on-site tests to the laboratory. Devise test systems for determining the extent to which enteroviruses reversibly bind to sludges, feces, and other solids in water and the 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.

4. Technical Support

- Provide analytical capability and expertise to support EMSL projects, other ORD laboratories, regional programs and other EPA programs. Analytical capability and expertise exist in the areas of gas chromatography, mass spectrometry, optical emission spectrometry, atomic absorption, autoanalyzers and selective ion electrodes.

- Provide technical expertise and consultation to EPA Program Offices, Regional Offices, Laboratories and states on problems relating to Water Supply Laboratory Certification, NPDES, Consent Decree (TOSCA) and Ocean Dumping Act.

5. Water Supply

- Investigate proposed analytical methods for determination of organic compounds in water supplies and develop new techniques for the measurement of drinking water quality.

6. Energy

- Provide quality assurance guidelines and materials to evaluate and improve monitoring of waste discharges and water quality in Western Sector Energy Development area. Develop techniques for measurement of contaminants produced by new energy sources.

7. Effluent Standards

- Initiate development of test procedures for priority pollutants identified in the Consent Decree. Provide standardized analytical methods for chlorinated hydrocarbons, nitrosoamines, pesticides, polynuclear aromatics, and halomethanes. Test proposed procedures in representative industrial effluents for applicability, accuracy, and specificity.

8. Land Application

- Develop monitoring techniques for identification and measruement of contaminants resulting from land application of municipal sludge. Provide standard analytical methods for characterization of leachates and sludge residues.

9. Technical Support--Interdisciplinary

- Provide to Regional Administrators, and to other governmental agencies:

  - technical support in sampling and assaying for viruses, and expert advice (including testimony at hearings and other legal proceedings).

  - specialized microbiological support and consultant services on water, waste, and sediment analyses.

- Provide opinions to agencies such as ORSANCO and Corps of Engineers on monitoring network for continuous measurement of selected water quality parameters.

- Provide quality assurance support to project officers on EPA grants and contracts, especially Effluent Guidelines Division and 208 Agency laboratories.

10. Toxic Substances

- Maintain a mass spectral search system for identification of toxic and hazardous organic compounds found in environmental samples.

11. Toxic Substances--Technical Support

- Provide information and analytical assistance to Office of Toxic Substances and other program offices on the measurement of toxic materials in water and waste samples.

- Provide to Regional Administrators, and to other governmental agencies, technical support in measuring toxicity of effluents to fish and other aquatic life, and effects of effluents on aquatic ecosystems.

RECENT ACCOMPLISHMENTS

1. As a result of public comments received on the proposed amendment to approved test procedures for NPDES testing (304 (g)), a complete revision of the October 25, 1973, Federal Register listing was made. Procedures where problems and/or interferences have been encountered were revised. Examples include: development of the ADMI color method, identification and elimination of an interference in the cyanide method, a re-write of the suspended solids method, and evaluation of a number of techniques for residual chlorine.

2. At the request of Effluent Guidelines Division, prepared a sampling and analysis protocol for use by contractors in determining BAT. Prepared interim sampling and analysis procedures for determining the priority pollutants in fish and sediments at the request of Office of Water and Hazardous Wastes. Prepared methods for determination of trihalomethanes in drinking water for Office of Water Supply.

3. Conducting extensive revision of manual, Methods for Chemical Analysis of Water and Wastes. Publication planned in early 1978.

4. Prepared RFP titled, "Development and Application of Test Procedures for Specific Organic Substances in Wastewater", as required by Effluent Guidelines Division for implementation of the Consent Decree. RFP calls for $1.6 million in contract funds, to cover the essential requirements for organic test procedures. A total of 82 proposals covering 12 categories of compounds have been evaluated for technical merit. Awarding of the contracts is currently in progress.

5. Conducted Laboratory Performance Evaluation studies for NPDES measurements (156 laboratories), a study of performance of 110 laboratories conducting water supply analysis, and an interlaboratory comparison study of the EPA test procedures for heavy metals.

6. Distributed 38,000 Quality Control Reference Samples for 73 measurements required by FWPCA Amendments, Safe Drinking Water Act, Ocean Dumping Act, and TSCA.

7. Developed Quality Control and Performance Samples for chlorinated hydrocarbon pesticides, trihalomethanes, polychlorinated biphenyls, and chlorophenoxy herbicides.

8. Investigated parametric systems for continuous measurement of residual chlorine chloramines, dissolved oxygen, ammonia, and chlorophyll. Investigations resulted in re-defined application of the residual chlorine

and chloramines systems, change in installation of the dissolved oxygen systems, and design modification to the chlorophyll system. One ammonia system was subsequently taken out of production.

9. Testimony on viruses contributed to the demonstration of irreparable harm to the environment by the City of Milwaukee which has been discharging inadequately treated sewage into Lake Michigan. The court ruled that "there is clear convincing evidence that these discharges constitute a health hazard of serious magnitude" and ordered the city to install advanced waste treatment equipment.

10. Implemented a central Agency biological data management system (BIOSTORET) to process field and laboratory data on: the toxicity of effluents to aquatic life, toxic substances in biological tissues, the effects of effluents on aquatic ecosystems.

11. Initiated the preparation of a series of reports on the pollution tolerance and environmental requirements of common aquatic organisms. Reports will be used to identify pollution sensitive, indicator organisms and to assist field personnel in interpreting biological data.

12. Completed evaluation of optimal methods for the separation of bacteria from particles in marine sediments. This evaluation is a part of an investigation to assess the potential public health risk from the transfer of plasmids (antibiotic resistance factors) to pathogens in the New York Blight.

13. Completed a final report on Streptococcus mitis-salivarius as a indicator of human pollution. No indicator specific for human pollution was previously available.

14. Completed the preliminary copy of EPA microbiological methods manual for external review. The manual provides the bacteriological methods required for compliance monitoring, recommended quality control procedures, and supplementary information on safety, statistics and legal considerations for the microbiologist.

RESEARCH PROGRAM TRENDS

1. Develop sensitive, reliable analytical procedures for monitoring toxic substances in public water supplies, industrial effluents, and surface waters.

2. Necessity to eliminate gross toxicity from waste discharges will require standardization of bioassay techniques to demonstrate the absence of harmful effects on aquatic life.

3. With increased action on the enforcement of waste discharge limitations, EPA and state laboratories will need to maintain high standards of performance through the use of documented quality control systems and continual attention to the legal defensibility of results.

4. Improve laboratory operations; e.g., laboratory automation, automatic monitoring devices, automated sample handling to reduce cost of water and waste monitoring programs in the Federal, state, and industrial sectors.

REGIONALLY RELATED PROJECTS

Regions I-X

1. Quality Assurance

   Quality control samples furnished as secondary checks on regional within-laboratory quality control programs. Performance evaluation samples furnished on a periodic basis to document acceptable performance levels of regional and state laboratories. Formal interlaboratory studies conducted to validate methods used in drinking water and waste monitoring. Criteria and procedures developed for use in the evaluation and certification of laboratories.

2. Methodology

   Analytical methods provided for the measurement of contaminants in drinking waters, ambient sources and treated discharges (municipal and industrial). Guidelines provided on sampling and analysis procedures for screening of industrial effluents, sediments, and fish for priority pollutants. Mechanism instituted for state, regional, nationwide approval of alternate analytical procedures for use in meeting monitoring requirements of NPDES and SDWA.

3. Technical Support

   Specialized analytical support provided, particularly to document and confirm data for use in enforcement actions. Emphasis has been on analyses of unique samples for priority pollutants and other potentially toxic materials.

DWIGHT G. BALLINGER

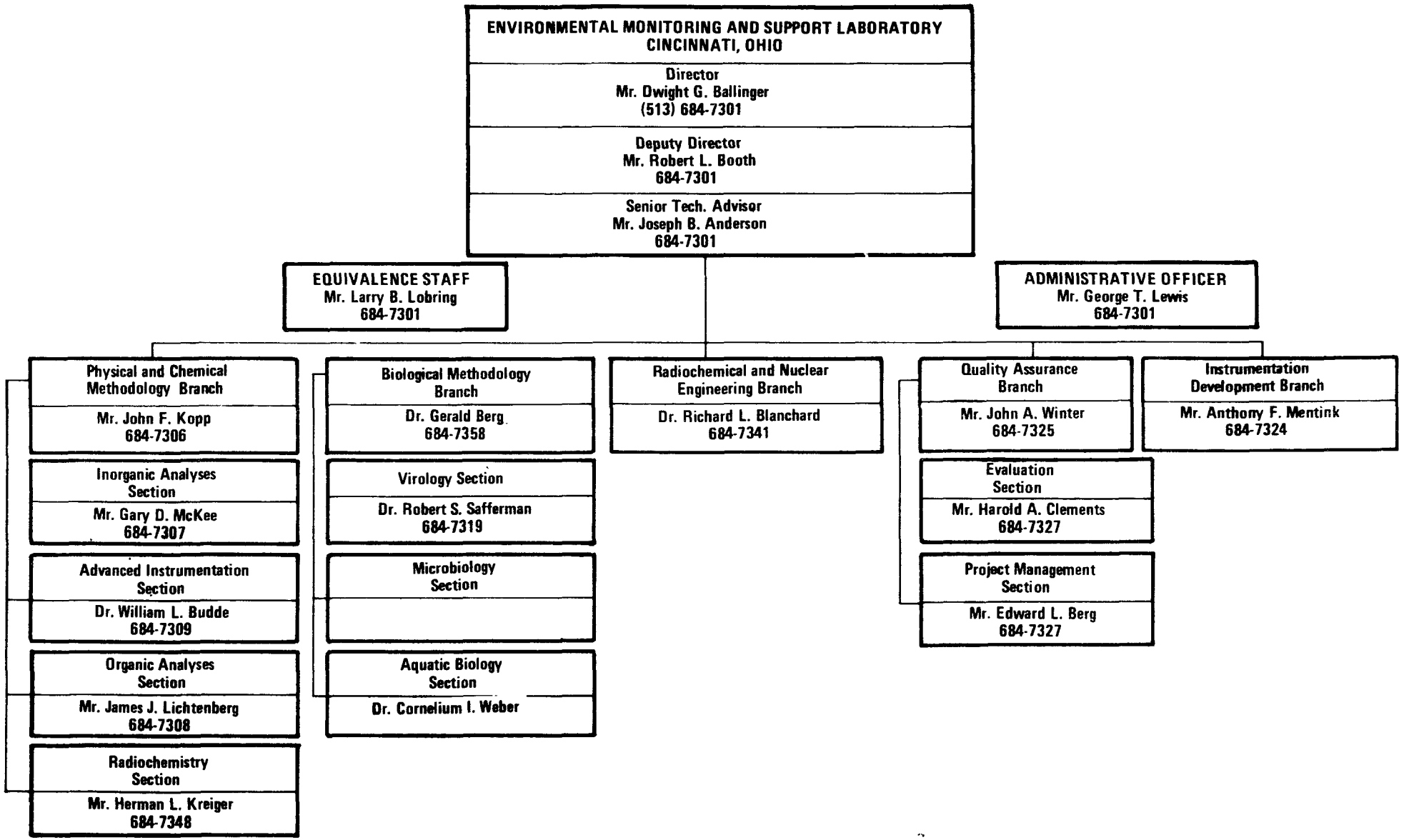
Director
Environmental Monitoring
and Support Laboratory
Cincinnati, Ohio

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

Professional Experience:
- Director, Environmental Monitoring and 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 + EXTENSION

March 1978

ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY

LAS VEGAS

NEVADA

ENVIRONMENTAL MONITORING AND SUPPORT 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 Agency 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.

RESEARCH PROGRAM RESOURCE SUMMARY

($1,000's)

Program Area	FY-77 In-house	FY-77 Extramural	FY-78 In-house	FY-78 Extramural
1. Technical Support to Agency Program and Regional Offices	2330	646	1906	688
2. Nuclear Testing Safety Program	1998	0	2291	0
3. Energy-related Pollutant and Effects Monitoring and Techniques Development	709	1300	829	1346
4. Integrated Monitoring	1251	216	1285	410
5. Contact and Remote Monitoring Methods Development	656	516	669	382
6. Radiation Research	673	0	624	0
TOTAL	7617 (197) (115)*	2678	7604 (155) (118)*	2826

( ) Manyears
* Manyears reimbursable

PERSONNEL

Total Full-time EPA Personnel = 195

- Professional = 65
- Non-Professional = 33

Total Full-time Reimbursable Personnel

- Professional = 31
- Non-Professional = 66

Professional Staff

	Bachelor	Master	Doctorate	Total
Agriculture	1	2	0	3
Biological Sciences	4	6	7	17
Chemistry	13	6	4	23
Engineering	6	5	3	14
Geology/Hydrology	3	1	0	4
Health	0	5	4	9
Mathematics	2	1	1	4
Oceanography	2	1	0	3
Physics	3	5	0	8
Other	8	2	1	11
	42	34	20	96

RESEARCH PROGRAM

1. Technical Support to Agency Program and Regional Offices

   - Provide air, land, and water monitoring technical support by applying specialized monitoring systems and techniques, including airborne and land-based monitoring platforms, state-of-the-art remote sensing techniques, automated in situ sensor systems, and an analytical center of excellence.

2. DOE-Reimbursed Nuclear Testing Safety Program

   - Monitor airborne, surface and subsurface environmental radioactivity and radiation exposures to individuals around all underground nuclear testing sites.

   - Direct the Medical Liaison Officer Network and assist DOE in claims against the Government for alleged radiation induced injuries.

   - Measure radionuclide burdens in families from the area surrounding the Nevada Test Site.

   - Provide off-site radiological safety support for all nuclear tests through aerial tracking and ground monitoring teams to monitor radioactivity releases and take necessary actions to reduce population exposure.

   - Provide technical support to the DOE field manager during radioactivity cleanup activities at Eniwetok Atoll.

3. Energy-Related Pollutant and Effects Monitoring and Techniques Development

   - Develop validated air quality data for fine particulates, NO_x, SO_x, O_3, reactive hydrocarbons, toxic substances, and visibility to determine air quality baselines and trends for those areas apt to be most impacted by energy developments.

   - Integrate historical and current water quality data to determine the impact of energy-related development on surface water and individual river basins in the western United States.

   - Develop airborne LIDAR techniques for monitoring fine particulates produced from energy development.

- Employ remote sensing techniques including multispectral sensing and analyses, to monitor mining and reclamation activities in the western United States.

- Qualify and quantify the radioactive effluent from coal-fired power plants.

- Determine ground water pollutants associated with western coal and oil shale mining, and design and demonstrate a method for monitoring ground water quality in these mining areas.

- Develop multimedia monitoring guidelines for identifying and quantifying pollutants associated with advanced coal and in situ oil shale conversion processes.

- Develop and validate an optimized, multimedia strategy to monitor the environmental impact associated with geothermal resource development.

4. Integrated Monitoring

- Apply multimedia systematic modeling concepts to problem of determining best monitoring practices for ubiquitous environmental pollutants, including carcinogens and other inorganic and organic chemical pollutants.

- Investigate the transport, transformation, and fate of environmental pollutants in soil and plant systems.

- Develop biological monitors to quantitatively assess dose resulting from known exposures to environmental pollutants.

- Apply modeling techniques to determine optimum monitoring sites required to define the pollution field.

- Develop quality assurance guidelines and provide standards, reference materials, methods, and quality control procedures for monitoring activities, analyses of radiological pollutants and biological research.

5. Contact and Remote Monitoring Methods Development

- Design and test a monitoring system to characterize the impact of airport air operations on air quality.

- Develop and demonstrate airborne monitoring platforms to characterize site-specific and regional air quality.

- Develop and conduct rough-terrain plume-model tests for implementation plan assessment and air quality enforcement.

- Develop and test automated waterborne water quality sensor systems for small boat or aircraft deployment and unattended operation in various water bodies.

- Develop methods to characterize surface water quality and degradation potential based on ambient nutrient levels, physical parameters, and the aquatic bio-community.

- Develop and evaluate techniques for the trophic assessment of lakes using satellite-acquired data.

- Develop and test monitoring techniques applicable to streams impacted by non-point source pollutants.

- Develop and adapt remote sensing instrumentation to monitor specific pollutants using the interaction of radiant energy with the environment.

- Modify and develop automated techniques and systems for processing environmental remote sensor data.

- Optimize aerial infrared scanner survey techniques for monitoring thermal effluent discharges.

- Apply aerial multispectral scanner and digital analysis techniques for quantitative remote determination of surface water turbidity.

- Develop photo-interpretation keys designed to aid in monitoring critical environmental conditions.

6. DOE-Reimbursed Radiation Research

- Define transport and metabolism of transuranic radionuclides in lactating goats and dairy cows.

- Maintain an experimental farm and dairy herd, abattoir, and large animal metabolism facilities on the Nevada Test Site.

- Conduct in vitro artificial rumen studies on intestinal absorption of transuranics and other nuclear debris.

- Investigate any influence of microbial activity on the solubility of transuranics in contaminated soils.

- Assess the radionuclide burdens in tissues of domestic and wild animals on and around the Nevada Test Site. Investigate claims of alleged radiation damage to such animals.

RECENT ACCOMPLISHMENTS

1. Published atlas showing baseline environmental data in the Western Energy Resources Development Area.

2. Developed methods for designing pollutant-oriented exposure monitoring systems.

3. Applied an airborne lighweight LIDAR system for measuring power plant plumes and atmospheric mixing heights.

4. Developed strategies for monitoring groundwater quality.

5. Completed airborne platform data acquisition and analysis for the St. Louis Regional Air Pollution Study (RAPS).

6. Demonstrated applications of a light-aircraft sensor system (Enviro-Pod) for various Regional Office applications.

7. Completed comprehensive data compilation on trophic conditions and lake characteristics of more than 800 lakes nationwide (the National Eutrophication Survey).

8. Implemented improved thermal aerial survey system for mapping heated effluent discharges.

9. Developed siting criteria and guidelines for air monitoring networks.

10. Characterized and quantified plutonium releases from breeder reactor fuel-fabrication facility.

11. Collected airborne data demonstrating long-range transport of oxidants and their precursors and the consequent deterioration of air quality hundreds of kilometers downwind.

12. Completed comprehensive soil survey of 40,000 square miles around the Nevada Test Site to determine distribution of plutonium.

13. Determined transfer coefficients to cows' milk of selected actinides.

14. Demonstrated application of overhead thermal imagery to energy conservation through public awareness of home and industrial heat loss.

RESEARCH PROGRAM TRENDS

1. Develop multimedia exposure monitoring systems and network design models to include the transport, transformation, fate, and exposure/dose relationships of environmental carcinogens and other high priority organic chemicals.

2. Provide and expand the capability for rapid response and wide-area monitoring using airborne platforms in support of Regional and Program Office requirements.

3. Develop a center of analytical excellence that will provide state-of-the-art surveillance and analysis services to EPA Regional and Program Offices and other environmental agencies. This concentration of equipment and skills will maximize use of the Agency's limited resources for equipment and highly skilled technicians.

4. Develop non-point source monitoring procedures and techniques to meet P.L. 92-500, Section 208, areawide wastewater management needs.

5. Develop automated waterborne monitoring systems in response to EPA needs for more effective water quality surveillance and assessment systems.

6. Develop methodology for quantitative visibility monitoring as required under the 1977 Clean Air Act Amendments.

7. Develop innovative statistical approaches to analyses of existing and developing data bases.

8. Apply existing satellite data and digital imaging technology to problems of environmental sensing and assessment.

9. Develop advanced laser techniques to identify and measure particulate and gaseous pollutants in the atmosphere and to define their spatial distribution.

