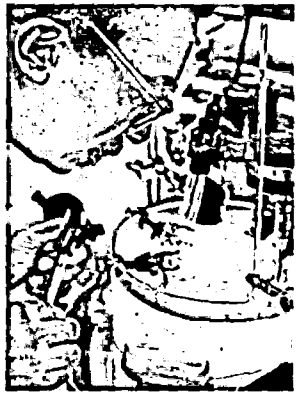
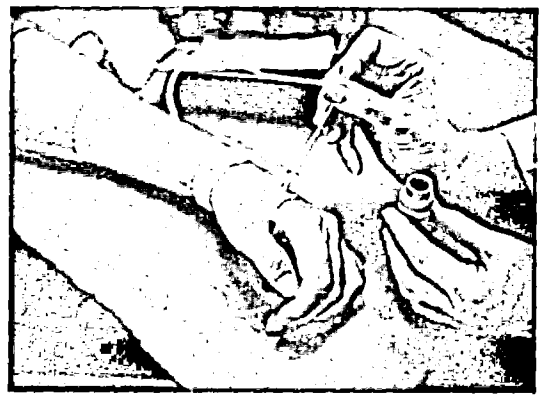
1971

Report of Progress 1971

RESEARCH TRIANGLE INSTITUTE






"Our primary purposes are to perform effective scientific research services for industry and government, to help achieve national goals, and to aid in the advancement of human and economic development in the Research Triangle region and all of North Carolina."

Research Triangle Institute has many missions. We are a scientific organization whose professional standards are set high and kept high for contributing as effectively as we can to human knowledge and an improved understanding of the world's physical and social environments. We are fortunate in the qualities of scientific ability and leadership that mark our staff members both as a group and as individuals. They are the sole basis for the Institute's recorded accomplishments, as well as for those that may lie ahead.

We are committed to a role of service through research. That is our business and our profession. Our products are research results that can be turned to the problem-solving and planning processes of business, industry, and government. Institute research is closely identified with the priorities, the problems, and the objectives of private and public enterprise in our region and throughout the nation.

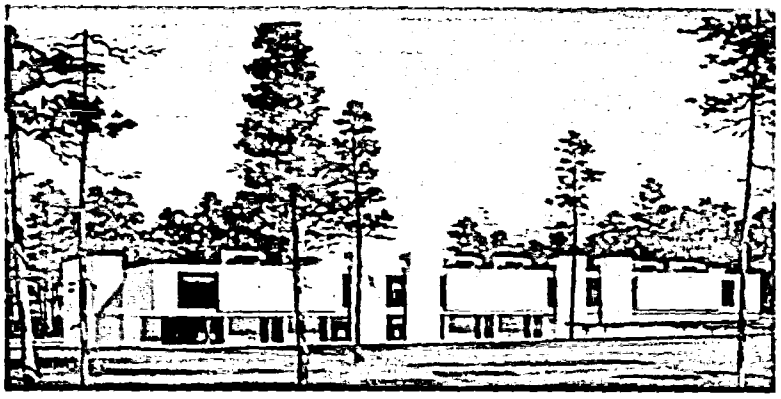
RTI research is inseparable from real-world contexts and human concerns. Implicit in nearly all of our work, and explicit in much of it, is a clear perception that the Institute and its staff members are directing their talents and energies toward a healthier, cleaner, safer, better-fed world, and toward a more satisfying quality of life.

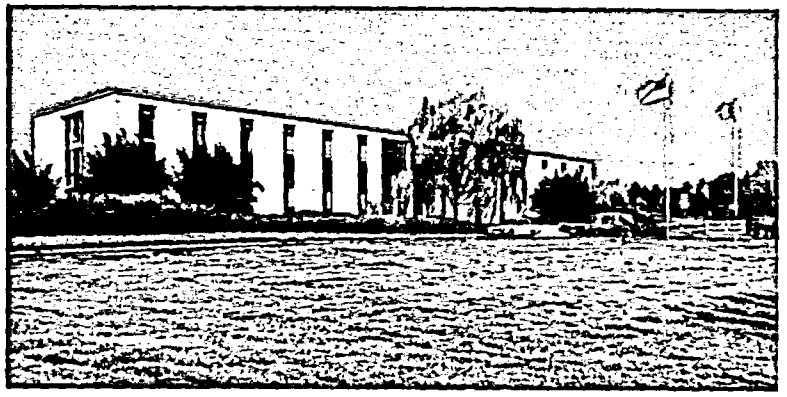
While proud of its growth as a part of the nation's total research resource, RTI also recognizes a special obligation to the people and institutions of its region. An increasing proportion of RTI research effort is carried out in conjunction with state and regional business organizations, government agencies, and educational institutions.

