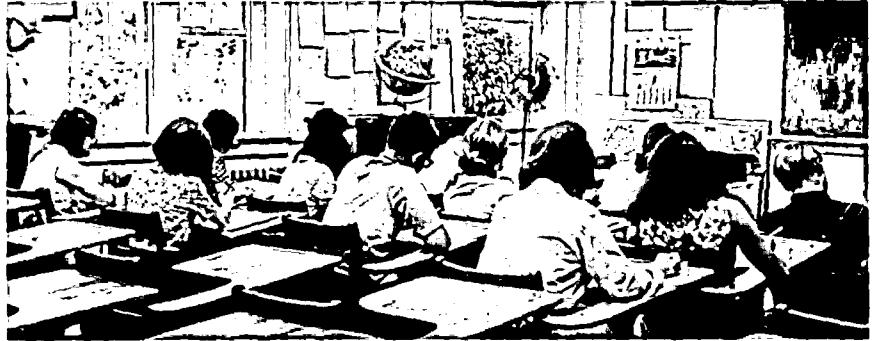


1964



Research Triangle Institute

In school classrooms all across the nation, Research Triangle Institute survey specialists and interviewers administer exercises to hundreds of thousands of students in the National Assessment of Educational Progress. National Assessment is an unprecedented undertaking that uses scientific methods to determine how much America's school children know, and to measure how much they are learning.



The assessment is based on a series of exercises designed to measure achievement of specific educational objectives in various subjects. The exercises are administered in five-year cycles to students aged 9, 13, and 17, and to young out-of-school adults.

Research Triangle Institute designs the necessary statistical sample surveys, specifies procedures for identifying randomly selected individuals to be assessed, and is responsible for exercise administration in the field.



RTI also participates in a research consortium that provides educational assessment services tailored to the local needs and circumstances of states and communities. Other members of the consortium are the American Institutes for Research, Palo Alto, California, and the Measurement Research Center, Iowa City, Iowa.



Organization Operations Facilities and Staff

Research Triangle Institute is a separately operated, not-for-profit scientific research organization established by joint action of the three major universities of North's Carolina's Research Triangle area—Duke University, the University of North Carolina at Chapel Hill, and North Carolina State University at Raleigh. Research operations began in 1959. The Institute is a self-supporting corporate entity under a Board of Governors that includes academic officials, university scientists, industrial research executives, and businessmen.

Institute research is performed on a contract basis for federal, state, and local government departments, public service agencies, foundations, regional and industrial associations, and industry clients ranging from small companies to international corporations. Contracts typically originate from exploratory discussions between the sponsor and RTI staff members. An Institute project team then prepares a research proposal that contains an outline of the work to be done, technical staff scheduling, project duration, and cost. When the proposal is accepted, a contract for the research is negotiated by RTI and the client.

Research Triangle Institute occupies nine laboratory and office buildings on a central campus of 200 acres in the Research Triangle Park. A 5,200-acre area near the center of a compact geographic triangle formed by the three universities and the cities of Raleigh, Durham, and Chapel Hill, the Park has been developed by the Research Triangle Foundation of North Carolina. Buildings on the RTI campus contain 170,000 square feet, an excellent complement of laboratory equipment, and many special purpose items, including a research computer and direct access terminals to the IBM 370/165 operated by the Triangle Universities Computation Center and located near RTI in the Research Triangle Park.

The Institute employs a permanent, full-time staff that has grown to 450 personnel. Approximately sixty per cent of the staff is professionally trained, with about one-third of this number holding Ph.D. degrees and another one-third Master's degrees. More than 50 different degree fields are represented. Most professional staff members have experience in industrial or government organizations, or in university research and teaching.

To meet project requirements, RTI field office operations are conducted throughout the United States and in other countries.





Research Triangle Institute management council and officers. From left: Ralph L. Ely, Jr., Director, Office of Institute Programs; William H. Perkins, Jr., Treasurer; George R. Herbert, President; James J.B. Worth, Group Vice President; S.C. Ashton, Corporate Vice President; Alva L. Finkner, Group Vice President; and Monroe E. Wall, Group Vice President.


Research Triangle Institute's steady growth has been marked by a flexibility that enables us to respond to increasing research needs with expanding and increasingly varied research capabilities. In perhaps the most dynamic and innovative of industries, these qualities have brought recognition to RTI as an established member of the nation's scientific community.

Our research managers and their associates offer high standards of ability and leadership in helping to meet the planning and problem-solving goals of the Institute's clients. The talents and energies of our staff are the sole basis for RTI's recorded accomplishments, as well as for those that lie ahead.

During the 14 years since RTI's first project work began in early 1959, national priorities have shifted to social and behavioral problems, environmental protection, urban growth, education, and regional economic development, with continued emphasis on medical and health-related programs.

Research Triangle Institute organization and operations as described in the following pages reflect this change. Approximately three-quarters of Institute effort is now directed to subjects dealing with concerns of human existence and well being. Other areas of prominent interest include civil defense, polymer science, engineering systems, and a wide range of research and technical services for industry.

This publication reports a sampling of RTI's diverse research programs. Current activities within our centers and divisions reflect the commitment of the Institute and its staff to assist in the attainment of the objectives of public and private enterprise, and to contribute towards a more satisfying quality of life for all.

A handwritten signature in black ink that reads "George R. Herbert". The signature is written in a cursive, flowing style.

President

RTI research for industry and government is inseparable from real-world contexts and human concerns. In meeting the problem-solving and planning goals of its clients, the Institute's approach calls for an intermingling of professional capabilities that cuts across organizational lines to combine the talents and experience of staff members of many skills and backgrounds.

As a result, most RTI programs are multidisciplinary both in purpose and in execution. They cover social and economic systems and human resources, the physical and life sciences, and environmental science and engineering.

Social and Economic Systems and Human Resources

Alva L. Finkner
Vice President

William C. Eckerman
Director
Center for the Study
of Social Behavior

Paul G. Homeyer
Director
Statistics Research
Division

Daniel G. Horvitz
Director
Center for
Population Research
and Services

Jay T. Wakeley
Director
Center for
Health Studies

Alva L. Finkner
Acting Director
Center for
Educational Research
and Evaluation

James A. Street
Manager
Office of
State and Regional
Planning



RESEARCH BRIEFS

Statistical design, analysis, and interpretation of experimental data for industrial and scientific purposes.

Census evaluation and vital rates analysis; estimation of birth rates and population changes from sample surveys.

Cost effectiveness, production control, process optimization, and quality assurance programs for business and industry.

Projections of long-term trends in revenues, expenditures, population, employment, and income levels to provide data bases for state and regional government planning strategies.

Analysis of the cost effectiveness of alternative strategies for disseminating oral contraceptives, and of factors affecting acceptance of the IUD.

Statistical sampling services for industrial assembly line inspection and testing.

Evaluation of the planning and decision-making processes in programs for improving employment and educational opportunities, health care services, and income growth potential in rural areas; development of a national index of the relative economic status of rural families.

Analyses of the effects of nutritional supplements and health services on family planning programs; surveys of the social and economic correlates of family fertility.

Surveys and informational analyses on problems related to alcohol abuse and alcoholism.

Refinement and application of randomized response, an interview technique for obtaining accurate information about even the most sensitive personal subjects while guaranteeing complete confidentiality of the answers given by those being questioned.

Development of a national registry of kidney disease patients suffering from chronic uremia and undergoing dialysis treatment.

External audits and sample designs of public school testing programs.

Comparison of the traditional fee-for-service system with alternative billing and reimbursement methods for the delivery of health care services.

Analysis of response errors in household interview surveys.

Surveys of the use of television programming in classroom instruction.

Computer simulations of current and future demand for hospital services and health manpower.

Sampling methodology for selecting, testing, and grading the raw materials used in manufacturing.



Gosh! It's great to be alive today!



Oh?
 You don't think we
 had a good time last night, right? And now you've got a
 little headache.
 Some other people had a good time last night too. But they
 don't have headaches.
 They're alone.
 We're going to be talking to you about this in a
 little while. About keeping your friends alive.
 But we won't bother you with it today.
 For now, relax. Enjoy the first day of
 this new year.
 And we'll get together with you when
 you're feeling better.