FOREIGN PROGRAM

Country	Project Title	Completion Date	Amount
Egypt	Biological Effects in Animals and Man of High Concentrations of Airborne Particles in the Inspired Air	1979	$155,454
International Atomic Energy Agency	Environmental Behavior of Tritium in Various Ecosystems	1978	0
	Accumulation of Heavy Metals in Plants as Influenced by Varying Air Pollution Compositions	1979	$264,809
Mexico	Bilateral Studies to Identify Environmental Pollution along the U.S./Mexico Border	Continuing	-
Poland	Influence of Industry on the Particulate Pollution of the Troposphere and Stratosphere	1979	$290,512

REGIONALLY RELATED PROJECTS

REGION I

- Boston, Mass. - Using aircraft-borne measurement system, investigated possible impact of areas outside metropolitan Boston area on oxidant and oxidant precursor concentrations within the Boston Air Quality Control Region (AQCR). Assisted Regional Office in evaluating its transportation control plan for metropolitan Boston. Study confirmed that emissions from the New York metropolitan area and other nearby areas produced ozone concentrations more than twice the ambient air quality standard for photochemical oxidants. Implications are: New York and other metropolitan areas probably add to ozone concentrations within the Boston AQCR; an effective oxidant control strategy must cover a much larger area than previously believed, probably including several EPA regions.

REGION II

- Hackensack Meadowlands, N.J. - Provided assistance to New Jersey and Regional Office in monitoring for mercury. Conducted workshop to develop recommendations for the continued monitoring of mercury.

- Hudson River - Provided helicopter support for bottom-sediment sampling of Hudson River for PCB contamination. Tested feasibility of ocean and surf-zone water sampling procedures for possible 3-month survey in the New York Bight area.

REGION III

- Wheeling, W. Va. - Measured power plant plume characteristics and meteorological data for two coal-fired power plants. Plume measurements were performed with a helicopter-borne, multi-parameter air quality measurement system and an airborne, down-looking LIDAR system. Plume measurements and meteorological data were used to validate dispersion modeling of the two point sources and were performed to support SIP SO_2 emission regulations.

REGION IV

- Florida - Documented thermal discharges at three electric generating power plants in southwest Florida. Data were acquired with color photography and thermal line-scan imagery.

- Indian River, Fla. - Used color infrared aerial photography to delineate marine grasses in selected areas as to extent and density.

REGION V

- Sabine River Basin, Illinois - Mapped identifiable mining features responsible for acid pollution of Sabine River Basin to show active and inactive mining areas, reclamation, and other sources of pollution. Assessed trends of mining in the area through analysis of old (1938, 1955) imagery.

- Cleveland, Ohio - Used remote sensing techniques to develop trend analysis report of beach erosion prior to and following construction of a power plant and breakwater.

- Cleveland, Ohio - Conducted land use study of the Southwest Interceptor Planning Area, Cleveland Regional Sewer District. Land use classification was derived from color infrared film flown by NASA in August 1976 and depicted on clear film overlays affixed to a black and white photo mosaic.

REGION VI

- Arkansas - Provided to Region VI photographic analysis of ethylene dibromide plants at Marysville, El Dorado and Magnolia showing vegetation stress and chemical drainage. The Regional Office will use this information in the establishment of in-situ air and water quality measurement stations. The data obtained supports the State of Arkansas in possible environmental litigation.

- Atchafalaya River Basin - Conducted pre- and post-flood analysis of petroleum storage facilities following the floods of April 1975. The imagery analysis was used to apprise oil and gas producers of their vulnerability to annual flood catastrophe.

- Missouri and Louisiana - Identified and mapped vegetation damage from lead smelter near Taum Sauk Mountain, Missouri and from chloride emission of the new ECOL Refinery in Garyville, Louisiana. Acreage of the damaged vegetation in Missouri was measured using aerial remote sensing techniques.

- Whitewater Creek/Mimbres River, New Mexico - Used remote sensing to verify and provide a positive record of water flow in the Whitewater Creek and Mimbres River, two streams southeast of Silver City, New Mexico. The imagery was obtained following a rainfall and provided data to support the Regional Office's claim for jurisdiction of these streams under NPDES.

REGION VII

- Kansas - Analyzed aerial imagery of eight counties for all oil production and storage facilities as potential sources of pollution. A report showed all facility locations, number of wells, number of storage tanks, and possible or probable spills with 90% accuracy as measured by field checks.

- Mississippi River - Photo reconnaissance of 30-miles of the River between Cape Girardeau and Whittenburg, Missouri showed numerous barges, some spilling oil, caught in frozen ice packs. Photo mosiacs, annotated with the identification and location of all barges, were provided to U.S. Coast Guard.

- Big Piney River Basin, Missouri - Used remote sensing to identify specialized land use of Big Piney River Basin as well as non-point source contributions to a water quality problem of algae blooms and aquatic growth.

REGION VIII

- San Juan Basin Survey, Four Corners Area - Conducted field investigations of San Juan River and San Juan Arm of Lake Powell. Completing report on ambient levels, sources and impact of pollutants and the contribution of the San Juan Arm to the larger Lake Powell ecosystem.

- Anaconda, Montana - Measured effluent plume characteristics, meteorological parameters, and ground level SO_2 concentrations at a large copper smelter. Study performed to develop SIP SO_2 emission regulations for Montana.

REGION IX

- Lake Tahoe, Calif. - Conducting study to determine effectiveness of marshlands and meadows in alleviating nutrient inputs to Lake Tahoe.

- Maui, Hawaii - Conducting ground-level SO_2 monitoring at three sites. Project will develop SO_2 impact models for the Kahului power plant and Kahe Point power plant on Oahu. Will permit State of Hawaii and Region IX to promulgate SO_2 emission regulations for Hawaii's SIP. Dispersion modeling will be performed for both plants.

REGION X

- Wenatchee National Forest, Wash. - Documented eight specific silvicultural practice problems within four watersheds of the Forest. The problems included: channel erosion, road washout, mass wasting, cut and/or fill failure, culvert and/or sidecase erosion, slash and debris accumulation, drainage on road surfaces, and bare sidecasts. Measurements were also made for total harvest area and forest road mileage.

ADDITIONAL REGIONALLY RELATED PROJECTS

REGION I

- Portland, Maine - Council of Governments 208 Planning
- Boston, Mass. - Regional Planning Commission, 208 Programs; Environmental Impact of Landfills on Wastewater Treatment Plants
- Tyngsborough, Mass. - Solid Waste Overflight
- Worchester, Mass. Metropolitan Area - Identify Emission Source
- Berlin, New Hampshire - Aerial Survey of Vegetation Damage
- Black River, Vermont - Nutrient Control Demonstration Project
- Lake Champlain Basin, Vermont - 208 Plan Assessment
- Massachusetts, Connecticut, Rhode Island, New Hampshire - Bulk Storage Facility Inventofy
- Aerial Infrared and Photographic Survey of Selected Electric Generating Station Thermal Discharges
- Remote Sensing Training Course
- Aerial Reconnaissance of Bulk Oil Storage Facilities
- Aerial Reconnaissance of Selected Oil and Industrial Facilities in Support of SPCC Inspections
- Sitings for SO_2 Monitors

REGION II

- Linden, N.J. and Buffalo, N.Y. - Aerial Remote Sensor Survey of Selected Thermal Discharges
- New York City, N.Y. - Suspended Particulate Geographical Distribution over New York City and the City of Environs; Central New York Sanitary Landfill Study
- Delaware River - Oil Storage Inventory
- Raritan River Outfalls
- Ocean Dump Study

REGION III

- Washington, D.C. - Ozone Distribution
- St. Martin's Neck, Worcester County, Md. - Landfill Site
- Allegheny County, Pa. - Aerial Photographic Survey of Mine Drainage Study Area
- Palmerton, Pa. - Vegetation Damage in the Vicinity of New Jersey Zinc Company
- Philadelphia, Pa. - PCB's
- Clairton Coke and Coal Chemical Works - Inventory of Selected Air Emissions from Coke Processing Operations
- Aerial Observation of Potential Oil and Chemical Spill Sources
- Aerial Photographic Survey of Selected Industrial Facilities
- Aerial Surveillance of Greater Pittsburgh Rivers

- FDA Court Actions Relative to Mercury Contaminated Swordfish
- Outfall Inventory of Selected Rivers
- Solid Waste User Manual
- Dulles Airport Land Use
- Oil Storage Facility Inventory
- Noise Survey
- Refinement of the Environmental Protection Agency Community Noise Model: A Feasibility Study
- Quantitative Remote Sensing Data are Being Collected over TVA Steam Plants to Detect SO_2 Effects on Vegetation

REGION IV

- Birmingham, Ala. - Region IV Aerial Survey of Duckweed
- Apalachiocola Bay, Fla. - Survey of an Area of Recent Dredging
- Apalachiocola, Fla. - Aerial Data Collection
- Tampa/St. Petersburg, Fla. - Oxidant Monitoring Network Design Methodology Field Test
- Florida - Thermal Mapping of Power Plants
- Athens, Ga. - Training of Regional Evaluation Teams
- Atlanta, Ga. - Investigations of Vegetation and Soil Near Hartsfield International Airport
- Black and Cedar Creeks, Ga. - Determine Land Use and Potential Sources of Pollution
- North Central Kentucky - Reconnaissance of Oil Storage Facilities
- Ross Barness Reservoir, Miss. - Aerial Photography and Related Ground Truth
- Mississippi - Assistance to Radiological Laboratory
- Charlotte, N.C. - Monitoring of CO
- Guilford County, N.C. - Land Use
- Holston River, Tenn. - Aerial Photography and Multispectral Data
- Jackson, Tenn. - Cut and Dredge Operations
- Jacksonville, Tenn. - SO_2 Damage
- Memphis, Tenn. - Velsicol Plant
- Apalachicola Multiband Aerial Photography
- Compliance Monitoring - Radionuclides
- Kentucky Strip Mines, NEIC
- North Carolina Agriculture
- NPDES Laboratory Evaluation
- Sampling Methodology
- Wetlands Inventory

REGION V

- Muskegon, Mich. - Photographic Mosaics
- Michigan and Ohio - Aerial Reconnaissance of Selected Oil Refineries and Bulk Oil Storage Facilities
- Cincinnati, Ohio - Health Effects Drinking Water Study

- Aerial Reconnaissance of Selected Refineries in Support of SPCC Inspections
- Illinois Lakes Trophic Status
- Lake Huron Phosphate Fallout Study
- Rural Water Survey
- Remote Sensing of Selected Waste Sites in Illinois

REGION VI

- Gulf Coast - Loop and Seadock Oil Ports
- Bayou Baratoria, La. - Inspection of Proposed Harvey Canal
- Jefferson Parish, La. - Remote Sensing Techniques
- Fruitland, New Mexico - Overflight
- Grants, New Mexico - Aerial Surveillance of Uranium Mill
- New Mexico - Aerial Surveillance of Selected Uranium Mills
- Beaumont-Port Arthur, Texas - Aerial Reconnaissance of Oil and Chemical Facilities
- Fisher County, Texas - Aerial Surveillance of Potential Salt Water Sources in the West Lake Drainage Basin
- Sabine Lake, Texas - Shell Mining
- Bench-Side Training for State Employees
- Photo Support, Dallas Noise Monitoring Stations
- Texas Pulp Mill Effluent

REGION VII

- Iowa - Iowa Non-Point Source Inventory
- Kansas City, Missouri/Kansas - Aerial Reconnaissance of Oil and Chemical Facilities
- Big River, Mo. - Pollution Source Inventory
- St. Louis, Mo. - Airborne Measurements of Primary and Secondary Pollutant Concentrations
- Nebraska - Thermal Mapping of Power Plant Discharges
- North Dakota - Land Use Near Bismarck

REGION VIII

- Northeastern Montana - Energy-Related Field Programs
- Poplar River Basin, Montana - Land Use, Potential Impact of Air Emissions from Coal-Fired Power Plant
- Montana - Vegetation Stress Survey
- Devil's Lake Basin, North Dakota - Land Use, Hydrological Areas
- Moab, Utah - Uranium Mills
- Provo, Utah - Steel Mill Study
- Teton County, Wyoming - Suspended Sediment Study
- Aerial Inventory of Selected Large Point Sources of Pollution
- Bulk Oil Storage Facility Inventory, July-August 1976
- Floor Analysis in Respect to Western Strip Mines
- Hazardous Waste Pathways
- Waste Water Outfall Inventory, July-August 1976

REGION IX

- Black Mesa Mine, Arizona - Thermal Data and Aerial Photography Used to Detect and Map Underground Burning Coal Mines
- Phoenix, Arizona - Airborne Particulate Study
- South Coast Basin, Calif. - Airborne Air Quality Measurements
- Kennecott Copper Smelter, Nevada - Overflight
- Mohave Power Plant, Nevada - Airborne Measurements of Power Plant Plumes
- Nevada, Arizona - Field Quality Assurance Audit Checks for State and Local Agency Monitoring Stations
- Aerial Reconnaissance of Selected Refineries and Bulk Oil Storage Facilities in Support of SPCC Inspections
- Data Collection of Toiyabe National Forest
- Lead-in-Gasoline Analyses
- Los Angeles Sulfuric Acid Freeway Study
- Nevada Mosaics

REGION X

- Valdez, Alaska - Oil Tanker/SO_2 Study
- Oregon-Idaho - Grazing Land Non-Point Source Monitoring
- Yakima River Valley, Washington - Agricultural Land Use
- Southwest Washington - Aerial Monitoring of Silvicultural Practices and Their Effect on Water Quality in the Washington Cascades
- Aerial Reconnaissance of Selected Oil Refineries and Bulk Storage Facilities in Support of SPCC Inspections
- Aerial Reconnaissance of Selected Oil and Chemical Facilities in Support of SPCC Inspections
- Laboratory Certification Workshop
- Non-Point Source Pollution Survey
- Willamette River Basin Land Use

GEORGE B. MORGAN

Director
Environmental Monitoring and Support Laboratory
Las Vegas, Nevada

Education: Valdosta State College, B.S. (Chemistry) 1951
University of Florida, M.S. (Bioanalytical Chemistry) 1954
New York University (graduate work in Nuclear Physics and Radiological Health)
Federal Executive Institute Presidential Program 1972

Professional Experience: Director, Environmental Monitoring and Support Laboratory-Las Vegas, 1977-Present
Director, Monitoring Systems Research and Development Division, Environmental Monitoring and Support Laboratory-Las Vegas, 1973-1977
Director, Quality Assurance Division, Office of Research and Monitoring, EPA, 1971-1973
Director, Division of Atmospheric Surveillance, National Air Pollution Control Administration 1969-1971
Director, Division of Air Quality and Emissions Data, National Air Pollution Control Administration 1968-1969
Chief, Laboratory Services Section, National Center for Air Pollution Control, U.S. DHEW, 1966-1968
Supervisory Chemist, Division of Air Pollution R. A. Taft Sanitary Engineering Center, U.S. DHEW 1965-1966
Director, Phelps Laboratory for Bioenvironmental Engineering Research, University of Florida 1964-1965
Associate Professor of Radiological Health University of Florida, 1954-1964
Research Assistant, University of Florida, 1951-1954
Laboratory Teaching Assistant, Emory University 1949-1951

Professional Affiliations:

U.S. delegate to the Organization for Economic Cooperation and Development Research Policy Committee and Expert Committee on Air Pollution Measurements

Member, U.S. delegation to United Nations Environmental Program Working Group

Member, U.S./USSR Joint Working Group on Cooperation in the Field of Air Pollution Modeling, Instrumentation and Measurement Technology

General Co-Chairman and Acting Coordinating Chairman, International Conference on Environmental Sensing and Assessment, 1975

President, Southern Nevada Federal Executive Association, 1977-1978

Member, Evaluation Panel, Office of Air and Water Measurements, National Bureau of Standards 1977-Present

Member, Environmental Advisory Panel for the National Science Foundation

American Public Health Association

American Chemical Society

Air Pollution Control Association

Water Pollution Control Federation

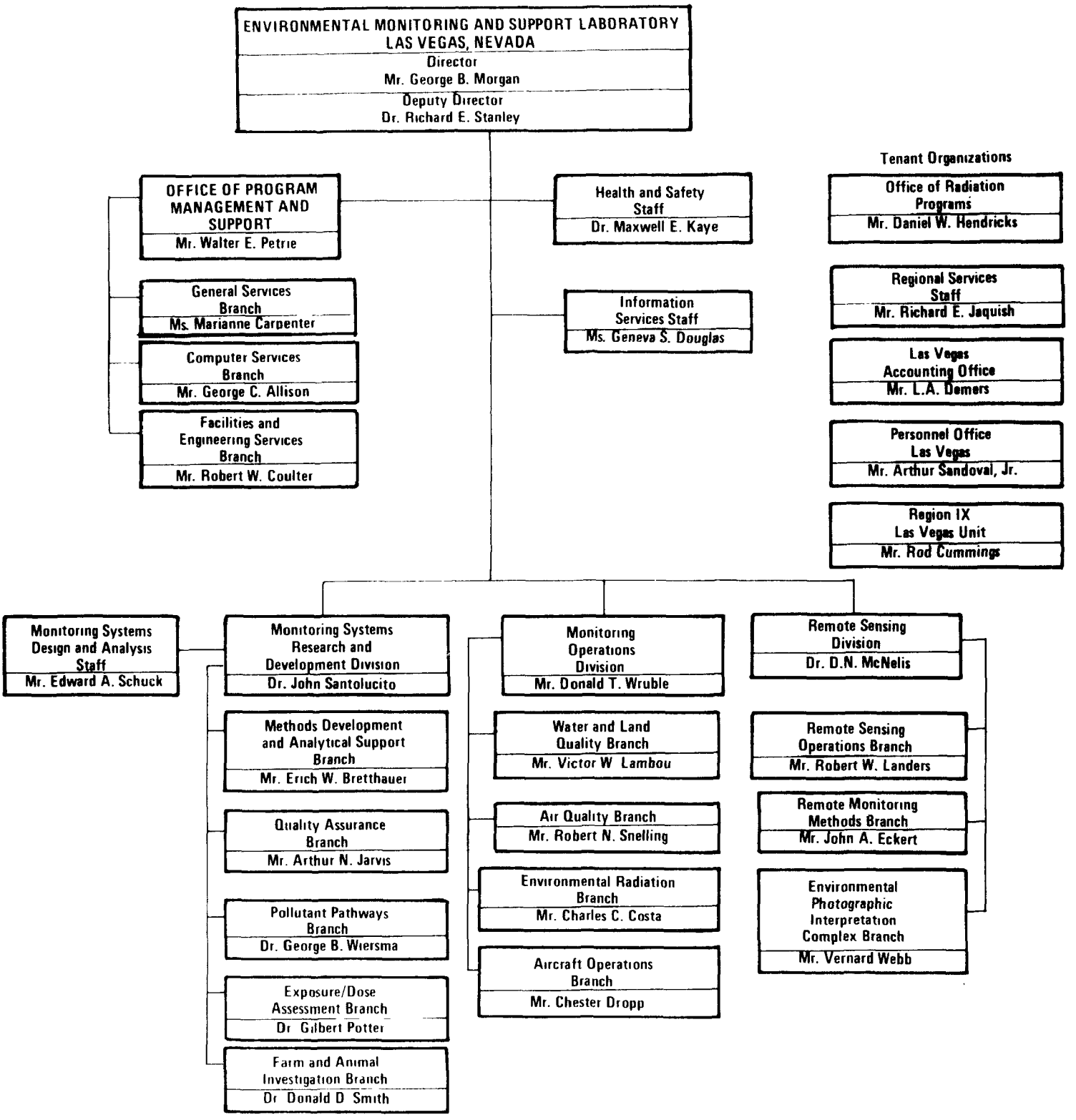
Sigma Xi

Alpha Chi Sigma

Honors:

Who's Who in American Colleges and Universities, 1951

Chairman, Gordon Research Conference, Nitrogen Metabolism Division, 1962



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March 1978
*Acting

ROBERT S. KERR ENVIRONMENTAL RESEARCH LABORATORY

ADA, OKLAHOMA

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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.