As namesake and symbol of North Carolina's Research Triangle, the Research Triangle Institute has many missions. Measured against their demands, RTI's future is alive with opportunity and challenge.

George R. Herbert

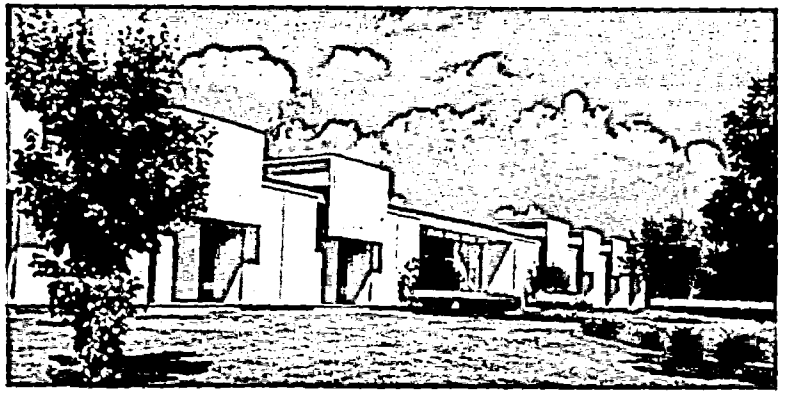
President



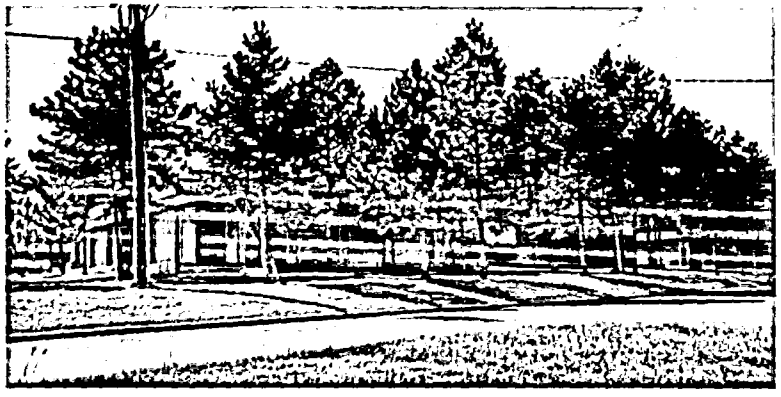


Robert M. Hanes Memorial Building

1971 completion of a $1.3 million, 40,000-square foot Chemistry and Life Sciences complex, above, brings investment in RTI buildings and equipment to approximately $6 million. The eight major structures on the Institute's 200-acre campus contain 160,000 square feet of laboratory and office space. Other facilities include the Research Triangle area's regional mass spectrometry center, a cobalt 60 gamma-radiation chamber, a 120-foot air chemistry sampling tower and instrument station, a 35-foot mobile laboratory trailer, and a BR-340 computer center with full-time staff. To meet project requirements, field office operations are conducted from locations abroad and throughout the United States.



Camille Dreyfus Laboratory



RTI numbered buildings 3, 5, 6, 7

William Trent Ragland Building

ORGANIZATION

Research Triangle Institute is a not-for-profit, contract research organization created as the focal point of North Carolina's Research Triangle Park, a national scientific center built on the resources of the area's three major universities—the University of North Carolina at Chapel Hill, Duke University at Durham, and North Carolina State University at Raleigh. The Institute's campus and buildings are in the 5,200-acre Research Triangle Park located at the center of the geographic triangle formed by the three cities and three schools.

RTI was established by joint action of the universities in December 1958 as a self-supporting corporate entity under a separate Board of Governors. The 25-member Board comprises 12 academic officials, 12 executives elected from business and industry, and the president of the Institute.

Initial funding for Institute operations and development was provided by a half-million dollar grant from the Research Triangle Foundation.