7 1 Statistical analysis of the effects of nitrogen oxides on human respiratory infections is part of an RTI community health evaluation and surveillance system. 2 Survey research at RTI combines advances in experimental design, sampling, statistical theory, and field interview methods. Major emphasis is given to sample surveys in education, health, employment and manpower, family planning, and census evaluation. 3 With arrestees at the central jail intakes of six major U.S. cities, RTI researchers conducted interviews and obtained urine samples in an exhaustive study of the relationship between drug usage and serious crime. 4 Economic trends, natural resource development, manpower utilization, industrial growth, and public investment priorities are analyzed by RTI in studies for multi-state regions, individual states, groups of counties and communities. 5 RTI population research ranges from the analysis of women's labor force participation and fertility, to economic development, health care and family planning services in Africa, the Near East, and South Asia. 6&7 Breathalyzer tests, newspaper and television advertising, roadside and household surveys, and stepped-up law enforcement are some of the methods analyzed in RTI's 42-month evaluation of drinking-driving countermeasures.

Physical and Life Sciences

Monroe E. Wall
Vice President
Director
Chemistry and
Life Sciences Division

Chemistry and Life Sciences Division

F. Ivy Carroll
Assistant Director

Clarence E. Cook
Assistant Director

Colin Pitt
Assistant Director

David Rosenthal
Assistant Director



RESEARCH BRIEFS

Basic research in drug metabolism, natural products chemistry, synthetic organic chemistry, analytical chemistry, biochemistry, and pharmacology.

Investigations of biologically active compounds with emphasis on isolation, structure determination, synthesis, distribution, and mode of action.

Investigations on the *in vitro* and *in vivo* metabolism of oral contraceptives, anticancer agents, active constituents of marijuana, antimalarials, analgesics, and barbiturates, including studies on the interaction of drugs and drug metabolizing enzyme systems.

Laboratory experimentation to determine the effects of contraceptive steroids and their interaction with other drugs.

Methodological and clinical approaches to the quantitative identification

of cannabinoids and their metabolites in body fluids.

Synthesis of radiolabeled drugs for use in metabolic studies of contraceptive agents, marijuana, and general drug metabolism.

Synthesis and testing of silicon substituted steroids, prostaglandin analogs, and isoflavonoids as potential antifertility agents.

Instrumental, biochemical, and pharmacological techniques for the analysis of steroidal contraceptive agents and such nonsteroids as barbiturates, analgesics, and antiarrhythmic drugs.

Preparation of organometallic derivatives of gallium for experimental use in cancer chemotherapy.

Analytical forensic chemistry assistance to state law enforcement agencies, including evaluation of the Duquenois-Levine color test as a means for detecting marijuana.

Isolation, structure elucidation, and synthesis

of strigol, the potent germination stimulant of the parasitic witchweed that attacks crops in the eastern Carolinas. Agricultural studies also involve the relationship of saponins to pest resistance in alfalfa.

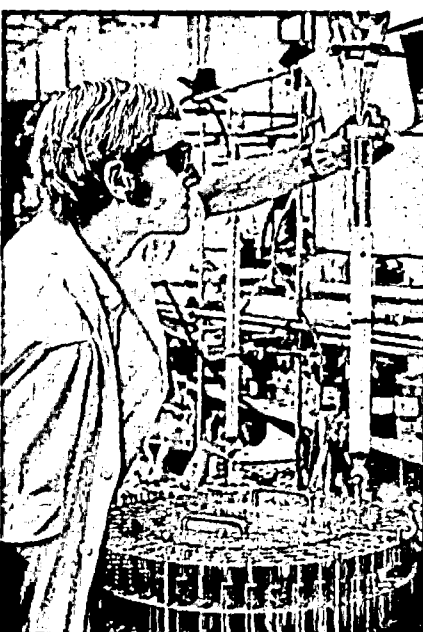
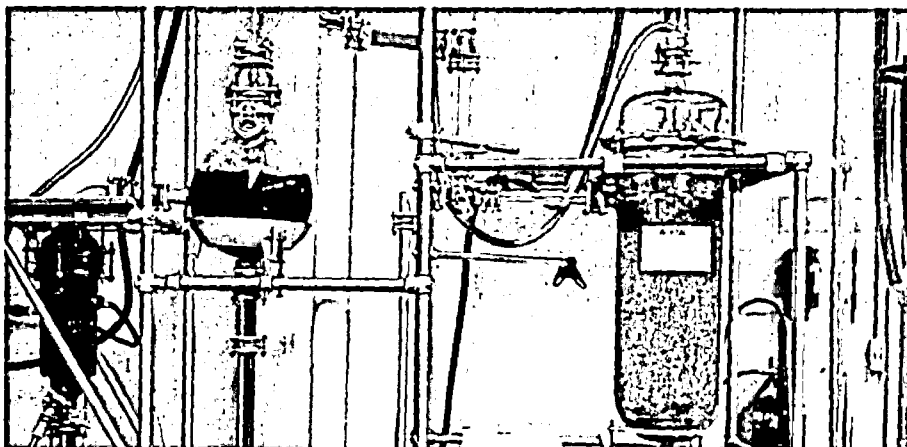
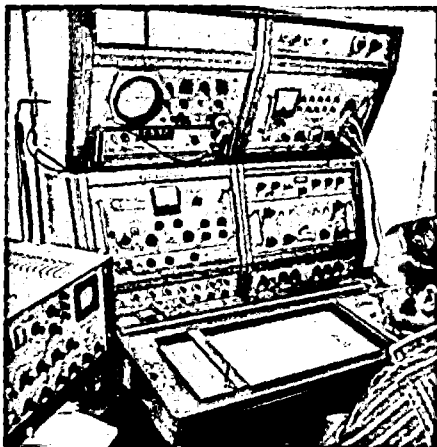
Design and synthesis of antiradiation compounds which have unique structures and properties.

Synthesis, characterization, and pharmacological evaluation of optically pure isomers of barbiturates and other drugs.

Fractionation, isolation, and characterization of antitumor and antileukemia substances from natural products.

Synthesis of novel compounds for treating malaria and preventing its recurrence.

Application of advanced analytical and instrumental techniques in industry, including development of new methods in mass spectral data processing.



1 Nuclear magnetic resonance systems with on-line computers enable RTI scientists to analyze microgram quantities of drug metabolites and natural products. RTI analytical equipment includes both proton NMR and pulsed fourier transform carbon-13 spectrometers. 2 Chemical compounds extracted from plant materials are screened and tested in RTI research on potentially active anticancer agents. 3 Gallium compounds from animal tissue are examined in RTI cancer chemotherapy research programs. 4 Gas chromatography plays an important role in RTI analyses of the active constituents of marijuana. 5 Medicinal chemistry programs at RTI include the synthesis of new antifertility steroids. 6 Animal antibodies are used in clinical pharmacology studies of oral contraceptives and their metabolites. 7 Separation techniques such as column chromatography support RTI research on synthetic antimalarial substances.

Environmental Sciences and Engineering

James J.B. Worth
Vice President

James N. Brown, Jr.
Director
Center for
Technology Applications

Harry L. Hamilton, Jr.
Deputy Director
Environmental Studies
Center

Jimmie J. Wortman
Director
Engineering Division

Robert M. Burger
Chief Scientist



RESEARCH BRIEFS

Baseline analyses of air quality and emission levels at existing or planned industrial locations.

Transfer of NASA technology to applications in medicine, air pollution control, law enforcement, and marine science.

Design and development of specialized electronic devices and instrumentation systems.

Technical services to assist local agencies in planning and implementing regional air quality standards, episode control procedures, and field abatement activities.

Develop improved radar techniques for aircraft collision avoidance and pilot warning systems; real-time simulation and analysis of air traffic control situations.

Forecast the economic impact of regulations to control particulate and gaseous emissions, and assess their effect on manufacturing costs and consumer prices.

Medical adaptation of an ear oximeter used for space flight simulation into a system that continuously monitors a patient's blood pressure to detect the onset of shock.

Applications of metals, semiconductors, and insulators as physical and chemical process sensors.

Evaluation of instruments for detecting, measuring, and monitoring air pollution concentrations at field locations.

Examination of alternative beverage container disposal policies to produce cost effective reductions in litter and solid waste.

Preparation of an air quality sampling network model for predicting air pollution concentrations in urban areas.

Development of continuous filtration waste processing techniques for water quality improvement.

Analyses of traffic flow, driver behavior, and vehicle and road conditions for highway safety and transportation system planning programs.