RESEARCH PROGRAM RESOURCE SUMMARY

($1,000's)

Program Area	FY-77 In-house	FY-77 Extramural	FY-78 In-house	FY-78 Extramural
1. Ground Water Research	440	1305	446	1315
2. Irrigated Agriculture	250	1090	323	1061
3. Wastewater Management	343	729	526	596
4. Animal Production	222	718	205	606
5. Industrial Sources	363	538	350	350
	1618 (65)	4380	1850 (65)	3928

( ) Manyears

PERSONNEL

Total Full-time EPA Personnel = 59

- Professional = 34
- Non-Professional = 25

PROFESSIONAL STAFF

	Bachelor	Master	Doctorate	Total
Agriculture	1	2	3	6
Biology	0	2	2	4
Chemistry	2	1	2	5
Engineering	1	6	2	9
Environmental Sciences	2	6	0	8
Mathematics	1	1	0	2
	7	18	9	34

RESEARCH PROGRAM

1. Ground Water Research

Conduct research and demonstration investigations concerning the nature, transport, and transformation of pollutants entering ground water from sources which include land use, surface waste disposal, spills, subsurface injection, and other sources which contaminate ground water. Management and control criteria of underground water supplies will include cost effectiveness and will assess the environmental and socioeconomic impacts of such control and management.

2. Irrigated Agriculture

- Irrigation System Technology

  - 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.

- Predictive Mdethods for Irrigation Return Flow Management

  - 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 soil 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.

3. Wastewater Management

- Application of Wastewater to Land (Soil Treatment Systems)

  - 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. Animal Production

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

5. Industrial Sources

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.

RECENT ACCOMPLISHMENTS

1. Prepared a state-of-knowledge document on the design, cost, regulations, and environmental effects of septic tank systems.

2. Prepared a report, Impact of Abandoned Wells on Ground Water, required by Section 1442 of the Safe Drinking Water Act.

3. Assisted in development of Underground Injection Control Regulations required by Safe Drinking Water Act.

4. Assisting in the development of a plan and the providing of training for a national assessment of pits, ponds, and lagoons required by Safe Drinking Water Act.

5. Conducted two-year study on septic tank systems to develop density criteria.

6. Assisted in development of screening protocol for "Evaluating the Fate and Transport of Toxic Substances in the Near-Surface and Subsurface Environments."

7. National Conference on Irrigation Return Flow Quality Management, May 1977 - Laboratory presentations represent results of considerable research effort for past seven years. Conference addressed research results and solutions to problems, and considered the legal, economic and institutional factors constraining and/or affecting implementation of water quality control measures in irrigated areas.

8. Completed development of model for predicting the quality of return flows from irrigated areas. The five-volume final report has been distributed.

9. Implemented Agricultural Salinity Control Technology in Grand Valley (Colorado) - "Total package" approach to implement salinity control measures has been successful in meeting the environmental goals as well as addressing the socio-economic aspects of gaining acceptance of the approach among local water users. Three reports deal with: (a) the methodology of implementation of a "total package" salinity control program; (b) evaluation of irrigation management/control methods on improved water quality; and (c) defining best management practices (BMP) for salinity control in the Grand Valley area.

10. Evaluating a minimum leaching concept on both citrus and alfalfa in Southwestern Arizona. Results indicate that salinity in subsurface drainage can be greatly reduced by very closely controlled, low leaching fractions-essentially salt storage within the soil profile.

11. Determined effectiveness and cost impacts of different sediment and nutrient control measures on surface-irrigated areas in the Pacific Northwest. Evaluated on-farm water management practices and pollutant removal systems.

12. Conducted study of movement and fate of applied nitrogen fertilizers. Methods of limiting concentration of nitrate in the soil solution while maintaining an adequate supply of available nitrogen for plant growth were reported. These methods are most logical approach to reducing nitrate leaching in soils, thus reducing amount of nitrate in subsurface return flows.

13. Assisted in development of first comprehensive soil treatment design manual.

14. Developed two computer programs for predicting storage requirements for land application systems based on available standard weather station data. Programs are valuable to designers especially in designing systems for extremely cold or wet regions.

15. Developing overland flow soil treatment system for municipal wastewaters. System promises to be an effective and economical treatment system, particularly for small communities.

16. Developed model for predicting the phosphorus sorption capabilities of various soil types used for treatment of municipal wastewaters. Model is being used by system designers and evaluators.

17. Completed the first comprehensive state-of-the-art review of wastewater aquaculture. This document will be the basis for planning future programs to develop aquaculture for treatment and management of municipal wastewaters.

18. Developed pilot scale reactor to convert beef cattle feedlot wastes into ammonia synthesis gas and ethylene.

19. Completed state-of-the-art report for swine waste production and and pretreatment processes. Report provides an evaluation of management, pretreatment, treatment and disposal systems available for pollution control at this time.

20. Developed jointly with USDA a "208" design and planners' manual for evaluation of runoff from land application of animal wastes and development of best management practices for runoff control.

21. Completed evaluation of alternatives to abate or lessen environmental impacts resulting from unconfined animal production on range and pastureland.

22. Published bibliography of over 4,000 articles on animal waste. Articles deal with all phases of waste management and pollution control from livestock production enterprises including range and pasture operations.

23. Assisted in toxic pollutant assessment of the petroleum refining industry to determine the presence or absence of 129 named compounds.

24. Developed screening technique to determine potential viability of industrial waste being discharged to a POTW.

RESEARCH PROGRAM TRENDS

1. Ground Water Research

   - Develop source control technology for management and regulatory agencies.

   - Increase emphasis on rapid development of preliminary data on movement and fate of toxic substances in the subsurface.

2. Irrigated Agriculture Section

   - Evaluate effectiveness of water management technologies, both structural and nonstructural, on water quality improvement in problem areas not yet investigated.

   - Solve problems with implementation of irrigation return flow quality control programs to obtain significant impacts on the quality of our western river systems.

   - Influent control offers a more feasible approach to control irrigation return flow pollution than attempts to control the effluent by permit, enforcement, legislation, etc. Evaluate and demonstrate the concept to gain support of state water quality control agencies.

   - Pursue field verification of the predictive models to provide the reliability and confidence required for their widespread acceptance and utilization.

3. Wastewater Management

   - Investigate suspected health effects related to land application of municipal wastewater. Identify real health hazards, develop design and operation criteria to eliminate or minimize; develop risk-beneficial criteria for unavoidable adverse effects.

   - Develop and demonstrate overland-flow system for municipal wastewater treatment.

   - Define the ability of land application systems to adequately treat heavy metals, organic compounds, and toxic substances contained in applied wastewaters.

   - Determine pretreatment requirements for the three types of soil treatment systems under different operating practices and different system performance requirements.

   - Aquaculture is receiving increasing attention as a possible treatment alternative.

4. Animal Production

- Animal production units are becoming larger with less controllable land for disposal. Develop treatment and pretreatment systems to insure pollution control from the industry.

- With rapid increase in energy and production costs producers are investigating refeeding and energy production from animal wastes. Evaluate this changing waste load from existing production facilities and develop control measures.

- Rising cost of commercial fertilizer and energy producers are questioning use of existing pollution control measures since they destroy nutrients and are energy intensive. Develop new control measures which conserve both nutrients and energy and still protect the environment. Such systems will be much more acceptable to producers, thereby making compliance easier to obtain.

5. Industrial Sources

- Determine problems associated with applying excess sludge, which contains concentrated organics and metals, to land spreading operations.

- Assess hazardous effects of industrial effluents with flow-through biological methods and examine the test organism to determine cause of death.

- Examine the irrigation treatment system as a viable alternative to tertiary treatment.

- Develop pretreatment methodology for industries which discharge to POTW's.

- Investigate methods of removing or reducing dissolved solids in industrial effluents to allow higher recycling rates.

- Determine the capabilities, economics, and operational problems associated with solvent and stream regeneration of activated carbon.

FOREIGN PROGRAM

Country/Organization	Program/Project Title	Completion Date	Amount ($)
Environmental Mangement Institute Poland	SFCP, Optimization of Animal Wastes Treatment with Reference to Biotreatment, Recovery of Gas, Proteins, and Agricultural Utilization of Effluents	1980	306,750
Scientific Committee on Problems of the Environment France	Evaluation of Existing Ground-Water Basin Management Models	1977	141,871
Poland	Control of Water Pollution Originating through Agricultural Runoff by Means of Closing the Biogenic Matter Circulation Cycle	1979	338,353
Poland	Critical Review and Assessment of Polish Literature on Sewage Irrigation	1979	79,977
Institute of Meteorology and Water Management Poland	SFCP, Studies on Combined Treatment Processing of Liquid Wastes from Industrial Swine Farms with Use of Barriered Landscape Water Renovation System	1979	386,000

REGIONALLY RELATED PROJECTS

REGION I

- Buffalo, New York - Conducted "Industrial Waste and Pretreatment in the Buffalo Municipal System" Project. Project included conduct of an industrial waste survey, development of an industrial waste control program, establishment of an equitable cost recovery and user charge system, and evaluation of effects of local, state, and federal requirements on the industrial users.

REGION II

- Long Island, New York - Investigating organic contamination of ground water supplies.

REGION III

- Pittsburgh, Pennsylvania - Conducting economic and technological study to analyze the feasibility of establishing a regional industrial waste treatment facility for the highly industrialized Monongahela River.

- Determining distribution, volume and characteristics of industrial wastewaters and sludges, and the best practical treatment for an areawide system.

- Examining wastewater and solid waste disposal practices, wastewater characterization, pretreatment and treatment alternatives for the Chesapeake Bay seafood industries which are isolated from municipal treatment systems.

REGION V

- Conducted preliminary survey of toxic pollutants in wastewater at the Muskegon County, Michigan Wastewater Management System. The primary purposes of this survey were: determine if selected toxic pollutants were present in the wastewater being treated by this system and, if so, evaluate effectiveness of the treatment system in removing these substances. Provide information, in terms of procedural and resource requirements, needed in developing a protocol for a possible National survey of toxic pollutants in municipal treatment systems.

REGION VIII

- Implemented Agricultural Salinity Control Technology in Grand Valley as a part of the Pilot Program for Salinity Control.

- Cooperated on research in western Colorado to correlate overburden mineralogy with the effects on ground water of coal strip mining activities.

REGION IX

- Palo Alto, California - Investigating the feasibility of ground water recharge and reuse of tertiary-treated municipal wastewaters.

- Sacramento and Central Valleys of California - Completing Tailwater Management project which is supporting Region IX's permit program.

- Conducting study to construct a residual waste facility to dispose of diverse industrial residues such as brine, cannery, manures, metals, chlorinated hydrocarbon, and residual petroleum wastes.

REGION X

- Snake Plain Aquifer, Idaho - Cooperated on research to determine effect of irrigation runoff disposal on the ground water of the Snake Plain Aquifer.

- Conducted evaluation of measures for controlling sediment and nutrient losses from irrigated areas. Project supported the NPDES program of Region X and provided information relevant to the issuances of irrigation return flow permits.

REGIONS I-X

- Provided funding and technical direction for the Muskegon County Wastewater Management System. This 10,000-acre soil treatment system is the largest of its kind in the United States and is providing valuable operating, design, and economic data applicable for the entire Nation.

REGIONS VII-X

- The National Conference on Irrigation Return Flow Quality Management provided the most up-to-date information available regarding the control of pollution from irrigated areas. Regional staff, state water control agencies, and "208" agency personnel were among the target audience.

REGIONS III-X

- Conducted "Toxic Compound Study for the Petroleum Refinery Industry" - A screening survey to determine the presence or absence of 129 toxic compounds in the intake, intermediary, and NPDES permit point at 12 BPTCA refineries. Each of the eight Regions visited were invited to participate in this National survey.

REGION VI, VII, VIII, X

- Conducting development of ammonia synthesis gas and ethylene process using cattle feedlots to fuel the system. These Regions have sufficient concentration of feedlots and animals to operate the system.

- Developing two irrigation management manuals of recommended practices: one addresses the Pacific Northwest (Regions VIII and X); the other the Central Plains (Regions VI, VII, and VIII).

WILLIAM C. GALEGAR

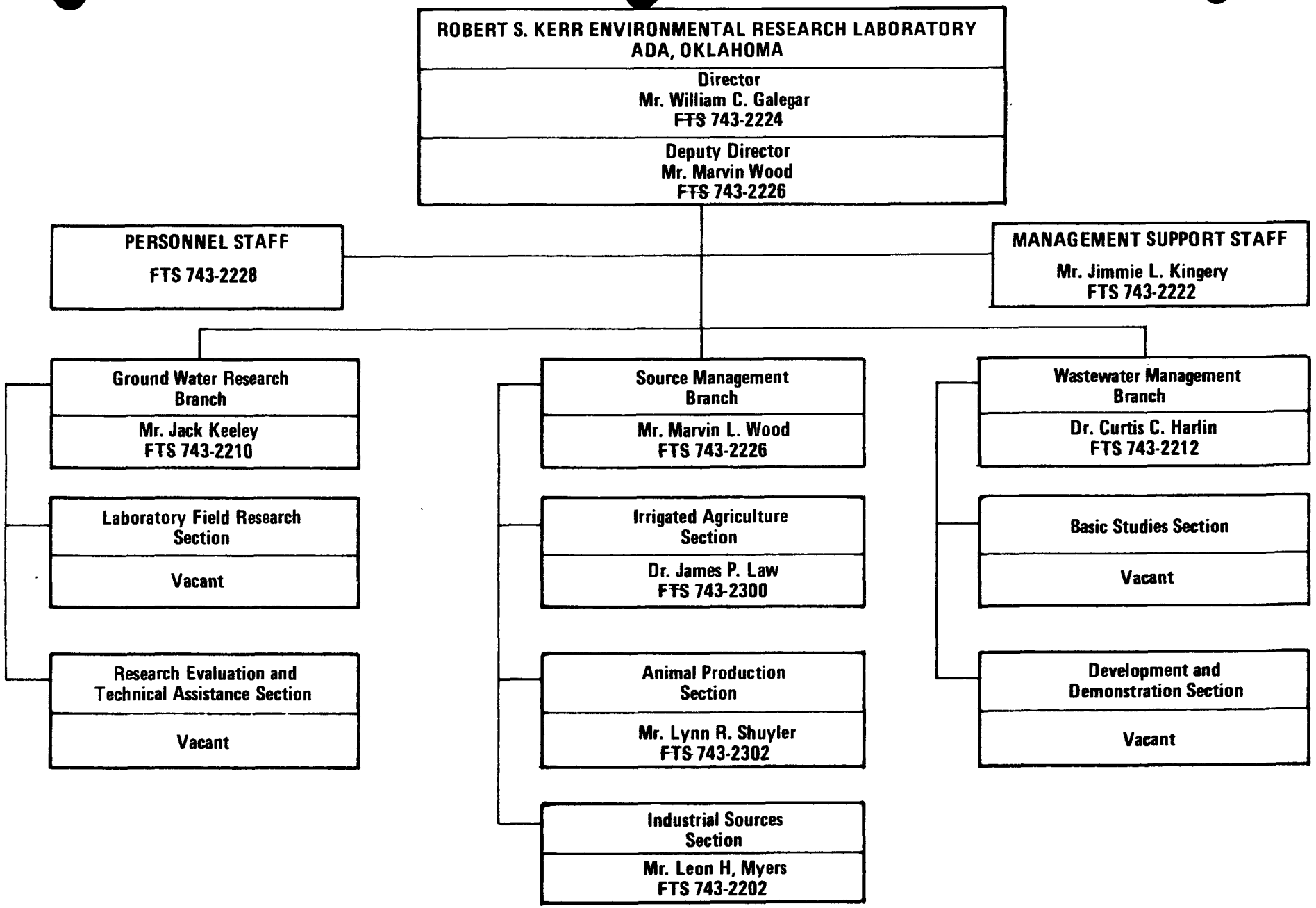
Director
Robert S. Kerr Environmental
Research Laboratory

Ada, Oklahoma

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

Professional Experience:
- Director, Robert S. Kerr, Environmental Research Laboratory, Ada, Oklahoma, 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
- Member, Sigma Xi



COMMERCIAL TELEPHONE NO. (405) 332-8800

March 1978

ENVIRONMENTAL RESEARCH LABORATORY

ATHENS

GEORGIA

ENVIRONMENTAL RESEARCH LABORATORY

ATHENS, GEORGIA

MISSION

Research and development on techniques to identify and measure environmental pollutants; determine their transport, transformation, and fate in soil and water; control their agricultural or silvicultural sources; and achieve water quality goals through the application of environmental systems models. 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 soils.
- Define and quantitate the individual microbiological, chemical, and physical-chemical processes that control the transport, transformation, and impact of pollutants in soil and water.
- Develop evaluative models that can aid in judging the environmental consequences if a specific contaminant were to reach some portion of a water-soil system.
- Develop methods for the control of pollution from agricultural or silvicultural sources.
- Develop effective analytical techniques for comprehensive basin-wide environmental management to achieve water quality objectives.
- Develop methods for assessing environmental exposures to toxic chemicals.

RESEARCH PROGRAM RESOURCE SUMMARY

($1,000's)

Program Area	FY-77 In-house	FY-77 Extramural	FY-78 In-house	FY-78 Extramural
1. Analytical Chemistry	1400	1300	1160	1120
2. Soil and Water Processes and Systems	1300	1600	1421	1125
3. Agricultural and Silvicultural Source Management	300	1300	444	1100
4. Watershed Management	300	700	415	455
5. Exposure Analysis Methods	0	0	120	250
TOTAL	3300 (120)	4900	3560 (111)	4050

( ) Manyears

PERSONNEL

Total Full-Time EPA Personnel = 83

- Professional = 53
- Non-Professional = 30

Professional Staff

	Bachelors	Master	Doctorate	Total
Biology	2	1	3	6
Chemistry	11	2	17	30
Ecology	0	0	2	2
Engineering	0	4	4	8
Other	4	2	1	7
	17	9	27	53

RESEARCH PROGRAM

1. Analytical Chemistry

- 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

- Define the individual environmental processes that control the fate of pollutants in soil 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 toxic materials to EPA regulatory offices and to the public.
- Construct and verify models of the environmental transport and effects of pollutants.
- Develop microcosm techniques to characterize pollutant behavior in laboratory ecosystems.
- Describe systems by which pollutants are transported and transformed through mathematical models as an aid in determining environmental consequences of a specific contaminant.

3. Agricultural and Silvicultural Source Management

- Produce 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 techniques for evaluating and minimizing water pollution problems from non-point sources.

4. Watershed Management

- Combine models of water quality, of pollutant sources, and of health and ecological effects of water pollution into water quality management schemes that achieve water quality goals.
- Develop tools and techniques for watershed managers in constructing feasible, cost-effective water pollution control strategies.

5. Exposure Analysis Methods

- Develop practical methods to evaluate and predict the transport, transformation, and fate of toxic chemicals in water and soil.
- Develop test protocols and decision rationale for assessing environmental exposure to toxic substances.

RECENT ACCOMPLISHMENTS

1. Demonstrated that singlet oxygen, a species that rapidly oxidizes certain water pollutants, is photochemically generated in natural waters.

2. Developed a protocol for analyzing industrial wastewaters for organic compounds identified as "priority pollutants."

3. Developed a prototype evaluative model, for vinyl chloride in aquatic systems, that includes interacting chemical, photochemical, microbiological, and physical processes.