OPERATIONS

RTI provides its industrial and government clients with professional scientific research and planning services on a contract basis. The Institute employs a permanent staff of professional, technical, and support personnel.

Institute project work began in March 1959. At the end of its first operating year, RTI reported a staff of 35; 10 projects; and revenues of $142,000. Cumulative totals to 1971 include more than 700 research assignments completed or in progress, and revenues of $42 million.

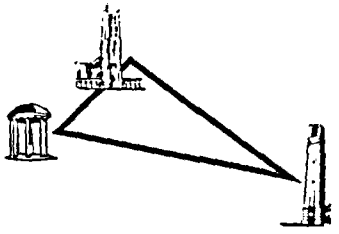
Figures for the current year show

- $7,800,000 research volume
- 120 active research projects
- 430 permanent, full-time staff members
- $6,000,000 investment in facilities and equipment.

UNIVERSITY AFFILIATIONS

RTI's place in the Triangle university family is a distinctive feature of its operations. The Institute is within a 20-minute drive of each of the schools.

Faculty members from RTI's three founding universities have assisted in planning and developing many of the Institute's research programs, and regularly participate as consultants to RTI projects. Other relationships among the four institutions are joint staff appointments, cooperative contract research, frequent seminars and lectures, and other professional associations. Numerous RTI staff members also hold active adjunct professorships and teaching appointments in their fields of specialty.



In addition to regular graduate department contacts, RTI benefits particularly from close ties with university professional schools and with other units of the academic research community, including the Carolina Population Center, Institute of Government, Highway Safety Research Center, Institute for Environmental Health Studies, Industrial Extension Service, Duke Marine Laboratory, and the prototype Triangle Universities Air Pollution Control Consortium.

Other educational institutions in the area with which RTI maintains working relationships are the Bowman Gray School of Medicine at Wake Forest University in Winston-Salem, North Carolina Central University in Durham, Shaw University in Raleigh, and the Cape Fear Technical Institute in Wilmington.

RTI has direct access terminals to the Triangle Universities Computation Center's IBM 360/75 located near the Institute in the Research Triangle Park, and schedules time on the TUCC system for many projects.

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.

Institute programs are geared to early recognition of emerging problems and opportunities in the nation's life, and to effective research-based measures for helping to meet them. As a result, most RTI project work is interdisciplinary both in purpose and in execution.

Health-related research has become one of the Institute's most comprehensive areas of effort. Its many aspects account for a significant proportion of activity in each Division and Laboratory. Studies encompass all staff disciplines and range from pharmacological evaluation of antifertility steroids to the statistical analysis of drug effects on the human system, and from diagnostic instrumentation engineering to the economics of community medical care services.

Other areas of prominent national concern which involve a major commitment of interdisciplinary staff effort throughout the Institute include