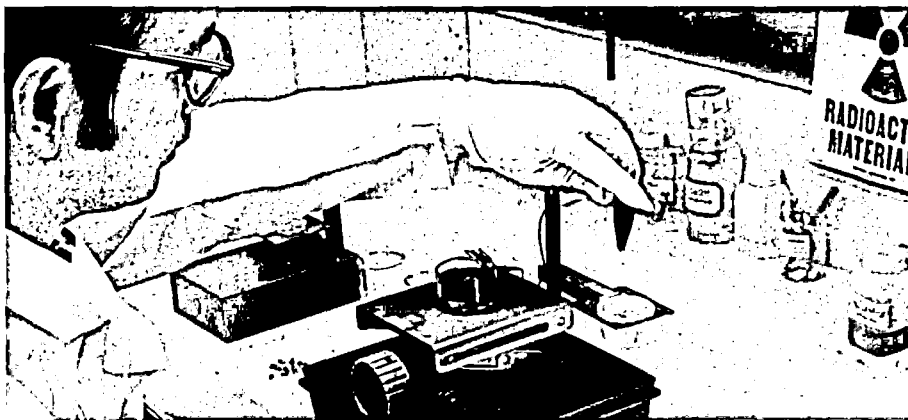
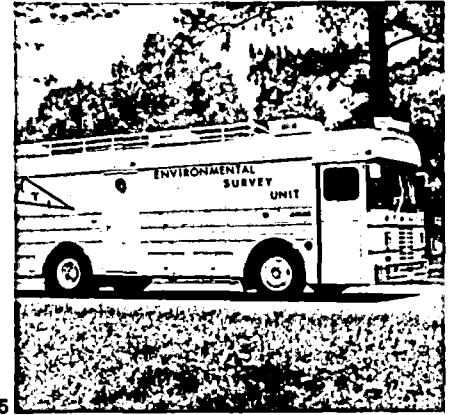
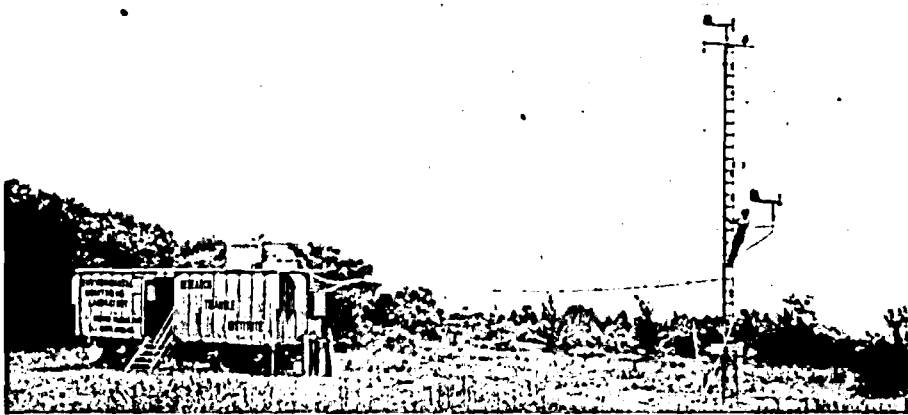
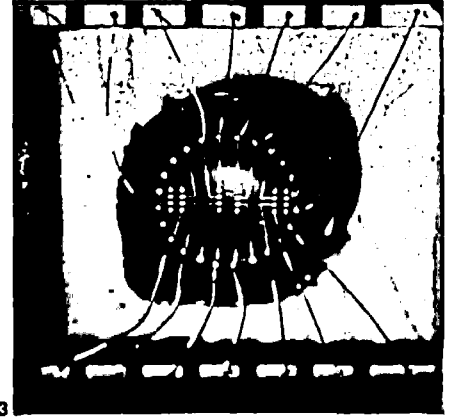
Compilation of engineering handbooks on environmental factors, system reliability, and silicon integrated devices.

Analysis and interpretation of air and surface data obtained in oceanographic and meteorological experiments.

Design and analysis of microwave sensors used for measuring geodetic and ocean surface characteristics in the SKYLAB and GEOS satellite programs; sea-surface temperature studies using satellite infrared data.

System analysis and engineering research for civil defense preparedness, including fallout shelter surveys, building design and construction, ventilation and radiation shielding techniques; planning and preparation for urban recovery following natural or nuclear disaster.

Computer simulations of geologic faults to investigate parameters of influence, techniques of prediction, and possible control methods.



1 Real-time frequency analysis is used in clinical research at Tulane University to produce a permanent visual record of pulmonary sounds. The system is the result of one of more than seventy technology transfers developed by an RTI Biomedical Applications Team under NASA's technology utilization program. 2 In an application of laser technology, an inspection system developed by RTI uses optical transform image enhancement to detect flaws and defects in inte-

grated circuits on the production line. 3 A prototype absolute pressure transducer developed by RTI reflects the Institute's capabilities in applying advanced microelectronics techniques to sensor and transducer problems. 4&5 Institute mobile environmental monitoring units include a fully instrumented trailer, left, and a motorized laboratory unit, both with on-line data acquisition equipment. They give RTI a comprehensive data collection capability for baseline surveys, field

evaluation of instruments, and for extended or short-term monitoring in urban and rural areas throughout the country. 6 Flight qualified pressure transducers being electroplated in an RTI engineering laboratory for the Asteroid Belt meteoroid experiment. 7 For measuring gaseous concentrations in air monitoring and surveillance programs, RTI engineers and chemists designed and built a chemiluminescent ozone meter.

Polymer Research

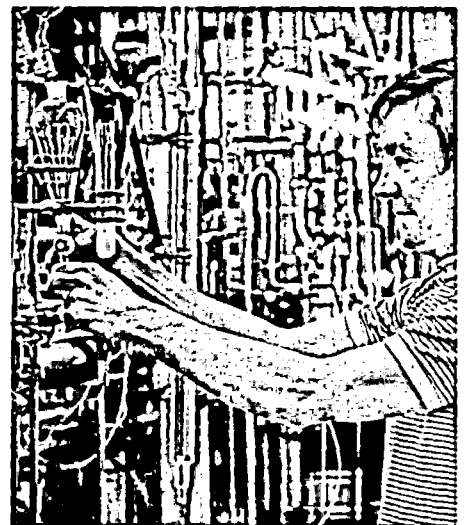
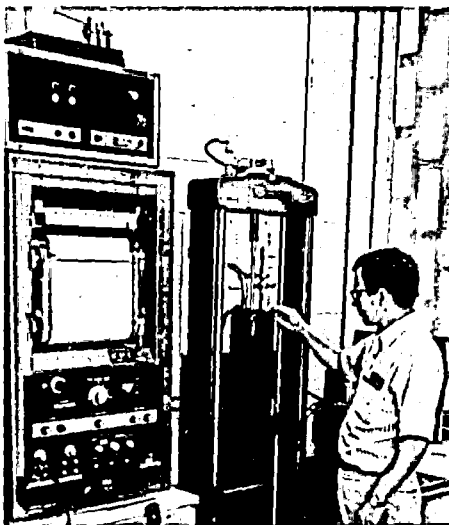
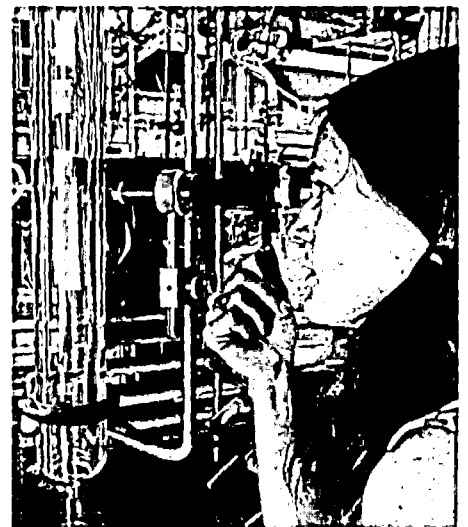
Anton Peterlin
Director
Camille Dreyfus
Laboratory



Research Triangle Institute's Camille Dreyfus Laboratory is a research memorial to the founder of the Celanese Corporation. The Laboratory was established as an integral part of RTI operations with the assistance of a \$2.9 million grant from the Camille and Henry Dreyfus Foundation.

Together with continuing attention to fundamental studies of the theories, definitions, and techniques of basic polymer science, the Laboratory has increasingly directed its broad range of skills and instrumentation resources toward applied research programs.