4. Completed a series of guidelines manuals to help field professionals select appropriate, cost-effective controls for pollution from agriculture and silviculture.

5. Compiled a list of all of the 1300 organic compounds identified in water.

6. Developed a process-oriented, continuous model, the Agricultural Runoff Management model, to predict both water phase and sediment-bound chemical concentrations of pesticides and nutrients in runoff from cropland.

7. Revealed that organonitrates produce false-positive responses in the thermal energy analyzer method for nitrosoamines.

8. Developed techniques to predict rates of direct photochemical transformation of aquatic pollutants by the action of sunlight.

9. Analyzed the fate and impact of cadmium in artificial streams.

10. Developed easy-to-use hand calculation method for assessing water quality in basin-scale, non-designated 208 areas.

11. Developed a multiple land use, continuous model, called the Non-Point Source (NPS) model, to estimate pollutant loads from general non-point sources for area-wide 208 planning and load allocation.

12. Developed a computer-assisted high-probability spectral library for the rapid identification of newly encountered compounds.

13. Completed comprehensive non-point source loading function manual based upon the Universal Soil Loss Equation for use by 208 planners for multiple level use load situations and problem definition.

14. Developed practical techniques for rapid multielement analysis of drinking water.

15. Developed an electron microscope procedure for determining asbestos fibers in water that has gained almost universal acceptance by government and industry laboratories.

16. Completed data collection on a study of the influence of stream flow, turbulence, and temperature on nitrification in aquatic systems.

17. Completed investigations on the water solubility, volatization, and partitioning of Aroclors 1016 and 1242, two polychlorinated biphenyls.

18. Analyzed wastes from coal gasification and oil shale processing industries.

19. Applied qualitative analysis of systems to environmental decision making.

20. Presented workshops on estimating magnitude of pollutant loads in streams from non-point sources.

RESEARCH PROGRAM TRENDS

1. Develop physical and mathematical models for estimating environmental exposures for toxic organic chemicals.

2. Design a comprehensive monitoring system to determine the nature and extent of environmental contamination by toxic chemicals.

3. Intensify research to develop methods to identify and measure inorganic chemical species in water rather than just measuring the elemental composition.

4. Extend testing and verifying of the Agricultural Runoff Management model to coastal plain and cornbelt regions of the United States.

5. Determine the transport, transformation and fate of energy-related aquatic pollutants through integrated artificial-stream and mathematical modeling studies.

6. Direct increased attention to socioeconomic effects and implementation factors involved in achieving adequate controls for non-point sources and managing water quality.

7. Determine the effect of temperature changes and the synergistic effects of temperature and a trace contaminant on algal communities.

8. Develop techniques for predicting effects of natural substances in water bodies upon photolysis of water pollutants.

9. Develop empirical methods of predicting the degree of pollutant sorption on natural sediments.

10. Mathematically describe hydrolytic and oxidative reaction processes under environmental conditions for use in exposure assessment models.

11. Determine the kinetics of microbial transformations of toxic substances in natural waters and sediments and the reliability of laboratory-determined rate constants for predicting these transformations in natural systems.

12. Continue development, refinement, and field testing of non-point source and water quality models as tools for selecting Best Management Practices and for evaluating discharges of "consent decree" hazardous materials.

13. Develop comprehensive forestry management planning models for use by environmental planners and timber producers.

14. Define new more powerful mathematical techniques for modeling environmental systems.

15. Establish a capability to identify and measure possibly toxic trace constituents in new commercial products in which the major constituent is considered non-toxic.

FOREIGN PROGRAM

Country	Project Title	Completion Date	Amount
Bilateral Agreements			
US-USSR	Forms and Mechanisms by which Pesticides and Chemicals are Transported	Continuing	$ 25,000
France	Effect of Temperature Shocks on Algal Communities and of Toxic Organic Pollutants on Degredation Rates of Organic Substances	1978	200,000
Special Foreign Currency Program (PL-480)			
Egypt	Water Quality Studies on the River Nile and Lake Nasser	1979	$1,000,000

REGIONALLY RELATED PROJECTS

REGION II

- Developed a simple slide colonization technique for estimating the nitrifying capacities of attached bacteria.

REGION IV

- Florida - Completed extensive field evaluations of the effects of various tillage practices on subsequent pesticide and fertilizer losses in surface runoff and tile drainage from intensive citrus production operations in Florida flatwood soils.

- Louisville, KY - Analyzed sludge from the Louisville sewage treatment plant for trace elements and to confirm identification of organic constituents made by the Region IV Laboratory. Plant was shut down because of chemical contamination.

- Tennessee - The Aquatic Ecosystem Simulator is being used to study nitrification kinetics in support of a study of the Holston River.

- Conducted multi-element analyses on various samples to support regional enforcement activities. Electron microscopic examinations were made of particulate samples from air and water sources.

- Provides continuous assistance and cooperation with the Surveillance and Analysis Division, Region IV. Being housed in the same facility permits a unique degree of scientific and technical interchange between the two groups.

REGION V

- Great Lakes - Applied the Non-Point Source model to a comprehensive assessment of non-point source loadings to the Great Lakes, including a preliminary comparative evaluation of practical remedial control strategies.

- Terre Haute, Indiana - Completed study to confirm the tentative finding by Region V and NEIC of the presence of nitrosamines in drinking water.

REGION VIII

- Investigating nitrification rates in cold water environments in the Aquatic Ecosystem Simulator.

REGION X

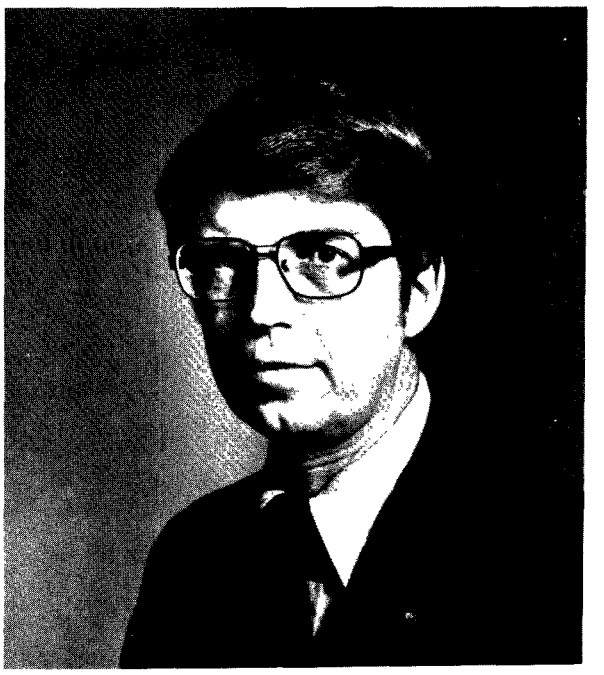
- Oregon - Completed detailed, restrospective economics and energy assessment of Willamette River clean-up project and compared three alternative clean-up strategies.

REGIONS II, IV, V

- Applied the Agricultural Runoff Management model to "regional" land types for use in evaluating various Best Management Practices in terms of their relative pollutant control effectiveness at the farm level.

DAVID WILLIAM DUTTWEILER

Director
Environmental Research Laboratory
Athens, Georgia



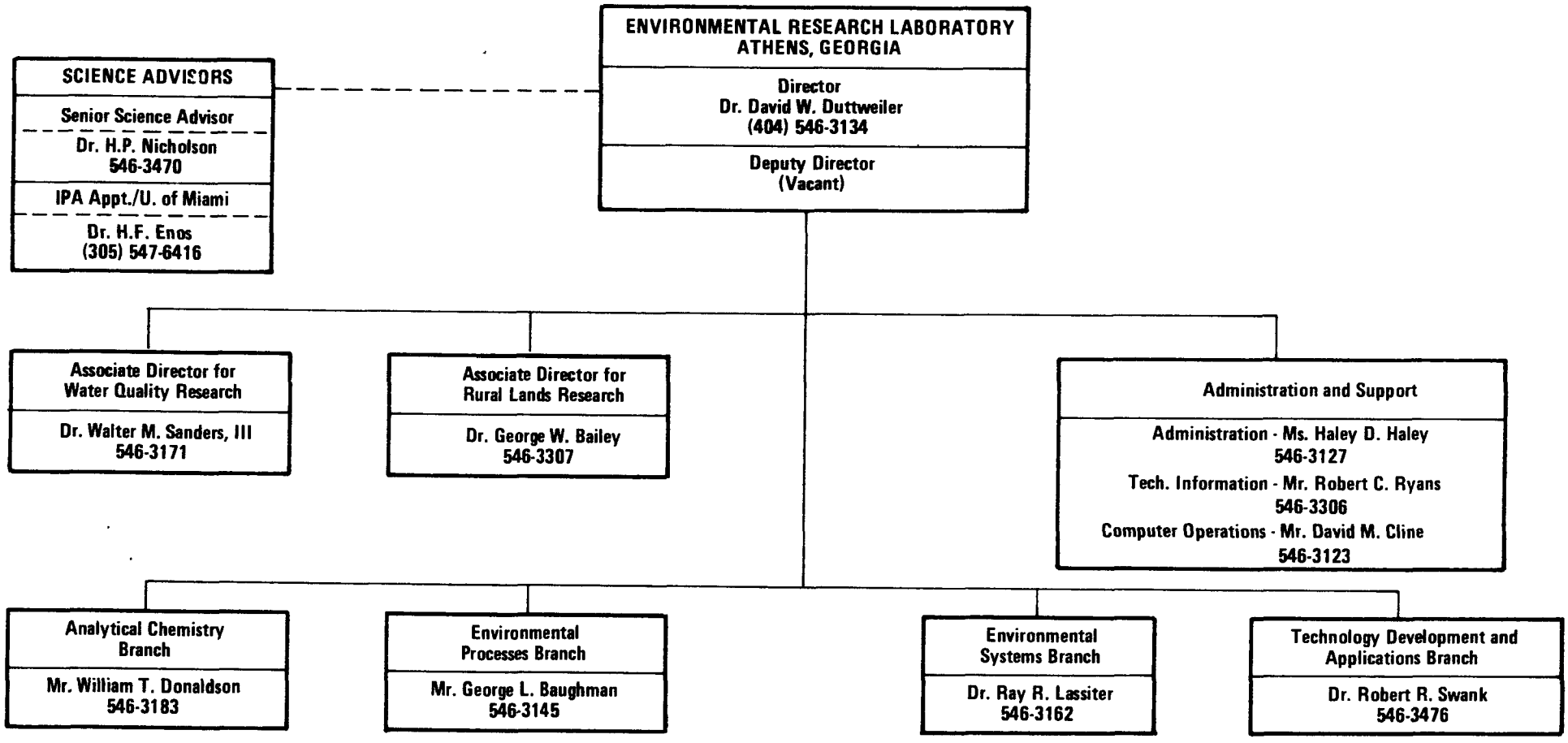
Education: University of Michigan, BSE (Civil Engineering), 1948
Johns Hopkins University, MSE (Sanitary Engineering), 1957
Johns Hopkins University, Ph.D. (Sanitary Engineering), 1963

Professional Experience: Director, Environmental Research Laboratory, Athens, Georgia. 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 Lt.), U. S. Army Engineer School, Ft. Belvoir, Virginia. 1949-1951
Structural Designer, T. H. McKaig Consulting Engineers, Buffalo, New York. 1948-1949

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

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
1977 Distinguished Service Award, Athens Area Chapter of Federally Employed Women, Inc.



FTS TELEPHONE NO. 250 + EXTENSION

March 1978

ENVIRONMENTAL RESEARCH LABORATORY

CORVALLIS

OREGON

ENVIRONMENTAL RESEARCH LABORATORY

CORVALLIS, OREGON

MISSION

Determine the effects of environmental pollutants on terrestrial, fresh water and marine ecosystems linking air, land and water. Knowledge gained is used to provide the scientific basis for establishing criteria, standards and regulations for air, land and water use. Specific areas of research concentrations are to:

- Determine effects of air pollutants on vegetation, animals, and total ecosystems.
- Determine effects of pollutants on aquatic plants and animals, including assessing the social and economic effects.
- Determine feasibility of restoring polluted or deteriorating lakes via construction of municipal waste treatment facilities to reduce the inflow of plant nutrients such as phosphorus and nitrogen; to include corrective measures for lakes with problem conditions as a consequence of diffuse nutrient sources and other pollutants.
- Assess the effects of non-point source water pollution such as runoff from croplands, forests, urban storm-waters, strip mining, and watersheds.
- Develop research criteria to delineate the boundaries of wetlands.
- Determine pollutant effects on plants and animals living in coastal and tidal areas, movement of pollutants through these ecosystems, and the degradation of pollutants.
- Develop and demonstrate innovative waste treatment and water conservation techniques in rural Alaska to improve community sanitation methods in cold climates, and at the same time enhance environmental health conditions.
- Assess ecological impacts of substitute chemicals utilizing terrestrial microcosms representing a practical, intermediate investigate level between the test tube and field studies; develop methods to determine pathways, effects and ultimate fate of selected substitute pesticides.
- Determine environmental effects of pollutants caused by extraction of coal and other energy resources, energy production, and energy transmission. Develop techniques for reclaiming land areas impacted by energy resource.

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

	Program Area	FY 77 In-House	FY 77 Extramural	FY 78 In-House	FY 78 Extramural
1.	Air Pollutant Effects on Terrestrial Ecosystems	$1,121	662	$1,024	(800)*
2.	Fresh Water Ecological Processes & Effects	2,475	300	2,440	320 (800)*
3.	Marine and Estuarine Ecological Processes and Effects	1,009	640	1,106	460
4.	Alaska Village Demonstration Program	158	158	50	235
5.	Substitute Chemicals Program	161	250	160	250
6.	Environmental Assessment Interface	50	-0-	30	20
7.	Effects of Energy Related Pollution Ecosystems	368	1,107	420	880
8.	Toxic Substances	-	-	60	-0-
9.	Effects of Land Application of Sludges	-	-	-	(250)*
10.	Program Support	610	-0-	640	-0-
	TOTAL	$5,952 (178)	$3,117	$5,930 (165)	$2,165 ($1,860)*

( ) Man Years
* Proposed Add-Ons

PERSONNEL

Total Full-Time Personnel = 133
- Professional = 104
- Non-Professional = 29

Professional Staff

Discipline	Bachelor	Master	Doctorate	Total
Biology/Agriculture	14	18	20	52
Chemistry	14	3	3	20
Engineering	8	3	4	15
Mathematics	0	1	1	2
Physical Sciences	4	2	4	10
Other	3	2	0	5
TOTAL	43	29	32	104

RESEARCH PROGRAM

1. Air Pollutant Effects on Terrestrial Ecosystem

- Determine the effects of air pollutants on plant and animal species, soil, whole ecosystems and components, and vital biological processes including transport, transformation and accumulation of pollutants and toxicity in natural food webs.

- Develop information necessary to support air qualtiy control strategies and standards.

- Measure acute and chronic effects of photochemical oxidants upon selected forest and agricultural ecosystems.

- Determine ecological effects of acid precipitation upon agricultural and non-agricultural ecosystems and their components; upon soil, soil biota, and soil fertility.

- Develop methodology to assess the economic impact of air pollutants on agricultural and silvicultural crops.

2. Fresh Water Ecological Processes and 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 controls. 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 costs and benefits of various lake restoration techniques.

3. Marine and Estuarine Ecological Processes and Effects

- Develop sampling guidelines for benthic, planktonic, fish and intertidal communities to provide data necessary for assessing pollution 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.

- Develop and apply techniques for exposing benthic microcosms to marine pollution under controlled laboratory conditions. Compare microcosm responses to the results of field surveys of community structure alterations.

- Determine the chemical-physical behavior and marine ecosystem responses to perturbations associated with municipal waste water discharges, diffuse source inputs and disposal of dredge spoils.

- 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.

o Develop, test and validate techniques for use in screening protocol to evaluate the impacts of harmful or toxic pollutants on the marine environment.

4. Alaskan Village Demonstration Program

- Demonstrate methods to provide central community facilities for safe water and elimination or control of pollution in rural Alaska.

5. Substitute Chemicals Program

- Develop a terrestrial microcosm ecosystem suitable for comparative measurements of ecosystem routes, rates of movement, sources and sinks of candidate pesticide chemicals.

- Assess the ecological effects of substitute pesticide chemicals using a suitable terrestrial microcosm ecosystem.

6. Environmental Assessment Interface

- Assist in the development and use of (1) decision criteria, (2) impact factors, and (3) bioassays (support to OEMI).

7. Effects of Energy Related Pollutants on Ecosystems

- Develop protocol to assess impact and effects of Western coal conversion activities on terrestrial ecosystems.
- Determine nature, loading, distribution and long-term effects of crude oil in Arctic and sub-Arctic environments.
- Evaluate current standards for petroleum discharges relative to impacts and effects on planktonic, benthic and intertidal organism on the West Coast.

8. Toxic Substances

- Develop screening methods for assessing the impact and effects of toxic materials.

9. Land Application of Treated Municipal Wastes

- Determine uptake of trace metal in plants grown on treated soils and the effects of microbial activity (i.e., nutrient cycling and decomposition) as resulting soil treatment.

RECENT ACCOMPLISHMENTS

1. 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 .02 ppm; at 0.06 ppm 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.

2. Distributed color maps which depict non-point source related concentrations of total phosphorus, total nitrogen and inorganic nitrogen in streams throughout the contiguous United States. (For use by 208 planning agencies.)

3. Evaluated relationships of stream nutrient levels to land use with equations for approximate national trends and regional differences.

4. Determined that with adequate buffer strips forest fertilization with urea has insignificant effects on small stream ecosystems.

5. Evaluation of three timber harvesting techniques on stream productivity shows no increased in productivity from clear-cutting.

6. Natural phosphorus supplies at Diamond Lake appear to be sufficiently great to offset significant effects of sewage diversion.

7. Zirconium tetrachloride is an efficient phosphorus inactivation agent, significantly reducing primary production in Cline's Pond during a two-year experiment.

8. Completed user's manual for determining chemical equilibrium. Manual will aid Regional Offices in determining pollution potential of chemicals in aquatic systems.

9. Identified seven chlorinated organic compounds in municipal wastewater. Each was tested for its effect on the growth of various marine phytoplankton. To date only one, 4-chlororesorcinol, had a deleterious effect.

10. Completed evaluation of heavy metals and nutrients introduced to the marine environment by dredge spoil material from the Duwamish River deposited in Elliott Bay, Seattle. Short-term increases were noted in ammonia, manganese, and suspended solid concentrations in the water column at the dump site. Increase was especially noticeable in the water near the bottom. No increases were noted for Hg, As, Cr, or NO_3-NO_2. After the disposal operation, there was an increase in Mn, sulfide, and ammonia in the sediment interstitial water which remained elevated for several months.

11. Evaluated methods to assess economic impact of crop losses caused by air pollution; initiated case study in Southern California.

12. Completed report, Impacts of Construction Activities in Wetlands.

13. Developing a field guide to estimating productivity of West Coast Marsh Plants.

14. Developing recommendations for vegetative criteria to establish wetland boundaries (by early 1978) in support of permits program for dredged and fill materials.

15. Evaluating Clean Lakes Demonstration Projects to determine effectiveness of various lake restoration techniques.

16. Established applicability of laboratory-developed microcosms to a wide variety of environmental programs dealing with the transport, fate and effect of toxic substances, pesticides and their substitutes.

17. Acute toxicity studies of cadmium, copper and zinc to salmon and Steelhead trout showed adults were no more susceptible than juveniles. Newly hatched fish were much more tolerant of cadmium and zinc than were older fish and steelhead were more sensitive than salmon.

18. Determined effect of forest logging practices and animal grazing on bacterial water quality. In clear-cut areas bacterial populations were 3-4 times those of undisturbed locations. When cattle were allowed on forests, bacterial populations were 2-3 times greater than ungrazed areas.

RESEARCH PROGRAM TRENDS

1. Determine the ecological effects of NPS pollutants and benefits of Best Management Practices beginning with sediments and nutrients.

2. Develop scientific base for stream standards emphasizing the non-steady nature of NPS loadings.

3. Develop regional approach that relates land use activity to NPS pollution problems.

4. Develop methodology for assessment of wetlands impacts to assist EPA permit personnel.

5. Refine productivity estimates on West Coast wetlands species.

6. Complete evaluation of selected Clean Lakes Demonstration projects.

7. Develop handbook to provide decision criteria for assessing the limnological, social, and economic impact of various lake restoration techniques.

8. Conduct demonstration study on economically important agricultural crops of the South Coast Air Basin, California, to relate air pollution damage to farm, local and regional economic loss.

9. Complete study of potential economic losses due to photochemical oxidants on the timber resources in the South Sierra Nevada Mountains, California.

10. A major effort has begun to improve the specificity of effluent criteria applicable to petroleum processing discharges based on sublethal responses of marine organisms. Two kinds of responses will be sought--chemical and biological. Chemical evidence includes bioaccumulation of specific organic constituents of the waste, or their metabolites, and changes in enzyme patterns. Biological responses will focus on parameters associated with function of the adulterated enzymes patterns, as well as conventional measures of organism health. In addition to the primary application to petroleum processing wastes, the techniques as well as the data will aid in regulation of other persistent organic compounds in municipal and industrial wastes considered to be harmful to the marine environment. Techniques employed will be evaluated for possible use in screening protocols for TSCA.

11. Develop acute and chronic methods for toxic substances screening.

12. Develop methods for detecting bioconcentration and other long-term effects of toxic substances.

13. Determine effects of stress on susceptibility of salmonid fishes to bacterial and viral diseases.

FOREIGN PROGRAM

Special Foreign Currency Program (PL-480)

Country	Project Title	Completion Date	Amount
Egypt	Systems Analysis of Mediterranean Desert Ecosystems of Northern Egypt	1979	413,957
Poland	Eutrophication Rate and Methods of Eutrophication Control in Water Reservoirs	1978	417,128
	Hydrological, Chemical and Physical Processes Affecting Pollution of the Baltic Sea	1977	334,600
	Biogenic Compound Balance of the Lake and Technical Possibilities of Prevention Against their Eutrophication	1977	413,755
Tunisia	Eutrophication Problems in Lake Tunis	1977	250,000

REGIONALLY RELATED PROJECTS

REGION I

- Berlin, N.H., Twin Mountain and Boston - Analyzed vegetation indigenous to mill and power plant at Berlin, New Hampshire, Twin Mountain and Boston to determine whether SO_2, acid mist and/or other pollutants were injuring plants in the area. No visible injury was observed. Analysis of the leaf tissue indicated the range of sulfur concentration from 1700-4300 ppm. Sulfur concentrations in leaf tissue greater than 2000 ppm indicates possible growth reduction from SO_2 exposure.

- Lake Champlain - Completed assessment of the trophic condition and phosphorus inputs to Lake Champlain. Project's results will aid Regional Office (which requested the assistance) in developing phosphorus control program for the Lake.

- Seabrook, New Hampshire - Participated in technical review of the 316a and 316b determination for the Seabrook Nuclear Power Plant. Review was used by the Administrator in his decision that the proposed cooling system does meet the test set forth in the law.

- Assisting Regional Office in review of the environmental impact of Dickey-Lincoln School Project. The project consists of two reservoirs created by impounding St. John River in Maine, for the purpose of power generation, pump storage and other multiple uses. The Laboratory is reviewing the hydrothermal math model and the analysis of physical hydraulic models.

REGION II

- Long Island, New York - Impact of Sewage Diversion on Fresh Water and Marine Resource; Alternative for Mitigating the Inputs. Extensive sewering of Cincinnati in Nisson and Suffolk Counties and subsequent discharge of the sewage through ocean outfalls has eliminated an important source of ground water recharge (septic tanks) and is resulting in lowered ground water table and reduced stream flows. The greatest potential environmental impact is increased salinity in Great South Bay which would endanger an economically significant commercial shellfish industry; change in fresh water ecology as well as social and economic benefit associated with the fresh water resource are also of concern. Assisting Regional Office in areas of: (1) modeling water quality in Great South Bay, (2) assessing impact of reduced stream flows on fresh water ecosystems, and (3) assessing social and economic costs and benefits associated with reduced stream flows and various alternatives for stream flow augmentation.

REGION III

- Assisted Regional Office regarding State of Maryland decision to approve EASTALCO request for increasing aluminum reduction by 50% at Buckytown plant. Review Maryland-proposed fluoride standards; prepared research protocol for one year field study.

REGION IV

- University of Miami - Grant to determine effects of domestic wastewater on fish, corals, and other sessile invertebrates in waters off Southeast coast of Florida. Research results will be used for establishing ocean outfall criteria, especially those relating to municipal sewage treatment type and degree, and to outfall location.

- Conducting studies to determine biogenic emissions of photochemical oxidant precursors from vegetation indigenous to central Florida. Completion scheduled for this fiscal year.

REGION VIII

- Poplar River Montana - Screened grain crops and indigenous vegetation for SO_2 sensitivity in controlled field plots at Corvallis. Effort is in reponse to Regional Office concern over Canadian coal-fired power plant near the United States border.

- Poplar River Project - Providing assistance as requested concerning this project. Of interest would be an evaluation of the integrity of the on-going modeling effort initiated by the State of Montana. To the Region, the model is a vital component of the environmental assessment of the Project.

- Provided evaluation of evaporation water losses that can be anticipated with the construction of a cool reservoir. An electric generation project proposed by the Saskatchewan Power Corporation impounds the East Branch of Poplar River (an international river) to form a cooling reservoir. Because the proposed dam will be located within five miles of the United States border, the project raises water quality concerns to the State of Montana and to the Regional Office.

REGION IX

- Lake County, California - Analyzing rainfall samples in connection with acid precipitation sampling network for geothermal Energy Projects. Lack of rainfall over past year has necessitated extension of the program through this winter season.

REGION X

- Duwamish River - Conducting study of the disposal of dredged Duwamish River sediment into Elliott Bay. Regional Office concern is with disposal of this dredged material to open water because of the potential release of PCB's, heavy metals and nutrients from this industrially impacted river sediment. Permit would be issued, the Regional Officed requested this evaluation prior to deciding on approval of disposal permit.

- Evaluating relative susceptibility of the various life stages and species of Pacific salmon and trout to cadmium, copper, and zinc. Emphasis is on broadening to develop adequate water quality criteria for these metals within one year. Related area is to determine effect of these metals and other pollutants; e.g., herbicides, on bacterial and viral disease susceptibility of fish indigenous to the Pacific coast.

- In conjunction with representatives from Region X, a grant was initiated with Dr. D. Winter, University of Washington, Department of Oceanography, in circulation and primary productivity in fiords. Application was primarily to Puget Sound, although the method applies to any fiord system. After the grant was concluded, a contract was awarded to the University of Washington to determine flow characteristics in deep stratified inlets. This was a direct spinoff of the above grant research and was funded by CERL at the request of Region X, the primary users of the grant and contract research.

- Assisting ADEC in design of a contract to assess effectiveness of various commonly available pre-heaters in reducing CO emissions to a safe and acceptable level. Cold start and warm up of vehicles at low air temperature is a major source of CO. Levels in Fairbanks often excess those at Los Angeles.

- Water Quality Criteria for Sediment - Assisting in developing a sediment criterion that is directly related to biological effects. Completed literature review on effects of suspended and dissolved solids on fresh water biota; completing second report that describes tentative methodology and criteria for lead load sediment to protect spawning areas for salmon and trout.

A. F. BARTSCH

Director
Environmental Research Laboratory
Corvallis, Oregon

Education: University of Minnesota, B.S.
University of Wisconsin, Ph.D. (Aquatic Biology) 1939

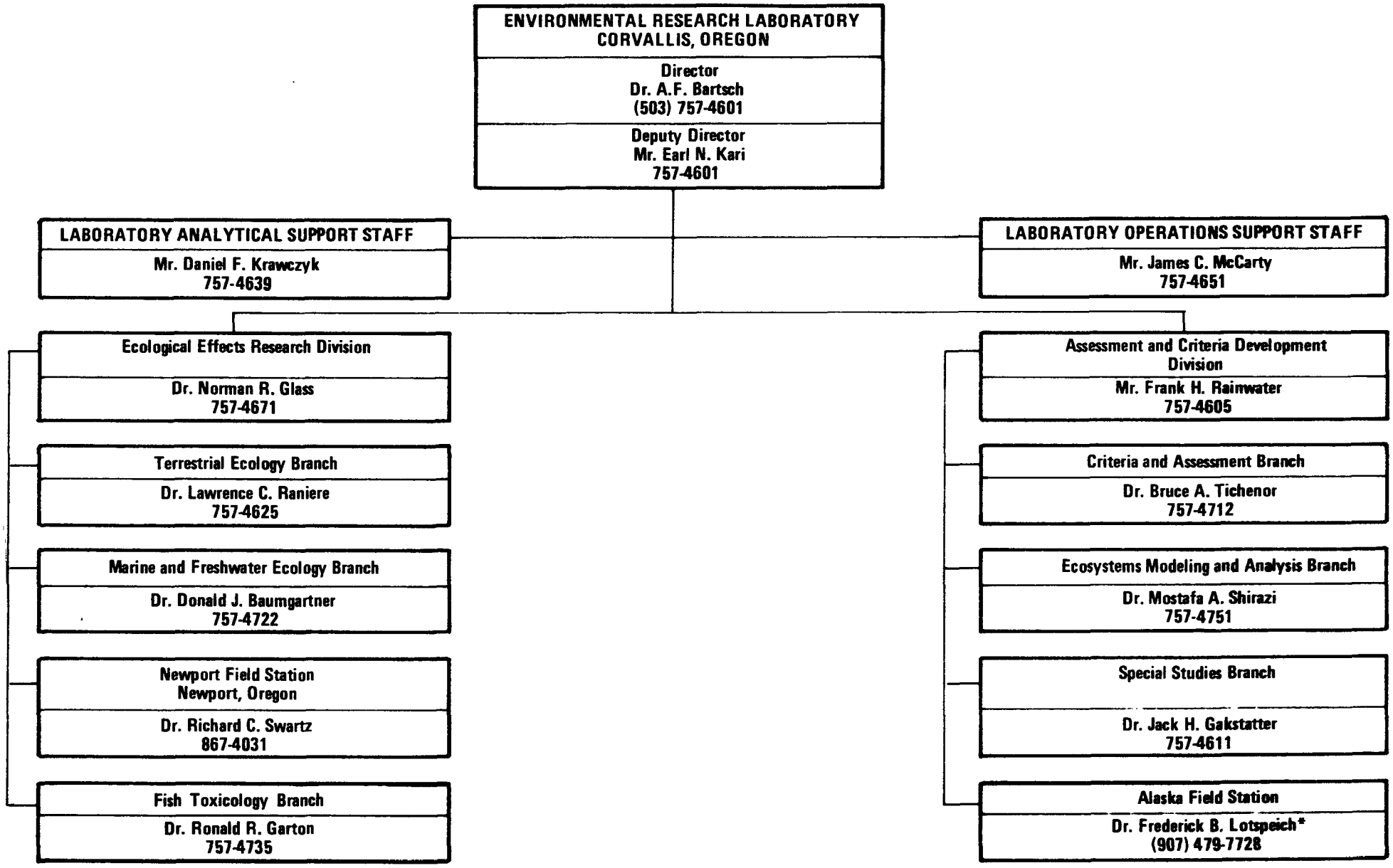
Professional Experience:

Director, Corvallis Environmental Research Laboratory
1975-Present
Director, National Environmental Research Center
Corvallis, 1971-1975
Director, Pacific Northwest Water Laboratory
Federal Water Quality Administration
1968-1971
Director of Research
Pacific Northwest Water Laboratory, 1964-1968
Chief, National Eutrophication Research Program
Pacific Northwest Water Laboratory
January 1968 to August 1968
Chief of Enforcement Activities
Division of Water Supply and Pollution Control
Federal Water Pollution Control Administration
1963-1964
Deputy Chief, Research Branch
Robert A. Taft Sanitary Engineering Center
U.S. Public Health Service
1954-1963
Biologist, Division of Water Pollution Control
U.S. Public Health Service, 1949-1954
Senior Biologist
State of Wisconsin Committee on Water Pollution
1945-1949
Assistant Professor, University of Wisconsin
1944-1945
U.S. Army Air Corps
1942-1944
Instructor, University of Wisconsin
1939-1942

Technical consultant (special water problems) to Brazilian Water Pollution Authority, health officials in Peru, Panama 1957
Chief of Party, field team investigating human poisoning (from poisonous fish) in the Trust Territory of Pacific Islands 1958
Consultant (freshwater biology) to the State of Guanabara, Brazil 1965
Member, international team assisting the Technological Center of Basic Sanitation, Sao Paulo, Brazil. May 1974

Professional Affiliations:
U.S. Co-Chairman of the Great Lakes Research Advisory Board of the International Joint Commission, U.S. and Canada 1974-1976
Member, Oregon Institute of Technology Environmental Advisory Committee 1975-Present
Member, Oregon State University Research Center Advisory Committee 1975-Present
Member, American Society of Limnology and Oceanography
Member, American Fisheries Society
Member, American Public Works Association
Member, Ecological Society of America
Member, American Institute of Biological Sciences
Member, American Association for the Advancement of Science
Member, American Institute of Fisheries Research Biologists
Member, International Association on Water Pollution Research
Member, Water Pollution Federation
Member, Federal Sewage Research Association
Member, Pacific Northwest Pollution Control Association
Member, Sigma Xi

Honors:
Thomas F. Andrews Prize, University of Minnesota, 1935
Gus A. Radebaugh Award, Central States Sewage and Industrial Wastes Association, 1948
U.S. Department of the Interior Honor Award for Meritorious Service, 1969



FTS TELEPHONE NO. 420 + EXTENSION

March 1978
*Acting

ENVIRONMENTAL RESEARCH LABORATORY

DULUTH

MINNESOTA

ENVIRONMENTAL RESEARCH LABORATORY

DULUTH, MINNESOTA

MISSION

Conduct research on biological and chemical effects of pollution on freshwater ecosystems, with specific responsibility for the effects of pollution on freshwater aquatic life.

Specifically the Laboratory:

- Studies the effects of toxic substances on freshwater biological systems
- Has primary research responsibility for describing fate and effects of pollution in the Great Lakes
- Advises EPA on freshwater toxicity
- Determines the effects of energy fuel cycles on freshwater systems

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

Program Area	FY 77 In-House	FY 77 Extramural	FY 78 In-House	FY 78 Extramural
1. Freshwater Ecological Processes and Effects	$3,348	1,833	$3,604	1,482
2. Fate and Effects of Synthetic Organic Compounds on Aquatic Ecosystems	150	68	150	70
3. Effects of Energy Related Pollutants on Organisms and Ecosystems	0	1,100	0	1,500
4. Development and Verification of Techniques for Evaluating Toxic Substances for Fate and Effects	0	0	135	0
5. Environmental Assessment Interface	0	0	100	0
Total	$3,498 (88)	$3,001	$3,989 (88)	$3,052

( ) Manyears

PERSONNEL

Total Full-Time Personnel = 86
- Professional = 59
- Non-Professional = 27

Professional Staff

Discipline	Bachelor	Master	Doctorate	Total
Biology	14	16	8	38
Chemistry	8	1	7	16
Engineering	1	2	0	3
Other	1	0	1	2
Total	24	19	16	59

RESEARCH PROGRAM

1. Freshwater Ecological Processes and 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 responses of complex freshwater systems to pollutant stress and the effects of freshwater ecosystems on pollutants.

   - Develop, evaluate and test short-term methods for the determination of hazards to freshwater organisms and ecosystems, resulting from the presence of toxic and hazardous substances.

   - Improve our ability to measure the toxic effects of wastes after treatment, especially those wastes receiving BPT or BDT and which are expected to contain toxics.

   - Characterize toxic pollutant problems of the Great Lakes, determine the dynamic processes affecting the pollution of large lakes, and develop management-oriented models for describing the fate and effects of pollutants in the Great Lakes.

2. Effect of Energy-related Pollutants on Organisms and Ecosystems

   - Monitor water quality and uptake of pollutants by aquatic organisms in areas affected by coal mining.

   - Verify the total environmental impact of coal-fired power plants on aquatic and terrestrial biota.

   - Evaluate the toxicity to aquatic organisms of pollutants originating from coal gasification, coal liquifaction and oil-shale extraction processing.

   - Determine the toxicity and bioaccumulation in aquatic animals of polynuclear aromatic hydrocarbons originating from energy-related wastes.

   - Evaluate the overall importance of entrainment of fish larvae through power plants and recommend siting locations to minimize adverse effects.

3. Fate and Effects of Synthetic Organic Pesticides on Aquatic Ecosystems

   - Determine acute and chronic effects of pesticides, singly and in combination, on freshwater organisms and ecosystem.

4. Ecological Effects of Substitute Pesticide Chemicals

- Develop and validate for use suitable laboratory and field methods for assessing the ecological effects of candidate substitute pesticide chemicals.

5. Development and Verification of Techniques for Evaluating Toxic Substance Fate and Effects

- Validate techniques, developed under other major research programs, which can be used to evaluate the fate and effects of toxic substances as required by the Toxic Substance Control Act.

6. Environmental Assessment Interface

- Determine, for single systems or processes, whether the system or process is environmentally acceptable or whether further control of waste streams is necessary. If necessary, estimate how much control is needed and which components are most important. Determine which systems or processes are environmentally preferable.

RECENT ACCOMPLISHMENTS

1. Completed a three year field study to measure the ability of laboratory bioassays to predict effects in a natural stream. The findings showed the predictions were good, giving EPA confidence that the present basis of predicting biological effects is good.

2. Demonstrated that the presence of pesticide in the food of fishes reduces the safe concentrations in the water. Such interactions have generally not been considered in estimating safe concentrations of toxicants.

3. Completed data gathering on Lake Ontario for the International Field Year for the Great Lakes, and developed an eutrophication model of Lake Ontario which enables managers to forecast lake response to different nutrient control strategies.

4. Found numerous residues of organic chemicals in Great Lakes fish and most recently identified polychlorinated styrene residues.

5. Provided the major support for the New York hearing regarding the discharge of PCB's by General Electric into the Hudson. Completed survey of PCB residues in approximately 54 major watersheds and notified four Regions of eight trouble areas.

6. Standardized several rapid bioassays that can accurately predict long term effects. Completed a simple chemical effluent test that can be used to find effluent components that will form residues.

7. Conducted a rapid assessment of the toxicity and bioaccumulation of three chlorinated cyclodiene insecticide intermediates, using recently-developed fathead minnow larvae-early juvenile short-term testing techniques.

RESEARCH PROGRAM TRENDS

1. Develop and refine the scientific basis for currently available short-cut and screening methods, so as to improve upon their generality and predictive capability.

2. Develop new short-cut and screening tests for freshwater biological and ecological effects.

3. Selectively validate laboratory-derived water quality criteria in natural and seminatural freshwater ecosystems.

4. Investigate the interactions of fine particles (such as clay, silt and asbestos) with organisms, and the effects of particulate matter and other water quality characteristics on the toxicity of pollutants.