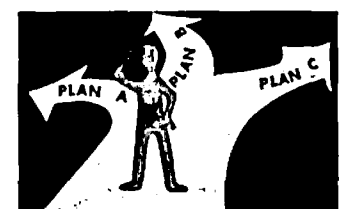
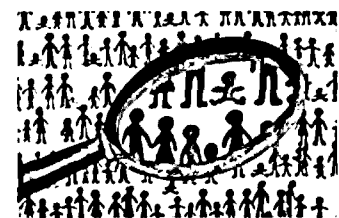
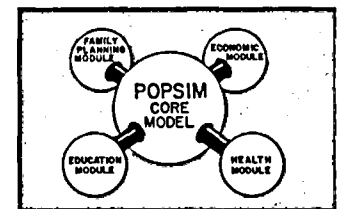
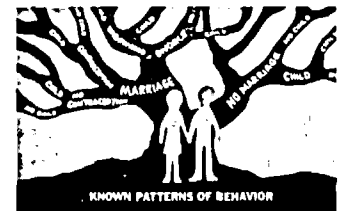
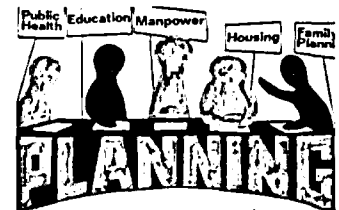
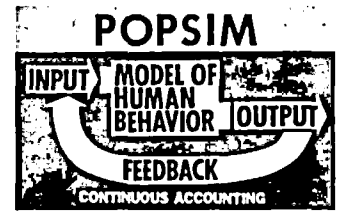
Applications of special interest in industrial research include the effects of various chemical treatments on textile fiber structure and properties, highly elastic fibers, semipermeable membranes for water desalination, highly porous membranes, thin film coatings, rapidly drying wool fabrics, and degradable polymers. Health-related research covers blood compatible polymeric substances, improved hemodialysis membrane materials, and hydrogel models of biological systems.



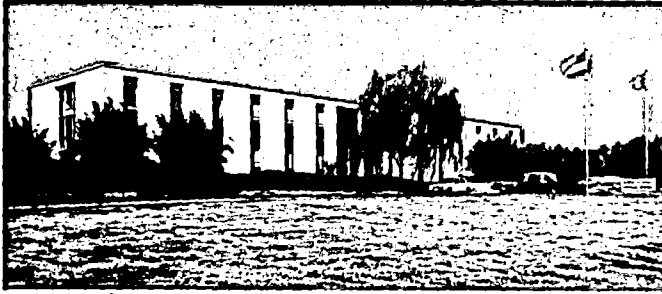
The broad scope and innovative aspects of RTI's population research are typified by a dynamic microsimulation computer model called POPSIM. Developed by the Institute in cooperation with the University of North Carolina and the National Center for Health Statistics, POPSIM absorbs into its processing functions the vital histories and other real-life events that occur among human societies and their subpopulations.

POPSIM works by establishing a small population of individuals identified by specific sets of attributes, including age, sex, color, marital status, education, income, residence, or other items of concern. The computer then considers each individual, and based upon that person's attributes and behavior it creates a history of events for the person: marriage, birth of child, divorce, illness, death, and so forth. At the end of set periods—a month, a year, or several years—the program summarizes the events for the entire population of individuals and reports these in terms of numbers, rates, and other descriptive statistics. POPSIM can be used, for example, to analyze fertility behavior and family planning programs, and to forecast the morbidity and mortality effects of public health measures, or the effects of educational manpower programs on employment and income levels.

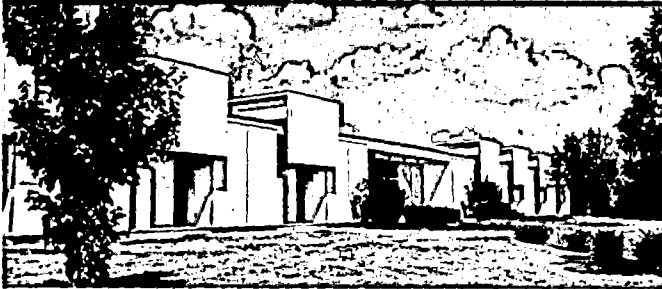
Such results are particularly useful because they allow the behavior of special population groups to be observed through time, and permit demographers and other analysts to examine in advance the potential consequences of proposed policies and practices.



RTI Facilities



Robert M. Hanes Memorial Building



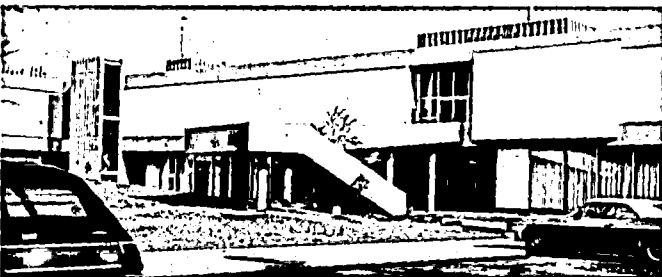
Camille Dreyfus Laboratory



Buildings 3, 5, 6, 7, and 9



William Trent Ragland Building



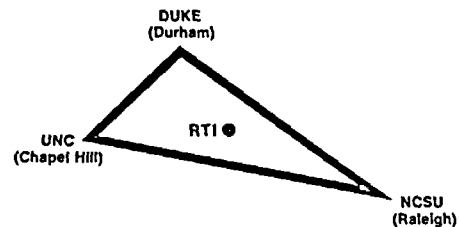
Chemistry and Life Sciences Laboratory

RTI and the Triangle Universities

Research Triangle Institute's relationship with its founding universities is the most distinctive feature of RTI operations and one of its greatest assets. Created by the three schools as a separate research affiliate, the Institute's place in the university family is recognized through a variety of formal and informal relationships. They range from corporate ownership and cooperative contract research, to the sharing of physical facilities and the exchange of information at many levels.

RTI and its clients benefit particularly from project participation by university specialists who supplement the capabilities of the Institute's permanent staff in executing research assignments. Over 200 active consulting agreements exist between RTI and faculty members of many disciplines and departments.

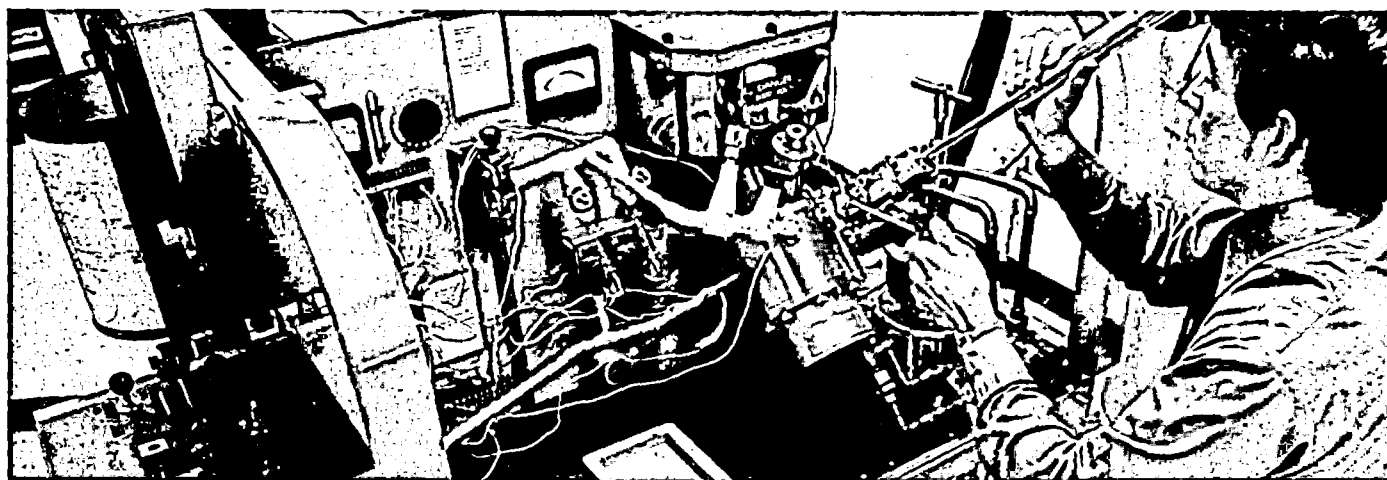
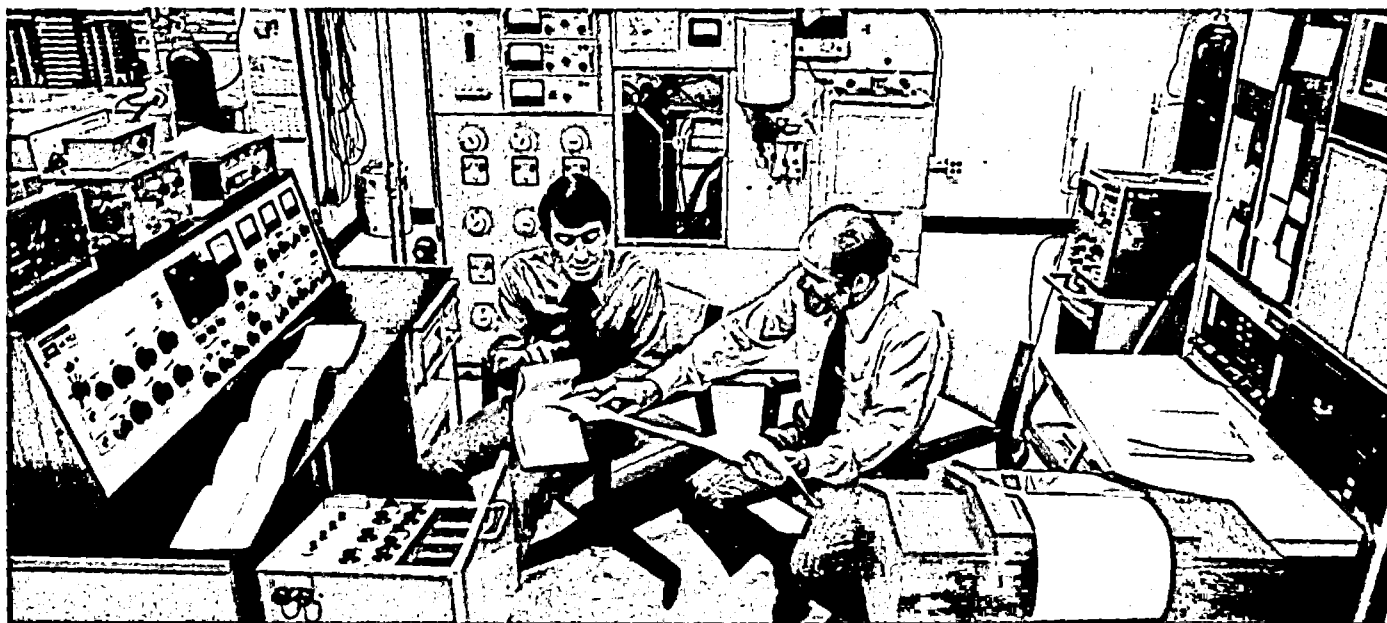
The convenience of consulting assistance, mutual research programs, joint staff appointments, and other RTI-university contacts is emphasized by the ease of communication among the four institutions. The campuses of Duke University in Durham, the University of North Carolina at Chapel Hill, and North Carolina State University at Raleigh are all within a 20-minute drive of the Institute.