5. Develop and refine methods for directly measuring or integrating the combined toxicity to aquatic organisms of complex effluents which vary both in composition and concentration over time.

6. Extend the application of screening methods, simulation techniques, and baseline research toward assessing the fate and effects of pollutants in the Great Lakes.

7. Determine the total environmental impact of coal-fired power plants on aquatic and terrestrial biota, and evaluate the potential impact on aquatic ecosystems of coal gasification, coal liquifaction, and oil shale extraction and processing.

FOREIGN PROGRAM

Country	Project Title	Completion Date	Amount
Union of Soviet Socialist Republics	Effects of Pollutants upon Aquatic Organisms and Ecosystems; Development of Water Quality Criteria	1982	$30-50,000/year

REGIONALLY RELATED PROJECTS

REGIONS I, II, IV, V

- Provided the major support for the New York hearing regarding the discharge of PCB's by General Electric into the Hudson. Completed a survey of PCB residues in approximately 54 major watersheds and notified four Regions of eight trouble areas.

REGIONS II, V

- Completed data gathering on Lake Ontario for the International Field Year for the Great Lakes, and developed an eutrophication model of Lake Ontario which enables managers to forecast lake response to different nutrient control strategies.

- Found numerous residues of organic chemicals in Great Lakes fish and most recently identified polychlorinated styrene residues.

REGION IV

- Conducted a rapid assessment of the toxicity and bioaccumulation of three chlorinated cyclodiene insecticide intermediates, using recently-developed fathead minnow larvae-early juvenile short-term testing techniques.

DONALD I. MOUNT, PH.D.

Director
Environmental Research Laboratory
Duluth, Minnesota

Education: Ohio State University, B.S. 1953
Ohio State University, M.S. 1957
Ohio State University
Ph.D. (Physiology & Toxicology) 1960

Professional Experience: Director, Environmental Research Laboratory
USEPA 1967-Present
Chief, Newtown Fish Toxicology Station
A. Taft Sanitary Engineering Center
Cincinnati, Ohio, USPHS 1960-1967

Professional Affiliations: U.S. Chairman of Research Advisory Board
International Joint Commission 1976-Present
Member of Board of Directors
Lake Superior Basin Studies Center 1975-Present
Member, American Fisheries Society
Washington, D.C. 1956-Present
Member, Water Pollution Control Federation
Washington, D.C. 1960-Present
Member, American Association for Advancement of Science
Washington, D.C. 1960-Present
Project Leader, U.S.-U.S.S.R. Cooperative Agreement
on Environmental Matters 1973-1977
Member, National Technical Advisory Committee to
Secretary of Interior for Aquatic Life 1966
Chairman, Lake Michigan Toxic Substances Committee
1969-1974

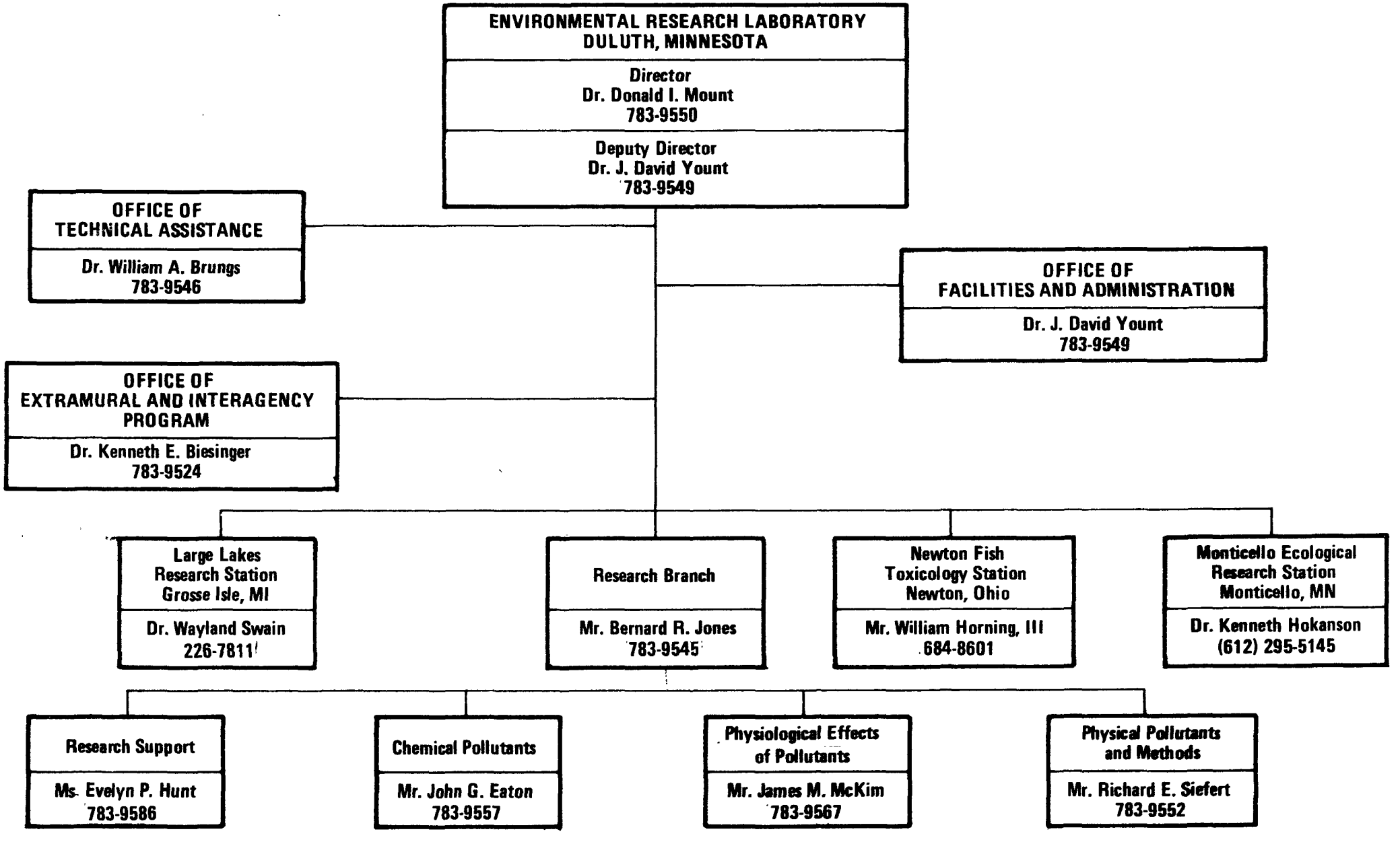
Honors: Environmental Protection Agency Gold Metal for
Exceptional Service-1973, for "his selfless
dedication and outstanding leadership, both as
a scientist and as an administrator, contributing
to the successful accomplishment of EPA's water
quality research.

Environmental Protection Agency Superior Service Award-1965, for "meritious contributions to public health through the development of methods of analysis of endrin as a cause of fish kills on the Mississippi River.

Elected as fellow in the Ohio Academy of Science-1963, for professional service in research.

Environmental Protection Agency Bronze Metal for Commendable Service-1976, for assistance in providing the U.S. District Court with evidence which proved the widespread distribution of pollution created by the discharge of taconite tailings into Lake Superior from the Reserve Mining Company.

Environmental Protection Agency Civil Servant of the year-1965, from the Federal Business Association, Cincinnati, Ohio.



COMMERCIAL TELEPHONE NO. (218) 727-6692

March 1978

ENVIRONMENTAL RESEARCH LABORATORY

GULF BREEZE

FLORIDA

ENVIRONMENTAL RESEARCH LABORATORY

GULF BREEZE, FLORIDA

MISSION

Conduct research on ecological systems; particularly, determine exposure-effects relationships in marine, coastal, and estuarine ecosystems of hazardous organic and inorganic pollutants. This information is required by the EPA pesticide registration and control program and for the development of water quality criteria designed to protect man and aquatic life in marine, coastal, and estuarine environments. Determine ecological impact of pollutants, both singly and in combination, derived from energy extraction, conversion, transmission, and use. Develop baseline information and technical methodologies to assess potential effects of energy resource development. Specific activities are to:

- Develop information essential for the EPA pesticide registration and control program and for development of EPA Water Quality Criteria.
- Investigate effects of halogenated organics on marine and estuarine ecosystems.
- Assess problems associated with coastal and estuarine ecosystems characteristic of South Atlantic and Gulf of Mexico areas.
- Determine effects of long term, low level, exposure of pollutants, singly and in combination, on marine and estuarine community structure and ecosystem dynamics; determine fate of these chemicals within the system.
- Assess pollutants which could reach man through bioconcentration in marine and estuarine food chains.
- Determine impact on marine and estuarine ecosystems of the extraction, transportation, and processing of petroleum and related products.

RESEARCH PROGRAM RESOURCE SUMMARY

($1,000's)

Program Area	FY-77 In-house	FY-77 Extramural	FY-78 In-house	FY-78 Extramural
1. Base Pesticides	1,555	107	1,660	0
2. Substitute Chemicals	230	41	150	120
3. Water	302	442	90	160
4. Energy	243	1,255	365	385
5. Industrial	39	23	100	0
6. TOSCA	0	0	135	0
7. Air Carcinogen	0	0	40	110
8. Support	278	0	296	0
TOTAL	2,647 (101)	1,868	2,836 (117)	775

( ) Manyears

PERSONNEL

Total Full-time EPA Personnel = 50

- Professional = 27
- Non-Professional = 23

Professional Staff

	Bachelor	Master	Doctorate	Total
Biology	4	6	8	18
Chemistry	3	1	3	7
Electrical Engr.	1			1
Oceanography			1	1
Total	8	7	12	27

RESEARCH PROGRAM

1. Impact of Synthetic Organic Compounds on Aquatic Ecosystems (Base Pesticide Program)

   - Determine effects of biocides and disinfectants on estuarine ecosystems.

   - Determine community response to chemically-subdetectable levels of biocides added under natural conditions of season, weather, sunlight and precipitation.

   - Determine both lethal and sublethal effects of toxic organic compounds on individual species and communities of marine and estuarine organisms.

   - Develop procedures to determine the effects of organic pollutants on ecosystem processes and regulating mechanisms and, using these tests, obtain data on ecosystems effects of important pesticides and other toxic organic contaminants.

   - Determine effect of pollutants on microbial activities at the air-water and sediment-water interfaces and the ecological significance of these effects.

   - Determine degree and significance of microbial transformation of selected pollutants.

   - Determine direct effect of potential carcinogenic, mutagenic, and teratogenic substances on estuarine and marine organisms and ecosystems.

   - Develop the use of aquatic species as indicators of the presence of environmental carcinogens, mutagens, and teratogens in aquatic food chains that ultimately affect man.

   - Develop the use of certain biochemical reactions as indicators of physiological stress.

2. Effects of Energy-Related Pollutants on Organisms and Ecosystems

   - Determine acute and chronic toxicological effects on freshwater, marine/estuarine, and terrestrial organisms (and the resultant ecosystem impacts) from pollutants released from energy resource activities (extraction, conversion, transmission, and use.)

3. Ecological Effects of Substitute Pesticide Chemicals

   - Determine the suitability of substitute chemicals which may replace those pesticides that have been suspended, cancelled, are in litigation, or are under review.

- Determine impact of substitute chemicals in the environment.

4. Marine and Estuarine Ecological Processes and Effects

- Develop "Mobil bioassay" techniques for environmental evaluation of effluents at industrial sites.
- Develop methods system for evaluating new treatment technologies in a pilot plant operations.
- Provide information on the effects on estuarine ecosystems of ozone and other chlorine substitute processes.
- Develop ecosystem models of benthic environments.
- Develop a single species bioassay procedure to assess ecological impact of dredge material disposal.
- Determine dynamics of polluted and unpolluted estuarine ecosystems.

5. Air Exposures and Their Effects: Assessment of the Contribution of Environmental Factors to Occurrence of Cancer in the General Population

- Determine reliability of aquatic species as indicators of carcinogens and the role of these pollutants in affecting living systems.

6. Toxic Substances Control Act

- Modify existing methods and develop new rapid screening methods to assess the toxicity of materials.

7. Environmental Assessment Interface and Research Studies

- Assist Environmental Assessment Program in development, use and interpretation of: Decision Criteria, Impact Factors, and Bioassays.

RECENT ACCOMPLISHMENTS

1. Provided much of the information in the marine toxic organic section of Water Quality Criteria, published in 1972 by the National Academy of Science,and for EPA's Quality Criteria for Water.

2. Assist Office of Pesticide Program in its registration and reregistration program; provide information for the caution label of particular pesticides.

3. Provided expert testimony for the Agency's various judicial proceedings concerning pollutants such as: DDT, Endrin, Chlorodane, Polychlorinated Biphenyls, Kepone, and various industrial wastes to be disposed of through ocean dumping.

4. Conducted emergency research on the effect of Kepone on the James River/ Chesapeake Bay organisms and environment.

5. Assisted Regional Office staff on specific regional pollution problems such as: ocean dumping permits - Regions II and IV; pollution problems in Escambia Bay Florida - Region IV.

6. Developed new techniques to determine effect of pollutants on sensitive life-stages of marine fishes and invertebrates.

8. Developed techniques for measuring effect of substitute chemical pesticides on marine microcosms and ecosystems.

RESEARCH PROGRAM TRENDS

- As pesticide usage patterns are changing so are, research objectives changing. Research is moving from acute tests with single species to chronic or entire life cycle of indicator species. Criteria for effects are now emphasizing sublethal rather than strictly lethal effects. Studies are moving from single species to multiple species involving communities of organisms. Research scope is expanding to include effects of complex industrial and municipal wastes as well as other toxic organics. Fewer tests are being conducted on organo-chlorine pesticides, and more on "third" generation ones such as juvenile hormone mimicks, viruses, etc.

REGIONALLY-RELATED PROJECTS

REGION II

- Provided expert testimony and toxicity data in the suit against General Electric concerning the release of PCB's into the Hudson River.

REGION III

- Evaluation of the ecological impact and potential methods for mitigating the Kepone problem in the James River Estuary. Significant research results on the fate and effects of Kepone were presented at a workshop in Easton, Maryland, September 1977. Investigations will be integrated into a predictive mathematical model on the fate of Kepone in the estuary.

REGION VI

- Provided assistance to Regional Office concerning investigation of effect of leptophos on the marine environment. Developed toxicity data on the effects of leptophos on embryo-fry stages of an estuarine fish and mysid shrimp.

MULTI-REGIONS

- Cooperated with several regions in developing bioassay methods for evaluating ocean dumping. Helped develop techniques and data for Regional Offices (permits) concerned with effluents and drilling muds related to offshore oil development.

DR. THOMAS W. DUKE

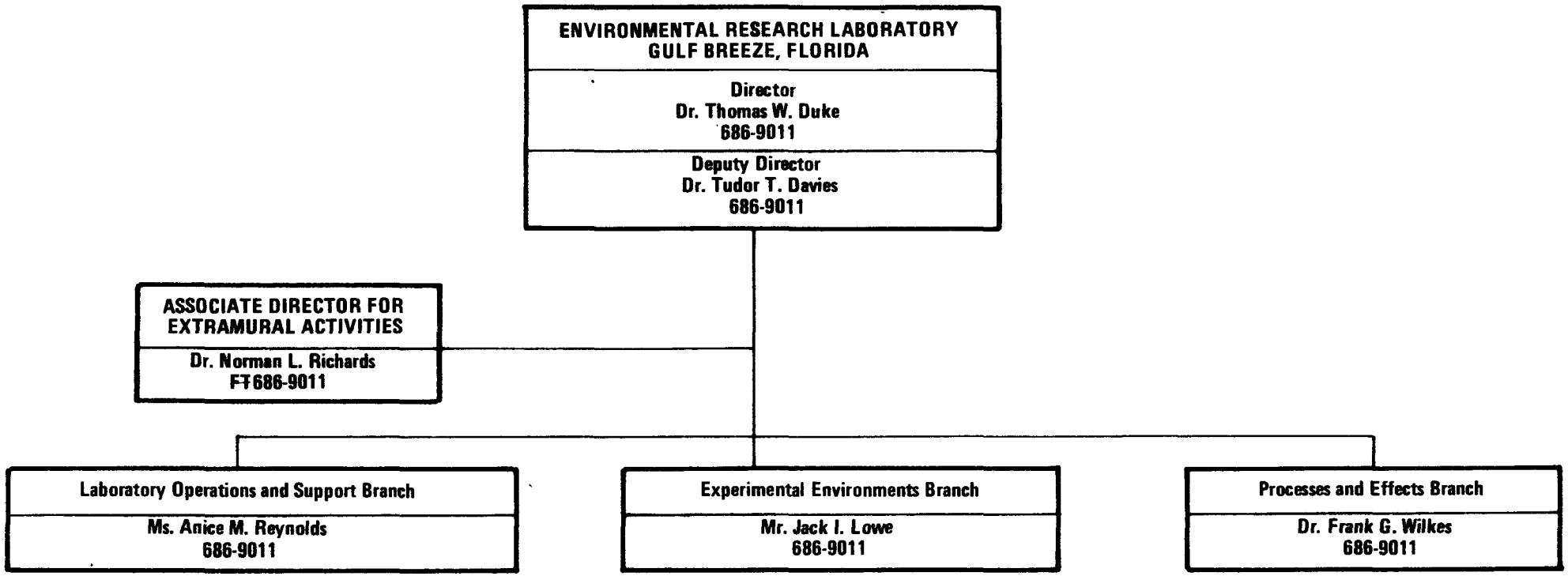
Director
Environmental Research Laboratory
Gulf Breeze, Florida

Education: Texas A & M University, B.S. 1953
Texas A & M University, M.S. 1960
Texas A & M University, Ph.D. (Oceanography) 1962
Oakridge Institute of Nuclear Studies, 1965, Radiosotope Techniques

Professional Experience: Director, Environmental Research Laboratory, EPA, Gulf Breeze, Florida, 1970 - Present
Station Chief, RBL (Beaufort, N.C.), Gulf Breeze, Florida, 1968-1970
Assistant Laboratory Director, RBL, Beaufort, N.C., 1966-1968
Chief, Pollution Studies Program, RBL, Beaufort, N.C., 1962-1966
Project Leader, Experimental Environments, Radiobiological Laboratory, Bureau of Commercial Fisheries, U.S. Fish & Wildlife Service, Beaufort, N.C., 1961-1962
Research Assistant, Texas A & M University, 1960-1961

Professional Affiliations: American Association for the Advancement of Science
Association of Southeastern Biologists
Atlantic Estuarine Research Society
Ecological Society of America
Gulf and Caribbean Fisheries Institute
Society of Limnology and Oceanography
Carolina Oceanography Club, President, 1965-1966
The Society of Sigma Xi

Honors: Gold Medal for Exceptional Service, U.S. Environmental Protection Agency, 1975
Bronze Medal for Commendable Service (Unit Award), U. S. Environmental Protection Agency, 1974
Outstanding Performance Award, Bureau of Commercial Fisheries, U. S. Department of Interior, 1969
Adjunct Professor of Biology (Marine Science), University of West Florida, Pensacola, Florida, 1968-Present
Adjunct Associate Professor, Zoology Department, North Carolina State University, 1965-1968.



COMMERCIAL TELEPHONE NO. (904) 932-5311

March 1978

ENVIRONMENTAL RESEARCH LABORATORY

NARRAGANSETT

RHODE ISLAND

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 monitoring pollutant buildup and movements in marine systems
- Methods of determining the impact of specific pollution incidents.

RESEARCH PROGRAM RESOURCE SUMMARY

($1,000's)

	Program Area	FY-77 In-house	FY-77 Extramural	FY-78 In-house	FY-78 Extramural
1.	Marine Ecosystem Research Laboratory	0	980	0	980
2.	Ecosystems Analysis	262	260	275	180
3.	Bioassay Methods	520	0	550	0
4.	Analytical Methodology	520	0	549	0
5.	Mussel Watch	22	356	23	0
6.	Oils	195	115	206	0
7.	Response Parameters	151	127	160	0
8.	Genetic Toxicology	258	0	273	0
9.	Ocean Disposal	226	124	239	0
10.	Culture	164	29	174	0
11.	Histopathology	110	0	116	0
12.	CEAS	109	0	115	0
13.	Support	369	0	379	0
	TOTAL	2906	1991	3059	1160

( ) Manyears

PERSONNEL

Total Full-time EPA Personnel = 58

- Professional = 34
- Non-professional = 24

Professional Staff

	Bachelor	Master	Doctorate	Total
Biology	7	5	9	21
Chemistry	0	2	7	9
Engineering	1	0	0	1
Geology	2	0	2	4
Oceanography	1	1	2	4
	11	8	20	39

RESEARCH PROGRAM

1. Marine Ecosystems Research Laboratory

   - 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.

2. Ecosystems Analysis

   - Examine the response of interdependent groups of organisms to pollutant stress by creating a microcosm model of the marine ecosystem.

   - Develop laboratory-sized ecosystem that replicates the natural system in structure and function. Use the ecosystem to predict effect of pollutants in nature and translate these results into meaningful water quality criteria.

3. Bioassay Methods

   - 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.

4. Analytical Methodology

   - 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.

   - Acquired ability to measure transuranic elements.

5. 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 sea water.

- Determine baseline levels of organic and metalic 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.

6. Oils

- Develop scientific criteria for acceptable levels of petroleum hydrocarbons in marine/estuarine water, sediment and biota.

- Examine sublethal responses and biological uptake from chronic and massive oil pollution under laboratory and field conditions. Use this information to indicate impacts of minute amounts of both fractions of oil and whole oil on all life stages of a broad spectrum of marine animals.

7. Response Parameters

- 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.

8. Genetic Toxicology

- Assess genetic toxicology of specific compounds or mixtures via short-term tests with mammalian cell systems. Evaluate potential impact of genetic toxicants on the genetic integrity of natural populations.

9. Ocean Disposal

- Conduct multi-disciplinary effort aimed at the development of standard methods to assess the environmental consequences of open marine disposal of municipal sewage and sludges, 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.

10. Culture

- 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.

11. Histopathology

- 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.

12. 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.

RECENT ACCOMPLISHMENTS

Significant contributions in methods development for approaching diverse problems in marine pollution, leading the Nation in marine animal bioassay, culture and response to chronic toxicant exposure. Water Quality Criteria have been generated as spin-off from methods development.

1. Developed a suite of bioassays, together with supporting culture and holding techniques, which are applicable to a wide spectrum of needs including assessment of dredge spoil, toxic substances and effluents.

2. Regional interagency workshops are developing Regional Oil Spill Damage Assessment plans.

3. Nationwide biological monitoring program ("Mussel Watch") has identified in coastal waters several localized "hot spots" of PCB's and of DDT and its degradation products.

4. Published comprehensive report documenting the effects of oil in the marine environment.

5. Developed useable criteria regarding thermal additiona to marine waters.

6. Established functional meso-scale ecological effects testing facility which is presently being used in studies of impact of petroleum hydrocarbons.

7. Provided field and laboratory data and expert testimony critical to a decision favorable to the Agency in the case of Philadelphia sewage sludge disposal.

8. Conducted studies in local waters which have confirmed the positive value of biological monitoring techniques in following the uptake, biomagnification and transport of pollutants.

RESEARCH PROGRAM TRENDS

1. Technology Transfer

The transfer of research results, especially in the development of methods, has been characterized by a lack of control, once methodology is established. Publication in the open literature, and in EPA Ecological Series, is rather like throwing seeds to the wind. One significant need emerges from this problem in the research program:

- Establish a toxicological testing laboratory in which data in support of Agency needs may be generated in a controlled manner for application to pertinent problems. ORD Laboratories do not have the in-house resources to "crank-out" numbers in support of a controlled data base once a method has been developed by the laboratory. Entropy at this point in our system is rampant.

2. Energy

The Laboratory has devoted significant efforts toward the environmental aspects of energy needs, especially in the areas of thermal effects and oil in the marine coastal systems. Trends related to growing needs to solve energy problems are:

a. Establishment of an Oil Spill Assessment Team to approach this problem on a national level as a controlled and cohesive response to such an event as the Argo Merchant spill. The EPA arm of the National Oil Spill Assessment Team is coordinated from this Laboratory which optimizes direct technology transfer to an immediate need, and in turn generates an influence on the research direction of that program.

b. Transuranics in the Marine Environment - With growing interest and controversy in expansion of nuclear power generation an objective data base is needed to identify the scope of problems arising from introduction of transuranics into marine systems, and especially into marine food chains that directly support man's shrinking nutritional base. A comprehensive research plan is being implemented in the Laboratory in FY-78 work plans.

c. Increased use of Coal - The need to assess airborne contaminants as they enter marine systems through the air/water interface. The Laboratory, which has no on-going research in this area can respond to this need if sufficient resources are provided.

d. Liquid Natural Gas - An area of potential concern is the cooling of coastal waters that occurs from coastal facilities for the transfer and storage of LNG. The problem is highly localized and deserves a relatively low priority in research needs. It is known, however, that marine animals are much more readily adapted to withstand sudden temperature rises than they are to withstand sudden cooling.

3. Coastal Marine Monitoring

The Agency is responsible to maintain an awareness of the quality of marine coastal systems and to recognize geographical areas and classes of pollutants that show evidence of supporting degradation. The Kepone incident in Chesapeake Bay emphasizes this problem. Primary need of this research direction is for a long-term commitment by the Agency in this area.

- Mussel Watch - Continue this national monitoring system for chemical contaminants characteristic of open coastal areas.

- Coastal Environmental Assessment Studies (CEAS) - Continue and expand this activity to include several Standard Assessment Stations located around the country against which change due to existing or future anthropogenic activities may be measured on a legally-viable basis. NOAA has instituted a similar network of standard offshore reference stations.

5. Ecosystems Studies

Investigate beyond the single organism or individual population approach to establish effects of man's activities on marine systems. Determine the ability of a marine system to recover from a major stress: How far can a portion of a coastal area be damaged before it looses its resiliency or ability to return to a productive level indigenous to that system?

REGIONALLY RELATED PROJECTS

REGION I

- Brayton Point, Massachusetts Power Plant - Assisted Regional Office, State of Massachusetts, local and private interests in the design of a monitoring program for the Brayton Plant. Assisted Regional Office in providing a legal resolution between Brayton Point operations and Massachusetts water quality standards.

- Seabrook Power Plant, N.H. - Prepared and presented expert testimony, and otherwise assisted Regional Office with biological and legal impacts of Seabrook construction for subsequent hearings and appeal proceedings. Helped develop conditions for the discharge permit and monitoring.

- Charlestown, Rhode Island Nuclear Power Plant - Assisted Regional Office in evaluating the proposed Charlestown, Rhode Island site. Assisted in negotiating research and monitoring programs for the NE Power/Yankee Atomic Co.'s 316 demonstration for Charlestown.

- R.I. Water Quality Standards - Presented expert testimony at the State of Rhode Island hearings on the State water quality standards, and at a subsequent hearing on revised standards. Much of the testimony was incorporated into the State's promulgated standards.

- Fall River--Brown's Ledge - Provided advice and information to both Regional Office and private interests on the impact of dredging Fall River Harbor and subsequent offshore dumping of dredge spoils on Brown's Ledge.

- Pilgrim Power - Assisted Regional Office in decision-making for Pilgrim Power Plant operations.

- N.E. Regional Commission on Outer Continental Shelf: Advised Headquarters and Regional Office on the possibility of developing the Georges Bank area for oil; presented expert testimony at N.E. Regional commission hearings.

- Newington Power Plant - Reviewed for Regional Office Newington's monitoring studies and reports and evaluated feasibility of reducing monitoring requirements and adequacy of Newington's 316 demonstration.

REGION II

- Argo Merchant Oil Spill - Coordinated all early research efforts concerning the massive oil spill resulting from the grounding of Liberian tanker, Argo Merchant, in December 1976. Assisted NOAA and U.S. Coast Guard efforts and coordinated all early field assessment endeavors. Have funded a NOAA project for a final environmental report of the Argo spill.

- Hudson River Oil Spill - Assisted Regional Office with the ecological assessment of a Hudson River (New York) oil spill. ERL staff were working in conjunction with Regional Office, and NOAA staff in this regard.

REGION III

- Calvert Cliffs, New Jersey Power Plant - Provided expert testimony on a request by Calvert Cliffs for a waiver of 316 (a) (b) requirements at an adjudicatory hearing held by the State of Maryland.

- Dupont Ocean Dumping - Provided expert advice and testimony on the possible impacts of waste disposal by the Dupont Company.

- Philadelphia Ocean Dumping - Assisted Regional Office in resolving issues surrounding the ocean disposal of sewage-sludge by the City of Philadelphia. Extensive offshore research studies by ERL's Ocean Disposal Research Team were fundamental in the preparation and presentation of testimony used to support EPA's position in hearings and litigation vs. Philadelphia. This effort resulted in landmark ocean disposal determination for the United States.

REGION IV

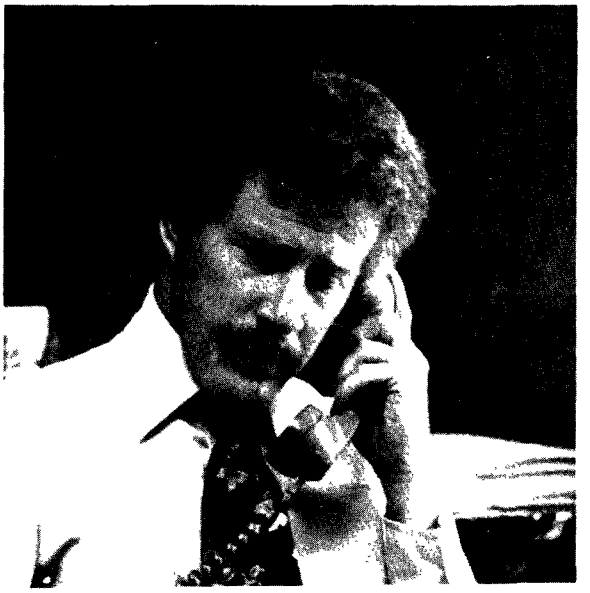
- Brunswick Power Plant - Responded to request by Region IV for expert assistance operating conditions for the Brunswick Power Plant. Assisted Regional Office in review of data and in preparation for adjudicatory hearings; provided expert testimony at these hearings.

REGIONS I, II, III, IV, VI, IX, X

- Conducting Regional Oil Spill Assessment Workshops in conjunction with NOAA, DOI, USCG, in all coastal regions to implement the Regional Response plans pursuant to Section 301 of PL 92-500.

ERIC D. SCHNEIDER

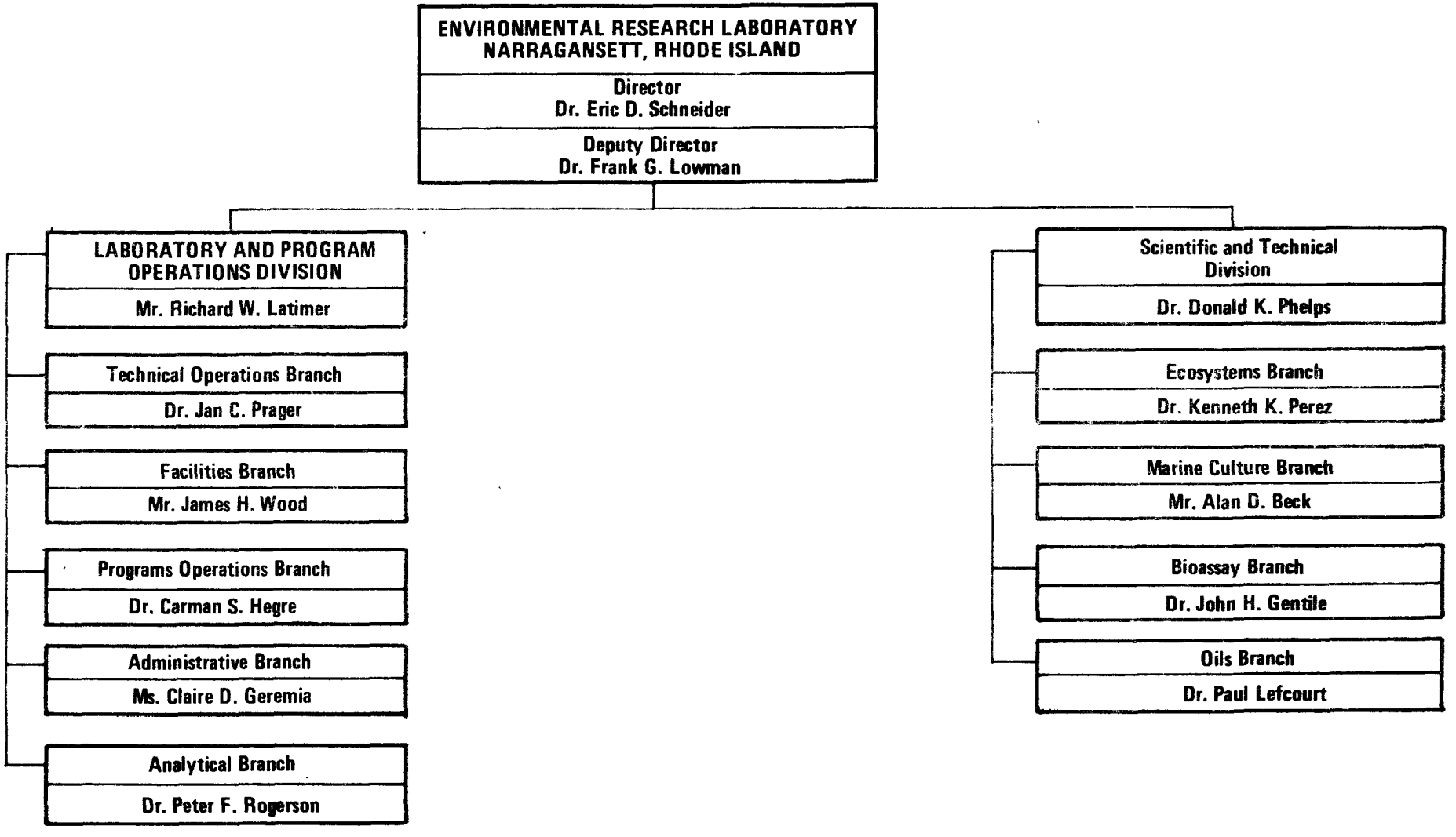
Director
Environmental Research Laboratory
Narragansett, Rhode Island



Education: University of Delaware, B.A. (Honors) 1962
Columbia University, M.S., 1965
Ph.D. (Marine Geology) 1969

Professional Experience:
- Director, Environmental Research Laboratory, Narragansett 1972-Present
- Director, Office of Special Projects, in the Office of Research and Monitoring, EPA, Washington, D. C. 1971-1972
- Director, Global Ocean Floor Analysis and Research Center, U. S. Naval Oceanographic Office, 1968-1971
- Staff Assistant to Commander U.S. Naval Oceanographic Office 1967-1968

Professional Affiliations:
- Member, Geophysical Union
- Member, American Association for the Advancement of Science
- Member, International Council on Exploration of the Seas
- Member, National Widlife Federation
- Member, Council for Economic Priorities
- U.S. Chairman, Working Group on the Effect of Pollutants on Marine Organisms, US-USSR Joint Committee on Cooperation in the Field of Environmental Protection, 1972-1976
- Member, Group of Experts on Scientific Aspects of Marine Pollution, United National
- Member, Sierra Club
- Adjunct Professor, Graduate School of Oceanography, and Department of Community Land Use and Planning, University of Rhode Island



FTS TELEPHONE NO. - 838-4843

CML TELEPHONE NO.- (401) 789-1071

March 1978

ENVIRONMENTAL RESEARCH INFORMATION CENTER

CINCINNATI

OHIO

ENVIRONMENTAL RESEARCH INFORMATION CENTER

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.

RESEARCH PROGRAM RESOURCE SUMMARY

($1,000's)

Program Area	FY-77 In-house	FY-77 Extramural	FY-78 In-house	FY-78 Extramural
Total Program	1,997	818	2,750	300

PERSONNEL

Total Full-time EPA Personnel = 21

- Professional = 13
- Non-Professional = 8

Professional Staff

	Bachelor	Master	Doctorate	Total
Biology	1	1	0	2
Chemistry	1	2	0	3
Engineering	2	3	1	6
English	0	0	1	1
Mathematics	0	1	0	1
	4	7	2	13

RECENT ACCOMPLISHMENTS

1. Technology Transfer

- Seminars (municipal and industrial) -- 208 planning and implementation, small flows, designing and upgrading drinking water treatment systems, industrial incentives, optimum management strategies, pollution abatement in the fruit and vegetable industry, coal mining pollution, forest products, water supply, sludge, waste-as-fuel, small wastewater treatment systems, metal working, and wastewater filtration.

- Design manuals/capsule reports -- land treatment of municipal wastewater, wastewater treatment facilities of sewered small communities, EPA alkali SO_2 scrubbing test facility, utility baghouses, flue gas desulfurization, pulp and paper industry - Part I/Air, land and water treatment, sludge composting, erosion and sediments control, and nitrogen control.

- Newsletters/executive briefings/symposia/exhibits -- industrial energy conservation measures, ozone, small flows, alternative planning, waste recycling, flue gas desulfurization, asbestos emissions control, and energy.

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 1977:

- Camera-ready copy reports	314
- NTIS submissions	657

SIGNIFICANT TRENDS

EPA's research program is developed around inputs of user needs. ORD is developing an information program to support the Toxic Substances Control Act by transferring the most up-to-date information in this area. Growing health and ecological effects programs for ERIC will emphasize priority research areas within EPA for toxic and hazardous substances. Other issues include: fate and transport of hazardous substances, state-of-the-art pollutant monitoring, quality control and assurance, and environmental management through areawide planning.

REGIONALLY RELATED PROJECTS

Maintenance of close communication with all EPA Regions and Program Offices to respond to specific Regional environmental needs. Conduct of regional seminars and workshops upon the requests of Regional Office or Agency Program Offices. Production of publications related to specific topics; dissemination of this information.