A number of RTI senior staff members hold university adjunct professorships and teaching appointments in their fields of specialty.

The libraries of the Triangle universities are an invaluable resource for the Institute. Cross-indexed and readily available to RTI staff members, their combined collections total five million volumes. In addition, access is provided to many of the special research facilities maintained by the schools.

RTI ties with the academic community also include a summer program of research internships for students at North Carolina Central University in Durham.



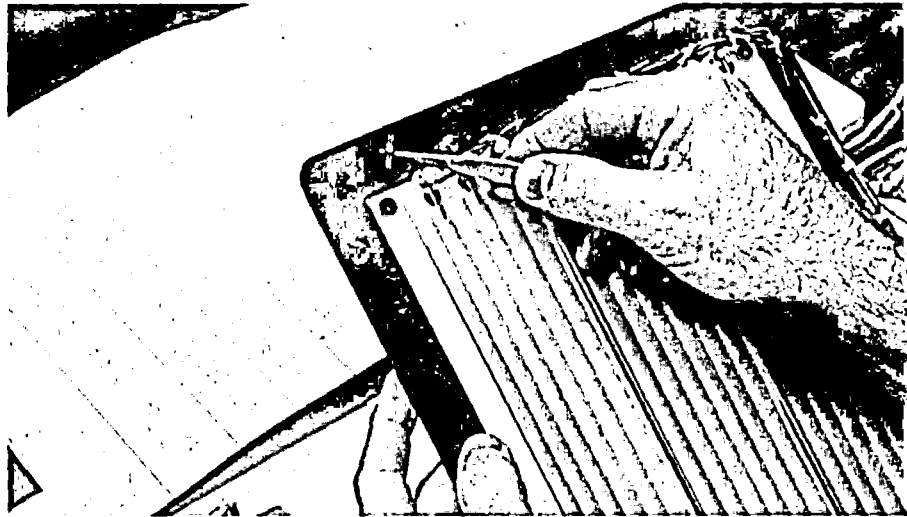
Under major grants from the National Institute of General Medical Sciences, Research Triangle Institute operates a regional mass spectrometry center. The center was established in conjunction with the Triangle universities.

Mass spectrometry is so sensitive an analytical technique that any organic compound can be identified by the unique fingerprint pattern each possesses, even using samples as small as a millionth of a gram.

RTI's regional center includes an MS-902 high resolution, double-focusing mass spectrometer with an on-line computer system which is fully integrated with the IBM 370/165 at the Triangle Universities Computation Center.

Research Triangle Institute engineers are credited by NASA with characterizing a gas pressure-sensor concept for measuring the spatial density of microsized dust particles in the Pioneer 10 Asteroid Belt meteoroid experiment.

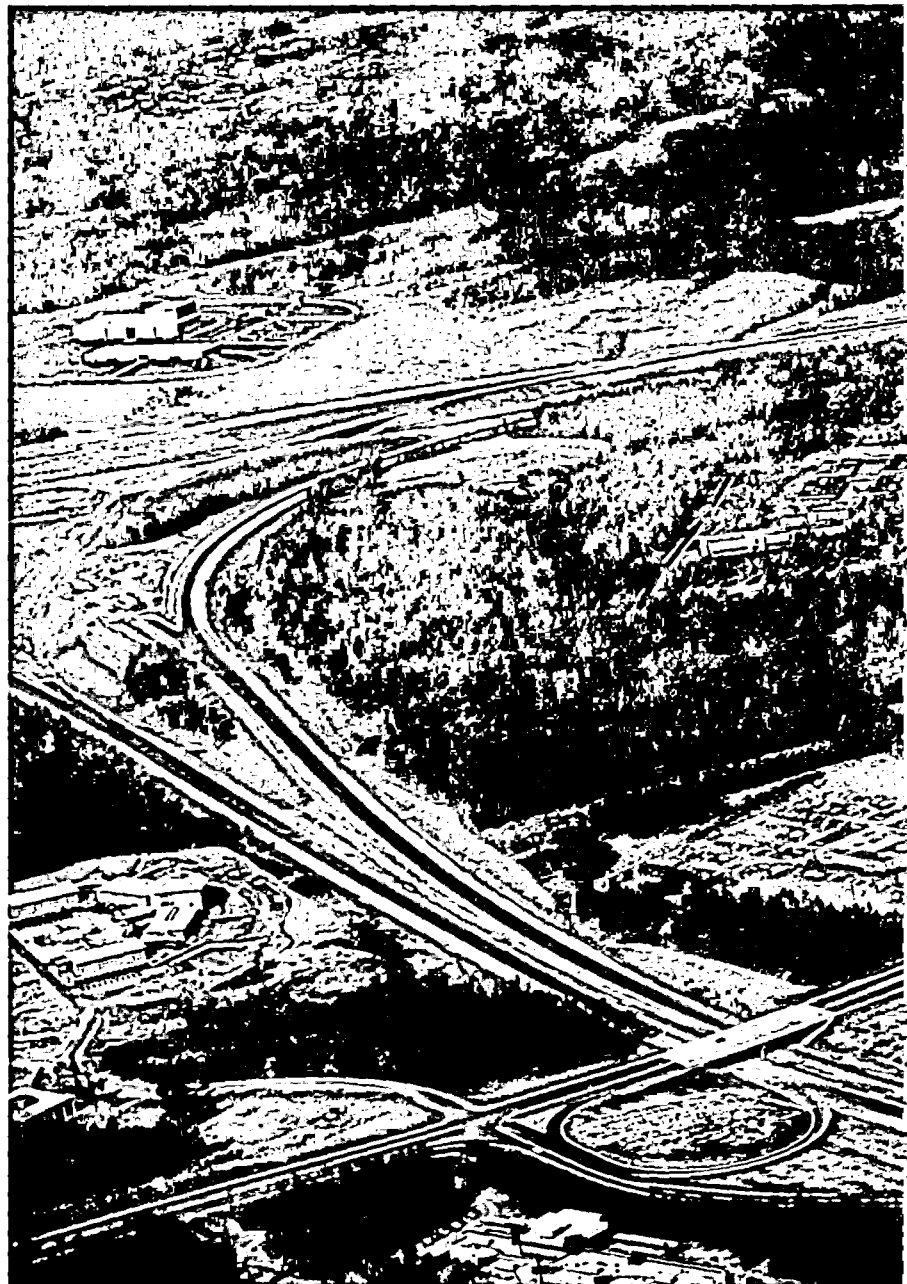
Thirteen detector panels are mounted on Pioneer 10's outer surface to record the frequency and impact of meteoroids striking the spacecraft during its flight across the 150-million-mile-wide Asteroid Belt between Mars and Jupiter. The panels consist of 18 narrow cells, each containing a mixture of argon and nitrogen gases and an electroplated miniature pressure transducer. When a spacedust particle penetrates a cell the gas escapes, and the resulting loss of pressure is sensed by the transducer and recorded as a meteoroid hit.

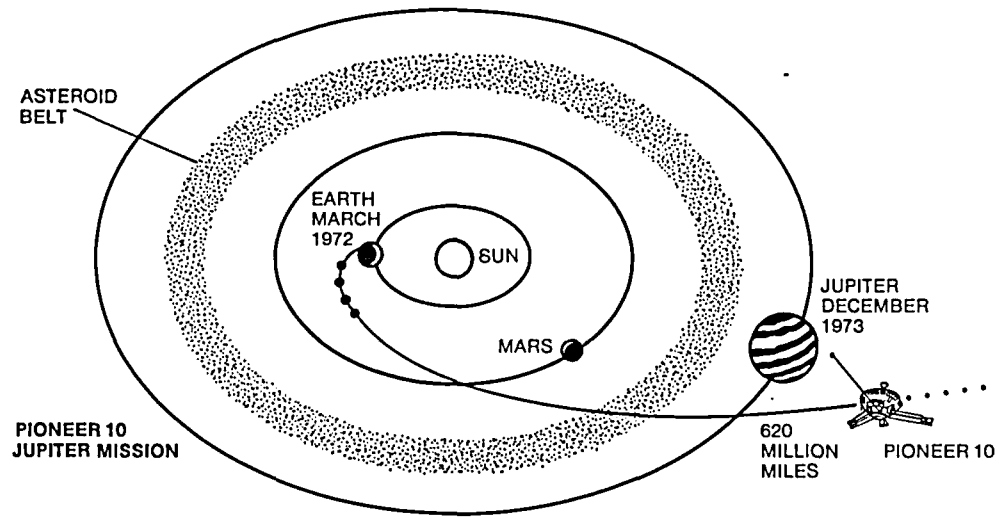
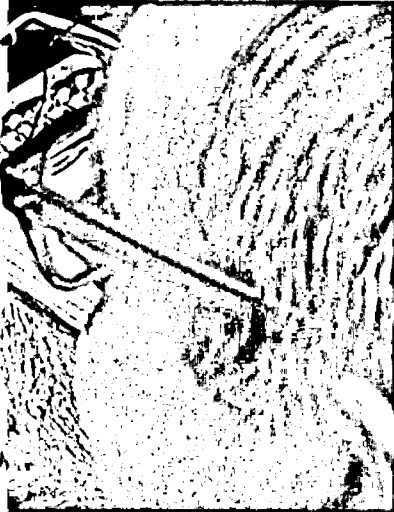


Research Triangle Institute's campus and buildings, center, and several neighboring organizations in the Research Triangle Park.

Clockwise from upper left are Beaunit Corporation's fibers and textiles technical center, the Burroughs Wellcome Co., Monsanto Company's Chemstrand Research Center, International Business Machines Corporation, the N.C. Science and Technology Research Center and Triangle Universities Computation Center occupying the same building below RTI's campus, Hercules Incorporated, the National Center for Health Statistics, and Becton, Dickinson and Company's research center. The Governor's Inn in the Park Plaza service area is at far left.

Hidden in the trees or just out of camera range are the National Environmental Research Center, the National Institute of Environmental Health Sciences, the American Association of Textile Chemists and Colorists, the U.S. Forest Service Southeastern Experiment Station, and Troxler Electronic Laboratories, Inc.





Founding Contributors and RTI Associates

The Founding Contributors and Associates of Research Triangle Institute are corporations, foundations, individuals, and other contributors that participate in RTI's growth and share in the development of its buildings, facilities, staff, and programs.

Initial funding of \$500,000 for Institute start-up operations was provided by the Research Triangle Foundation of North Carolina from contributions made by corporate and individual citizens throughout the state. Land for RTI's campus in Research Triangle Park has also been donated to the Institute by the Foundation.

Other major contributions include grants of \$2.9 million from the Camille and Henry Dreyfus Foundation, a series of equipment grants totaling \$1,018,000 from the State of North Carolina, and large personal gifts from Mr. Grover M. Hermann and Mr. George Watts Hill. All are designated as *Founding Contributors* of the Institute in recognition of gifts of \$100,000 or more.

Smaller amounts in the form of special gifts and annual contributions have been given by others designated as *RTI Associates*.

FOUNDING CONTRIBUTORS

Research Triangle Foundation
State of North Carolina
Camille and Henry Dreyfus Foundation
Grover M. Hermann
George Watts Hill
Celanese Corporation

RTI ASSOCIATES

Alma Desk Company
BASF Corporation
Burlington Industries Foundation
Central Carolina Bank and Trust Company
Chemstrand Research Center, Inc.
John Sprunt Hill
Liggett & Myers, Inc.
Martin Marietta Corporation
Planters National Bank and Trust Company
Herbert T. and Ollie Randall Foundation
Southland Associates

Clients of the Research Triangle Institute

A partial list covering research in progress and recently completed projects. Because the proprietary nature of RTI's work for some of its industry clients makes it inappropriate to name them all, the list is not fully representative.

American College Testing Program
American Society for Testing and Materials
Becton, Dickinson and Company
Bell Telephone Laboratories, Inc.
Blue Cross Association
Brick Association of North Carolina
Burlington Industries, Inc.
Burroughs-Wellcome Co.
Carolina Population Center of the University of North Carolina at Chapel Hill
Carolina Power and Light Company
Celanese Corporation
Children's Television Workshop
Colt Industries of Fairbanks Morse, Inc.
Commonwealth of Virginia
Coordinating Research Council, Inc.
Cotton Incorporated
Crown Zellerbach Central Research
District of Columbia
Dixie Furniture Company, Inc.
Duke Power Company
Eli Lilly and Company
Ford Foundation
General Electric Company
Glen Alden Corporation
Hitachi, Ltd.
Jet Propulsion Laboratory
Johns-Manville Corporation
Keep America Beautiful, Inc.
Kimley Horn and Associates, Inc.
Liggett & Myers, Inc.
Mecklenburg County Commissioners
Monsanto Company (Chemstrand Research Center)
National Academy of Sciences
Highway Research Board
National Assessment of Educational Progress
North Carolina Manpower Development Corporation

North Carolina Textile Manufacturers Association
Owens-Illinois, Inc.
Population Council
R.J. Reynolds Tobacco Company
Schering Corporation
G.D. Searle & Company
State of Maine
State of Michigan
State of Minnesota

State of North Carolina

Board of Education
Department of Community Colleges
Department of Public Instruction
Department of Administration
Manpower Council
State Planning Division
Zoological Authority
Department of Human Resources
Board of Health
Department of Mental Health
Department of Social Services
Governor's Coordinating Council on Aging
Department of Natural and Economic Resources
Department of Conservation and Development
Department of Local Affairs
Department of Water and Air Resources
Wildlife Resources Commission
Department of Transportation and Highway Safety
Department of Motor Vehicles
Governor's Highway Safety Program
State Highway Commission
Employment Security Commission
State Bureau of Investigation

State of South Carolina

State of West Virginia
J.P. Stevens and Company, Inc.
Union Carbide Corporation

United States Government

Appalachian Regional Commission
Coastal Plains Regional Commission
Department of Agriculture
Department of Commerce
Bureau of the Census
National Bureau of Standards
National Oceanic and Atmospheric Administration

Department of Defense
Departments of Army, Navy, Air Force
Advanced Research Projects Agency
Defense Civil Preparedness Agency
Department of Health, Education and Welfare
Office of Education
Public Health Service
Health Services and Mental Health Administration
National Institute of Mental Health
National Institute on Alcohol Abuse
and Alcoholism
National Center for Health Statistics
National Institutes of Health (during 1972 RTI
was under contract to seven of the National
Institutes of Health)
Social Security Administration
Department of the Interior
Geological Survey
Office of Saline Water
Office of Water Resources Research
Department of Justice
Bureau of Narcotics and Dangerous Drugs
Department of Labor
Bureau of Labor Statistics
Office of Manpower Policy, Evaluation and Research
Department of State
Agency for International Development
Department of Transportation
Bureau of Public Roads
Federal Highway Administration
National Highway Traffic Safety Administration
U.S. Coast Guard
Environmental Protection Agency
Advanced Waste Treatment Laboratory
Division of Resource Recovery
National Environmental Research Center
Office of Air Programs
Office of Planning and Evaluation
National Aeronautics and Space Administration
National Science Foundation
Office of Economic Opportunity

Virginia Beach Association
Virginia Electric Power Company
Wake County Community Health Care Task Force
Wake County Hospital System, Inc.
Westinghouse Electric Corporation
Wilbur Smith and Associates

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Durham

*Member, Executive Committee

Research Triangle Institute
P.O. Box 12194
Research Triangle Park
North Carolina 27709
(919) 549-8311 Cable: RTI

MEASUREMENT AND CONTROLS LABORATORY

Applying physical and chemical principles to measurement problems, with emphasis on the use of radioisotope methods, is the central interest of the Measurement and Controls Laboratory.