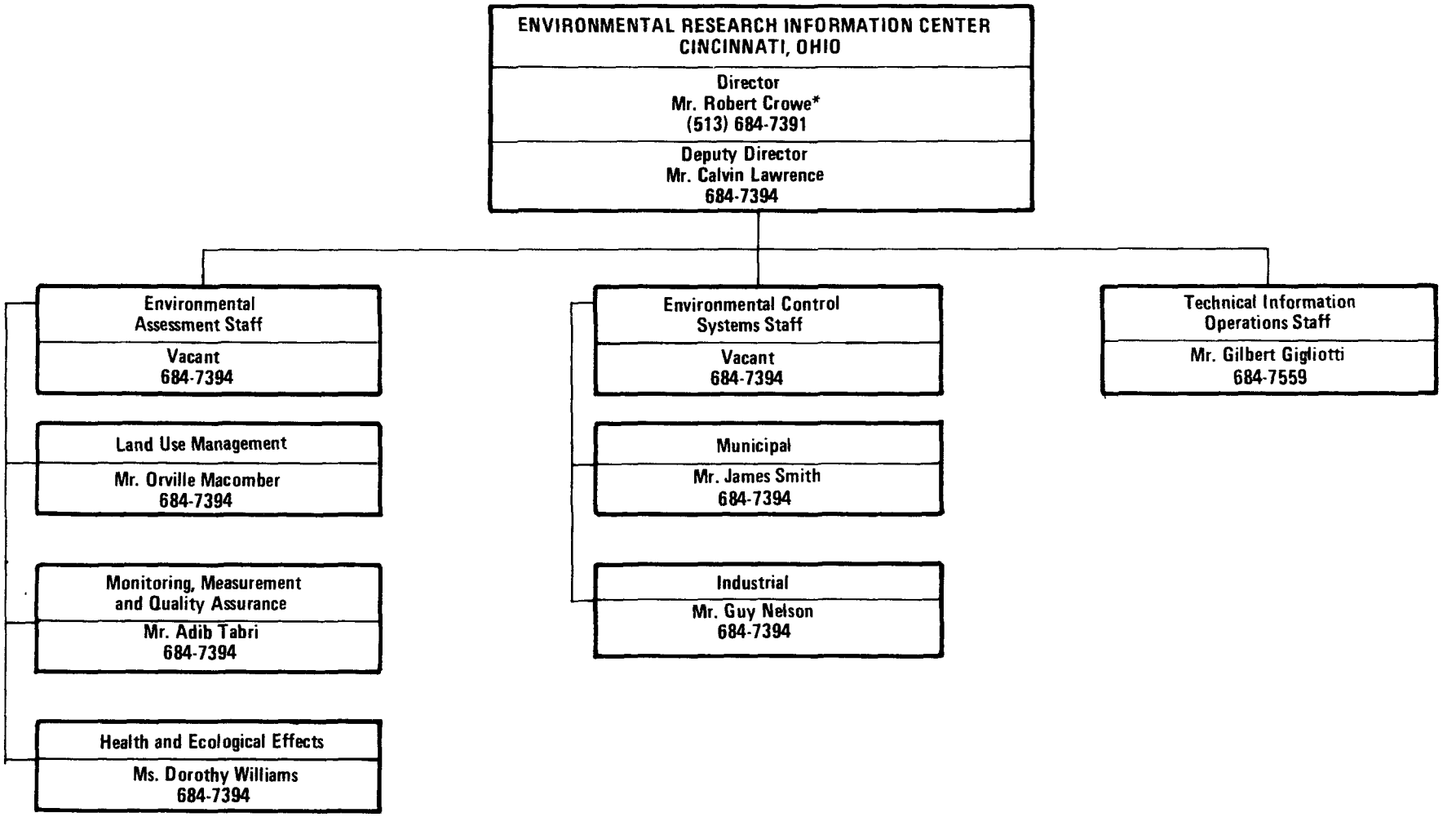
Robert E. Crowe

Director
Environmental Research Information Center
Cincinnati, Ohio

Education: Southeastern Oklahoma State College
B.S. 1954
North Texas State University
M.S. (Organic Chemistry) 1957

Professional Experience: Director, Environmental Research Information Center 1977-Present
Chief, Municipal Pollution Control Branch, Research and Development Program; and Technology Transfer Program, EPA, 1970-1977
Head, Chemistry and Biology Section, Technical Services, Robert S. Kerr Laboratory Ada, Oklahoma, 1966-1970
Section Head, Water and Waste Treatment Products Division, Dow Chemical Company, 1961-1966
Research Chemist, Dow Chemical Company, 1957-1961

Professional Affiliations: Water Pollution Control Federation
American Chemical Society



FTS TELEPHONE NO. 684 + EXTENSION

March 1978
*Acting

NATIONAL CENTER FOR TOXICOLOGICAL RESEARCH

JEFFERSON, ARKANSAS

NATIONAL CENTER FOR TOXICOLOGICAL RESEARCH

JEFFERSON, ARKANSAS

MISSION

Study the biological effects of potentially toxic chemical substances found in people's environment with the following emphasis:

- Determination of adverse health effects resulting from long-term, low-level exposure to chemical toxicants.
- Determination of the basic biological processes for chemical toxicants in animal organisms.
- Development of improved methodologies and test protocols for evaluating the safety of chemical toxicants.
- Development of data that will facilitate extrapolation of toxicological data from laboratory animals to people.

RESEARCH PROGRAM RESOURCE SUMMARY

($1,000's)

		FY-77	FY-78
1.	Aromatic Amines	$ 3,900	$ 3,900
2.	Risk Analysis	450	600
3.	Hormone	3,600	4,200
4.	Test Methods Development	2,600	3,300
5.	Teratogenesis Research	1,600	2,000
6.	Bladder Cancer	1,300	1,500
7.	Hepatic Toxicology	1,000	1,200
8.	Immunotoxicology	850	1,000
9.	Host & Environmental Factors	650	750
10.	Inhalation Toxicology	50	100
11.	Integrated Approach	150	200
12.	Transplacental Carcinogenesis	100	150
13.	Neuroscience	30	300
14.	Perinatal	400	600
15.	Dosimetry	500	600
16.	Cell Biology	400	600
17.	Nutrition	0	*
		$17,580	$21,000

*Additional funding required

PERSONNEL

Total Full-Time FDA Personnel = 225

- Professional = 180
- Non-Professional = 45

Professional Staff

	Bachelor	Masters	Doctorate	Total
Biology	28	34	27	89
Chemistry	14	16	14	44
Engineering	7	0	0	7
Mathematics	3	3	3	9
Other	27	2	2	31
	79	55	46	180

RESEARCH PROGRAM

1. Aromatic Amine Carcinogenesis

   - Identify biological hazards so that steps may be taken to avoid them.

   - Devise methods to assess potential effects of exposure to a chemical already in use, or to a new compound that has not yet been introduced into or accepted by society.

2. Risk Analysis Program

   - Improve techniques for estimating health effects for humans exposed to low levels of environmental chemicals.

3. Hormone Research Program

   - Compare dose-response curves for a series of estrogenic and carcinogenic endpoints in six mouse strains and crosses.

   - Expose perinatal animals to estrogens before and after appearance of specific cellular estrogen receptors to determine the necessity of the receptor for a carcinogenic response.

   - Develop metabolic-pharmacokinetic systems aimed at detecting potentially carcinogenic metabolites and rapidly inactivated estrogens or estrogenic metabolites that might be resistent to crossing the placental or other barriers.

   - Examine blood protein binding of estrogens as a modulator of physiologic and carcinogenic action.

   - Examine gene-products as a marker that will potentially distinguish between normal and carcinogenic action.

   - Determine extent to which negative-feedback regulation of ovarian estrogen secretion modulates the carcinogenic response to an exogenous estrogen.

   - Develop a series of short term and *in vitro* assays based on physiologic endpoints.

   - Assess and validate appropriate whole animal and *in vitro* systems for carcinogenic evaluation of estrogens.

4. Mutagenesis Test Methods Development

   - Improve mammalian and non-mammalian systems to provide reliable and meaningful response data to estimate accurately the relative risk to human populations exposed to various levels of environmental chemicals. Develop reliable short-term bioassays to predict the mutagenicity and/or carcinogenicity of an environmental or physical agent.

5. Teratogenesis Research Program

Develop testing procedures and improve their accuracy and precision.

- Pharmacokinetics Project - Address the question of adequate testing procedures by quantitating the exposure of a sensitive organism, organ or tissue to a noxious agent, and the final form, delivery and disappearance of the agent at the effector site.

- Conventional Teratology and Test Methodology Project - Investigate use of other species and orders of animals to enhance our predictive ability to people.

- Mechanisms and Manifestations of Abnormal Development Project - Determine the effector site within the developing system.

- Postnatal Expressions of Abnormal Development Project - Investigate the cogenital development of hypertension, an extremely prevalent condition in the general population; and test an electrolytic respirometer.

6. Etiology of Bladder Cancer in Experimental Animals and Man

- Provide regulatory agencies with a scientific basis for accurately evaluating the results of bioassays in which bladder tumors are produced by various chemicals.

- Identify the various cofactors and secondary effects that occur during administration of selected chemicals; determine the role each may play in the development of bladder tumors.

- Clarify the role of microcrystals, calculi and other changes in the urinary tract associated with tumor induction in the rodent urinary bladder.

7. Hepatic Toxicology Program

Evaluation of Hepatic Toxicity in the Rodent in Carcinogenesis Bioassay - Determine the relevance of hepatic neoplasms in the rodent, and specifically in the mouse, in carcinogensis bioassay studies.

8. Immunotoxicology

Develop standardized models for detecting and assessing impact of chemical agents. These models will make available more complete and accurate data to assist regulatory and other governmental agencies in their decision making responsibility. When alterations

in immunocompetence are not considered, injurious effects of a particular substance may be overlooked, creating a false sense of security. Immunotoxicology is concerned with five areas of study:

- Hypersensitivity - A state of augmented reactivity, can be produced by repeated exposure to specific drugs, food additives and/or chemical agents.

- Immunosuppression - Involves a depressed activity of mechanisms utilized by the body to defend itself against the onslaught of viruses, bacteria, parasites, other pathogenic agents, and neoplasms.

- Tumor Immunity - One of the most irreversible consequences of immunosuppression is the removal of factors which inhibit growth of malignant cells.

- Immunocompetence During Pregnacy and Lactation - Using amultivalent vaccine of pneumopolysaccharides to determine, in mice, the effect of this vaccine administered during pregnancy and lactation upon the mother and her offspring.

- Autoimmunity - Condition in which the immune mechanisms are turned upon the body's own tissues.

9. Host and Environmental Factors in Carcinogenesis Bioassay

Develop assay methodology for increasing rate at which chemical substances can be tested for relative carcinogenic potential by:

- Utilization of preneoplastic lesions, both morphologic and biochemical, in conjunction with genetic host factors which decrease the latent period to tumorigenesis or enhance the susceptibility of the animal to induction of neoplasia by particular classes of chemicals.

- Use of subpopulations of test animals which exhibit different susceptibilities to tumorigenesis but differ from each other by only a single dominant gene.

- *In vitro* assays to identify qualitative and quantitative differences, among different species, strains and genotypes of test animals.

- Improve and validate *in vitro* transformation assays and develop methodology for expediting the evaluation of carcinogenic potential of chemicals.

10. Inhalation Toxicology Program

Most of the chronically induced diseases of today have resulted from exposure by the inhalation route. This is particularly true of both environmental and industrial exposures to chemicals and pollutants. This then becomes a very important aspect of formulation of regulatory concepts and in the process of risk assessment and hazard evaluation. Many of these exposures cannot be eliminated, therefore the next alternative is to identify and estimate the hazard to man. Conduct large scale multidisciplinary type studies which yield quantitative results.

11. Integrated Approach to Determination of Relative Mutagenicity of Chemicals

Predict the relative mutagenicity to mammalian germ cells *in situ* of a given dose of a chemical in more complex whole animal assay systems on the basis of data obtained in cheaper and more rapid test systems.

12. Transplacental Carcinogenesis

- Develop an appropriate experimental design for testing chemicals for transplacental carcinogenesis. Test selected compounds, representing different chemical classes, by the transplacental route and compare with results obtained in oral, chronic studies started at time of weaning. Rotenone is the first compound being tested; other model compounds are being selected with initial emphasis on hormones and aromatic amines.

13. Neuroscience

Develop cost-effective animal test protocols to predict the neuro-behavioral effects in humans of long-term low-dose exposure to toxicants.

- Develop methods from several disciplines that are most likely to be applicable to toxicity testing. Determine the conditions under which these methods are most sensitive and compared for relative utility and cost-effectiveness in the regulation of chemicals. Develop methods for certain prototypic toxicants and a strategy for testing unknown substances. Evaluate health effects, validity, and generality of tests by interspecies comparisons in rodents and non-human primates. Initiate basic studies of mechanism for more rapid, accurate, and cost-effective short-term screening procedures, and methods for the prevention and/or amelioration of toxicity.

14. Perinatal Research Program

Research the effects of toxicants and carcinogens on the unborn fetus.

15. Dosimetry/Pharmacokinetics in Mutagenesis

Delineate appropriate mechanisms for estimating the "effective dose" of mutagens. This estimation of effective dose will be used in generating dose/response data for use in comparing mutational test systems and for extrapolating from animal models to people.

- Quantify macromolecular alterations for use in dosimetry.
- Separate and identify specific germ cell stages for studies on relative stage sensitivity.
- Identify specific time/rate factors influencing differential mutation effects; i.e., pharmacokinetics/pharmacodynamics.
- Investigate molecular mechanisms of mutation induction and fixation.

16. Cell Biology Program

Study discrete biological transitions in mammalian cells and tissue culture cell systems which are exposed to carcinogenic and toxic compounds.

17. Nutrition Research Program

- Investigate extent to which dietary factors influence toxicological responses in laboratory animals.
- Provide technical advice and scientific direction to the design, construction and operation of a national resource diet preparation facility to be constructed at NCTR.
- Sponsor a series of annual symposia to highlight the significant impact of dietary factors on various toxicological responses in laboratory animals and man.
- Conduct limited clinical studies in humans to assist in the extrapolation of animal nutritional-toxicological principles to humans
- Develop and exercise the capabilities of conducting specific nutritional-toxicological studies.
- Document the effects of specific dietary components on a variety of toxicological responses in several species of laboratory animals.

RECENT ACCOMPLISHMENTS

1. Continue mutagenic research activity to study assay techniques and methods development.

2. Continue research to ascertain the significance of the hepatoma in the mouse.

3. Continue research to investigate the etiology of bladder cancer in experimental animals.

4. Conduct at least five more advanced courses for approximately 200 FDA investigators, to provide instruction in bio-research monitoring, non-clinical studies.

5. Complete the long-range planning study to assure the most effective and efficient use of NCTR's facilities.

6. Complete the Information Systems Study for FDA's Field Offices (to determine the feasibility of alternative systems for capturing data generated by district laboratories).

7. Initiate development of a joint National Cancer Institute/NCTR research information system to share data collected in support of scientific findings, as well as to assure that research is not duplicated unnecessarily.

8. Conduct the Third Annual Hormone Research Symposium.

9. Sponsor the conference, Status of Predictive Tools in Application to Safety Evaluation: Present and Future with the National Institutes of Health, presented by 38 invited speakers to 350 scientists from the United States and four foreign countries.

10. Initiate carcino-teratogenic study of DES and progesterone in sub-human primates.

11. Completed the first long-term effective dose-response study of 2-AAF in Specific Pathogen Free (SPF) animal facilities. Continue pathology and initiate analysis of data for preparation of papers.

12. Continue the long-term, low-level dose-response study with benzidine, and continue comparative metabolic studies of benzidine.

13. Continue long-term dose-response and biochemical studies with 4-aminobiphenyl.

14. Continue large scale DES and estradiol studies and initiate studies with zearalenone and zearalanol.

15. Complete long-term teratogenic studies with aspirin and cortisone.

16. Complete development of radioimmunoassay methods for DES, estradiol, and N-OH-AAF (a metabolite of 2-AAF).

17. Continue the study of chemical hypersensitivity evaluation methods.

18. Continue the testing of a model for determining the capacity of drugs and other materials to induce hypersensitivity in mice.

TRENDS

Evaluation of correlation between carcinogenesis, mutagenesis and teratogenesis utilizing methods development and evaluation.

THOMAS CAIRNS

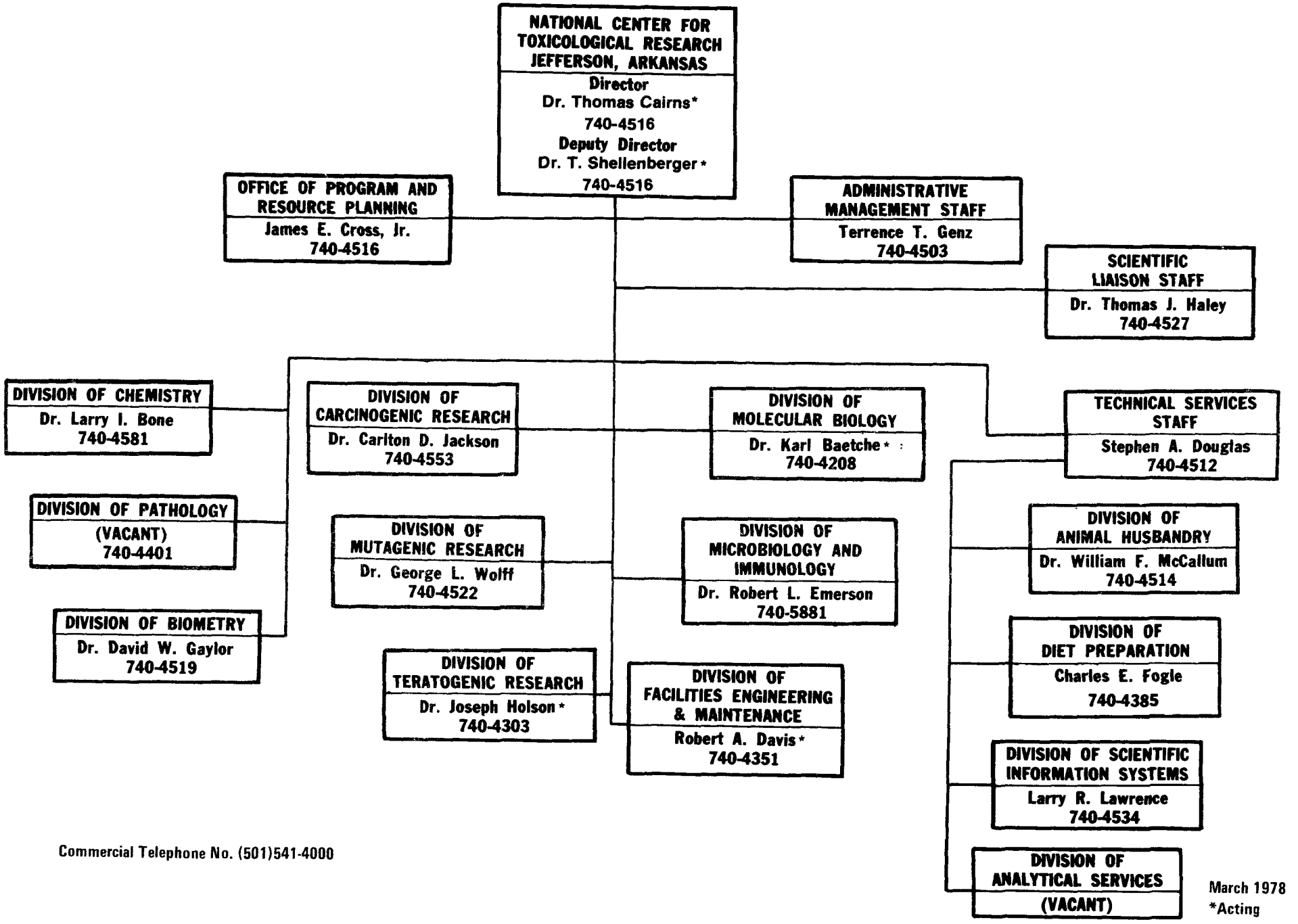
Acting Director
National Center for Toxicological Research

Jefferson, Arkansas

Education : University of Glasgow, Scotland
B.Sc., 1965
Ph.D. (Chemistry), 1968

Professional Experience : Acting Director, NCTR, 1977-Present
International Expert in Mass Spectrometry, FDA, 1977-Present
National Expert in Mass Spectrometry, FDA, 1975-1977
Adjunct Professor of Chemistry, UCLA, 1968-1975
Conservation Chemist, Los Angeles County Museum of Art, 1968-1975

Professional Affiliations: American Chemical Society
American Society for Mass Spectrometry
The Chemical Society of London



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March 1978
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