Nuclear techniques are utilized to solve a wide variety of problems in such fields as water flow and water pollution, engineering studies and trace element analysis. Particular attention is given to extending their range of application through the development and improvement of nuclear detection devices and associated instrumentation.

Complementary research activity is based on the Laboratory's capability in physics, analytical and physical chemistry and chemical engineering. It includes oceanographic measurements and the measurement of industrial process variables.

RTI scientists have pioneered in developing the new concept of "radio-release" analysis, using the extreme sensitivity of radioisotope techniques to determine the presence of non-radioactive elements in trace amounts.



RADIATION SYSTEMS LABORATORY

Theoretical and applied research is directed toward communications, radar, navigation, guidance and control systems. Theoretical studies cover information systems, probability applications, electromagnetic systems, circuit design and feedback systems. Applied work includes studies in wave propagation, antennas, microwave devices, low-noise receivers, networks, storage devices, control circuits, displays, and development and use of special components and materials.

The following areas are of specific research interest:

- Field Programs—Special antenna studies, propagation measurements, target reflectivity, and special problems associated with data acquisition and tracking stations.
- Feasibility Programs—Conceptual, analytical and experimental studies of the applicability of new devices and materials; state-of-the-art component and system studies.
- Development of special components and sub-system techniques for meeting future radiation systems requirements.

GEOPHYSICS LABORATORY

Geophysics research at RTI encompasses the study of physical phenomena occurring throughout the earth-ocean-atmosphere environment. It is conducted on an interdisciplinary basis in cooperation with the Institute's other laboratories and divisions. Major research areas include:

Geology—Physics, chemistry and mathematics are applied to problems concerning the composition, structure and energy balance of the solid earth.

Meteorology—Study of the atmospheric environment gives particular attention to engineering and industrial problems, and to aviation and military weapon systems.

Oceanography—Evaluation of the environmental influence of ocean boundaries and the chemistry and physics of sea water, including ocean dynamics and ocean-atmosphere interactions.

Aeronomy—Research on energy exchange processes in the ionosphere and their influence on electromagnetic propagation, communications and control, and the performance of instrumentation in satellites and rocket-propelled vehicles.

OPERATIONS RESEARCH AND ECONOMICS DIVISION

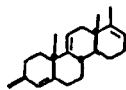
The objective of operations research is to provide explicit, quantitative understanding of the essential elements in an operating system and of the factors controlling them. OR techniques add a new dimension to the scope of problems in which trained research personnel can contribute to increased effectiveness and profitability.

Operations research and economics research at RTI bring together many skills and disciplines to aid business and governmental decision making. Staff members have professional training and experience in the economic sciences, the physical sciences and engineering, agriculture, government, finance and mathematics.

Economic analysis, mathematical models, statistical techniques and high speed computers are among the basic tools of the Division. RTI analysts use them to discover and highlight significant patterns of interaction within industrial, military, national and international operating systems. Their purposes are to identify and evaluate alternative choices facing management in its policy, planning and action decisions, and to determine the most effective utilization of natural, physical, financial and human resources.

Program capabilities at RTI include industrial and regional economics, resource development, military systems, international economics, investment planning, civil defense, marketing and distribution, transportation, communications, and information and command and control systems.

NATURAL PRODUCTS LABORATORY



The Natural Products Laboratory uniquely includes chemists and biologists working together on problems which require inter-disciplinary approaches. Broad programs are pursued in screening natural products for potential drugs or biologically active compounds, with particular emphasis on isolation, structure proof and synthesis.

Although organic chemistry is the major discipline, there are also excellent facilities and subject matter specialists in biochemistry, pharmacology and microbiology. Specialties include steroid and alkaloid chemistry, sulfur and phosphorous chemistry, heterocycles, photochemistry, metallo-organic chemistry, proteins and peptides.

Activity within the Laboratory's closely inter-related areas of research interest includes:

Production of new, structurally modified steroids and testing them for hormonal and anti-tumor properties.

Synthesis of compounds that may reduce the effects of radiation upon living cells.

Exhaustive effort to discover, isolate and identify cancer-retarding agents in growing plants.

Bio-assay of crude extracts from natural products.

Characterization of unidentified natural resins in flue-cured tobacco.

Preparation of a new family of chemicals for possible agricultural applications.

SOLID STATE LABORATORY

Ranging from basic exploratory research to application and product development, activities of the Solid State Laboratory focus on microelectronics, silicon technology, sensors, and device and system reliability.

Microelectronic processes, devices and systems are the subject of an intensive research effort which includes a comprehensive technical information program.

Advances in gas source diffusion, device design theory and electrochemical processes, as well as broad fundamental studies, are the product of continuing research programs in silicon technology.

Sensors—for micrometeoroids in space, for acceleration, for medical research and for other applications—provide the opportunity for applying the results of electronic systems research to the measurement of external phenomena. The piezotransistor effect, as one phenomenon for application, has been given particular attention.

Device reliability is studied by modeling performance in terms of all the factors which influence it. The time dependent variations in the factors are then translated into performance.

System reliability, based upon probabilistic modeling, is given practical interpretation for application to a variety of industrial, military and space systems.




The science of statistics is yielding increasingly powerful techniques and tools for use in all fields of scientific research and development, and in the technical and business operations of industry, government bureaus and other public agencies. The growing complexity of decision-making processes in manufacturing, distribution, marketing and public service functions requires improved methods of identifying, collecting and analyzing information.

At RTI research in the classical fields of experimental design, sampling and statistical theory is conducted in support of and concurrently with extensive programs in reliability and in the control and optimization of industrial processes. The approach is often multidisciplinary, involving the skills of statisticians, mathematicians and engineers in various subject fields. Research objectives in the analysis of functional relationships are, in general, to:

- Develop meaningful probabilistic or stochastic models which describe a process, system or piece of equipment.
- Identify those points where controllable variation enters the system.
- Design experiments so that the effect of variation at control points can be measured.
- Optimize the system with respect to some meaningful criteria for the output.

Emphasis is given to the following program areas:

Design and Analysis of Experiments
 Sampling and Data Collection
 Statistical Theory
 Reliability
 Analysis and Control of Industrial Processes




RTI's Camille Dreyfus Laboratory is an international center for basic studies in the physics and chemistry of polymers. It is dedicated to long-range fundamental research in polymer science, and to the discovery of new materials and the modification of known polymers which may provide the foundation blocks for products and industries of the future.

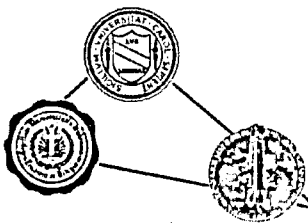
The Laboratory was created by a \$2.5 million grant from the Camille and Henry Dreyfus Foundation as a research memorial to one of the great pioneers of man-made fibers, chemicals and plastics. Sustaining support is also received from corporate and government sponsors.

The Laboratory's general program is about equally divided between research relating to the synthesis and modification of polymer structures, and research relating to pure property investigations. All projects undertaken in the Laboratory serve to advance these objectives. Research findings are published in scientific journals and other publications.

Selected areas of study within the general program include: the dynamics and thermodynamics of polymer solids; polymer morphology; electrical, optical and solution properties of polymers; crystallization, deformation, permeation and diffusion in polymers; radiation chemistry (degradation, grafting, cross-linking, polymerization); stereochemistry; polymerization kinetics.

The work of the Laboratory's permanent staff is enhanced by the knowledge and experience of Resident Visiting Scientists, from this country and abroad, who hold six-month to two-year appointments at RTI.





UNIVERSITY AFFILIATIONS

RTI's privileges and relationships within the Triangle university family are the Institute's greatest assets. Strong university orientation is a distinctive feature of RTI operations. The universities are its corporate parents, and faculty members and department heads have played key roles in planning and developing major research areas at RTI. Exchange of information and the sharing of research facilities occurs both at formal levels and through many informal and personal associations.

▣ The libraries of the three universities contain by far the largest collections in the south. RTI's staff has access to a combined total of nearly 2.5 million volumes, cross-referenced and readily obtainable.

▣ Other university facilities available to RTI include high-speed computers, research reactors, particle accelerators, wind tunnels, low- and high-temperature laboratories, and extensive general purpose and specialized equipment.

▣ Consulting assistance from faculty members is of great importance to RTI as a means of supplementing the capabilities of its permanent staff.

▣ Numerous projects in support of university programs are performed at RTI in such fields as public health, agriculture, economics, marketing and instrumentation.

▣ A number of RTI senior staff members hold adjunct faculty appointments, many of them involving special teaching assignments. Many RTI employees are enrolled in credit courses for graduate training.

▣ Seminars and symposia are attended by members of the four institutions. A distinguished visiting lecturer series is presented on a regular basis by RTI's Camille Dreyfus Laboratory.

CONTRACT PROCEDURE



Sponsors of research at RTI include industry, government agencies and foundations. Many contracts call for cooperation and mutual assistance between the Institute and departments of the Triangle universities.



Senior scientists plan and carry out research programs at RTI. They participate to an unusual degree in the conduct of project work. Close contact is maintained with sponsors through frequent meetings and informal communications, as well as through regular written reports. All research is supervised at the senior level. Results are reviewed by laboratory and division heads.



A typical project is developed through preliminary discussion and direct negotiation between the sponsor and senior RTI staff members. Proposals for research are prepared by a project team and approved by RTI management. Each proposal describes objectives of the research, an outline of work and technical staff assignments, and estimates of duration and cost.



Contract work is held in any degree of confidence the sponsor may desire. RTI personnel hold clearances at the highest level for the conduct of government-classified research. All research results, including patentable discoveries, become the property of the sponsor.

FACILITIES

RTI
RTI's 200-acre campus is centrally located within the Research Triangle whose geographic points are the University of North Carolina at Chapel Hill, Duke University and North Carolina State. The proximity of the four institutions, which are only a few minutes drive from each other, creates an environment of unique stimulus and challenge for the research scientist.

Activities of the Institute's eight research laboratories and divisions are housed in five modern buildings containing 95,000 square feet devoted to laboratory space, offices, meeting rooms, an auditorium, and library, shop and service areas. As contractual obligations require, RTI project offices are established in foreign countries and throughout the United States.

RTI
Laboratory equipment and specialized instrumentation to support the Institute's wide-ranging research interests represent an investment of over \$700,000 by RTI, including appropriations from the State of North Carolina and gifts. Major items include a Cobalt-60 radiation facility, nuclear magnetic resonance equipment, x-ray diffraction units, infra-red and ultra-violet spectrophotometers, gas chromatographs, electron microscope, facilities for fabricating solid state and thin film devices, seismic installations for field and laboratory studies, and Craig counter-current equipment. RTI also maintains an animal colony for the evaluation of biologically active substances.

RTI
The Camille Dreyfus Laboratory for fundamental research in polymer science was created under a \$2.5 million, ten-year grant from the Camille and Henry Dreyfus Foundation. Research findings from this international center are distributed on an unrestricted basis.

AREAS OF RESEARCH

RTI
Ideas and innovation are the hallmarks of RTI's research approach. Staff scientists pursue original investigations along lines consistent with sponsor objectives. Publication is encouraged. These policies attract scientists, engineers, mathematicians and economists of unusual attainment and experience. Over two-thirds of RTI's professional staff members have training at the graduate level; of these, more than half hold the Ph.D. degree.

Advances in modern technology spring from the successful application of new facts and new knowledge in the physical and economic sciences. RTI's primary service lies in its trained, professional capability to perform the analysis and planning necessary to achieve the most productive matching of scientific and technical opportunity with the objectives of industrial and government sponsors.

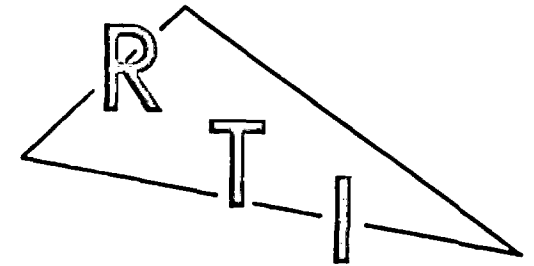
Areas of Major Research Interest Include:

Aeronomy / Agricultural Statistics / Antennas / Area Development / Biochemistry / Biological Assays / Circuit Theory / Civil Defense / Deep-space Communications / Design of Experiments / Economic Analyses / Electrical Properties of Organic Materials / Electrochemical Techniques / Guidance Systems / Industrial Operations / Information Processing / Instrument Development / International Development / Management Systems / Marketing / Mathematical Modeling / Medical Instrumentation / Meteorology / Microelectronics / Network Control / Oceanography and Oceanographic Instrumentation / Organic Chemistry / Performance Evaluation / Pharmaceutical Chemistry / Pharmacology / Phytochemistry / Polymer Science / Process Design and Analysis / Production Economics / Propagation Studies / Radar Target Studies / Radioisotope Applications / Sampling / Seismology / Sensors / Silicon Technology / Solid State Devices / Statistical Theory / Steroid Synthesis / Systems and Device Reliability / Thin Film Devices / Transportation Analysis / Weapons System Evaluation.

RTI RESEARCH SPONSORS 1959-1964

(A Partial Listing)

Atlantic National Advertising Agency	mand, Research and Technology Division
Atomic Energy Commission	Army Research Office (Durham)
Bell Telephone Laboratories	Edgewood Arsenal, U.S. Army
Camille and Henry Dreyfus Foundation	Electronics Materiel Agency, U.S. Army
Celanese Corporation of America	Electronics Systems Division, U.S. Air Force
Chemstrand Research Center, Inc.	Frankford Arsenal, U.S. Army
Continental Can Company	Office of Civil Defense, U.S. Army
Corning Glass Works	Office of Naval Research
Douglas Aircraft Company	Office of Scientific Research, U.S. Air Force
Federal Power Commission	Office of the Surgeon General, U.S. Army
General Electric Company	U. S. Department of Health, Education and Welfare
National Academy of Science, Highway Research Board	National Institutes of Health
National Aeronautics and Space Administration	U. S. Department of the Interior
National Science Foundation	Office of Saline Water
North Carolina Board of Science and Technology	U. S. Department of State
Owens-Illinois Glass Company	Agency for International Development
Tidewater Oil Company	Western Electric Company
Union Carbide Corp.	
U. S. Department of Agriculture	
U. S. Department of Commerce	
Bureau of the Census	
Weather Bureau	
U. S. Department of Defense	
Air Force Systems Com-	



RESEARCH
TRIANGLE
INSTITUTE

RESEARCH TRIANGLE INSTITUTE

DURHAM, NORTH CAROLINA





RESEARCH TRIANGLE INSTITUTE is a contract research organization formed at the initiative of business leaders and state and university officials in North-Carolina. Initial funding was provided by the Research Triangle Foundation through contributions received from individuals and corporations.

The purpose of RTI's founders was to establish a research center supplementing the activities of its neighboring universities—the University of North Carolina at Chapel Hill, Duke University in Durham, North Carolina State in Raleigh—in the discovery and application of new knowledge. Created to provide professional research services to industry and government, RTI is a scientific resource which contributes directly to the economic well-being and security of the people of North Carolina, its region and the nation.

RTI is a separate corporate entity. Under an independent Board of Governors, Institute management is solely responsible for operating policies and for developing the programs of its research laboratories and divisions. Ultimate ownership of the organization's assets is vested in the Triangle universities.

Non-profit status affirms RTI's independence. Like any business, however, it must rely on its own earnings for continued staff growth and expansion of facilities. RTI's operating surplus is used to provide new laboratory equipment, to underwrite new areas of research, and to fulfill the public service obligations of its charter.

Research operations were underway early in 1959 and, by the end of 1964, had grown to a rate in excess of \$3 million annually.

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Vice Provost for Medical Affairs
Duke University |
| George R. Herbert*
President
Research Triangle Institute | |

* Member, Executive Committee

RTI programs emphasize the multi-disciplinary approach. Most work benefits from the active participation of professionals within the Institute and at the Triangle universities who are skilled in a variety of disciplines.

Close and continuing association among specialists in many fields extends the resources of RTI's research managers and enhances the quality of scientific enterprise throughout the Institute.