Air and Water Pollution

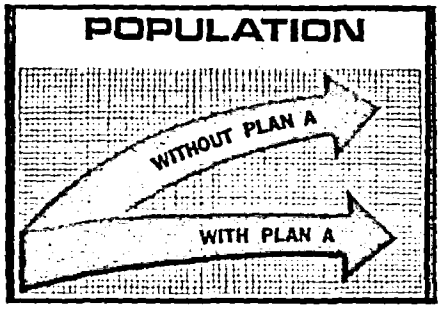
Education Assessment

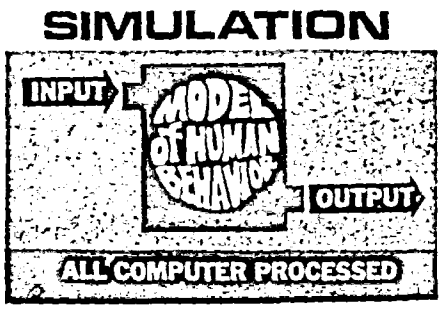
Population

State Planning and
Regional Development

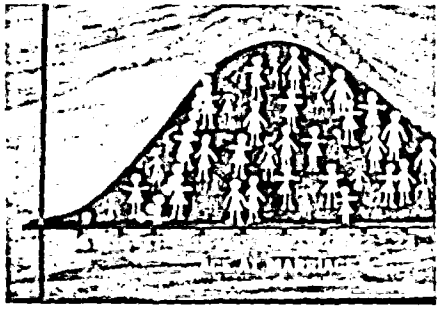
Biomedical Engineering

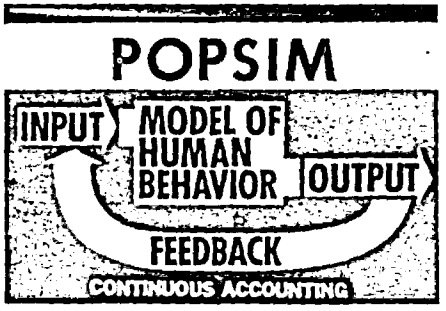
Transportation

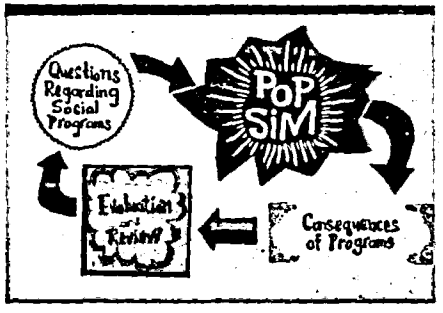




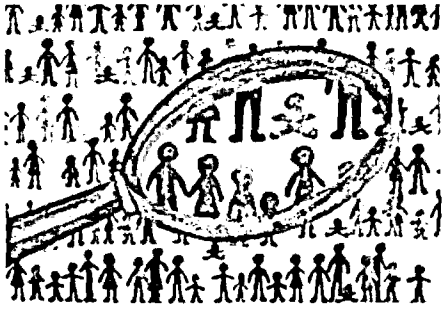
POP SIM dynamic open micro demographic model

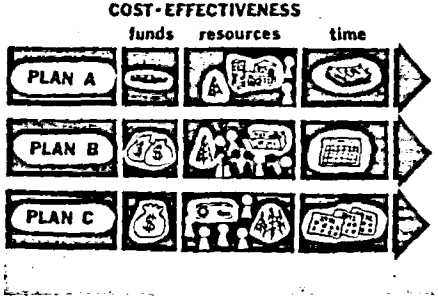


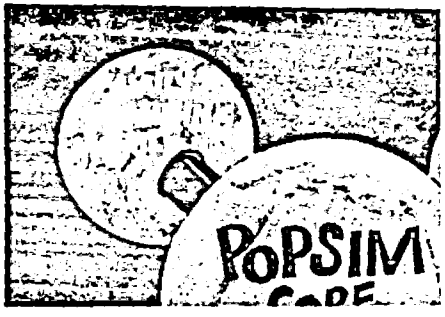




POPSIM is a demographic microsimulation computer model that generates and absorbs into its processes the vital histories and other real-life events occurring in human populations. Developed by RTI in cooperation with the University of North Carolina at Chapel Hill and the National Center for Health Statistics, POPSIM is the leading edge of the Institute's commitment to extensive population research. Other studies include investigations on the metabolic effects and potency of oral contraceptives; analyses of family planning practices and medical care services; and improved methods for collecting and projecting reliable census data and related information about economic and social trends, health, nutrition, and agriculture.





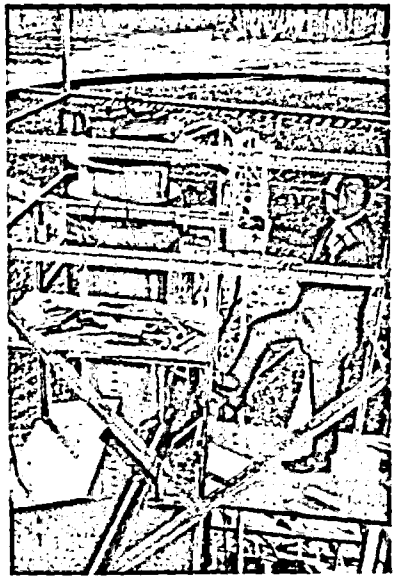


In one of many social sciences projects, Neighborhood Youth Corps enrollees' characteristics, problems, aptitudes, and expectations were the subject of RTI probability sampling and field survey analyses. Institute researchers have also examined the problems of young men mentally unqualified for military service, developed an index to measure the relative economic status of rural families, and are investigating the relationship of drug usage to serious crime.

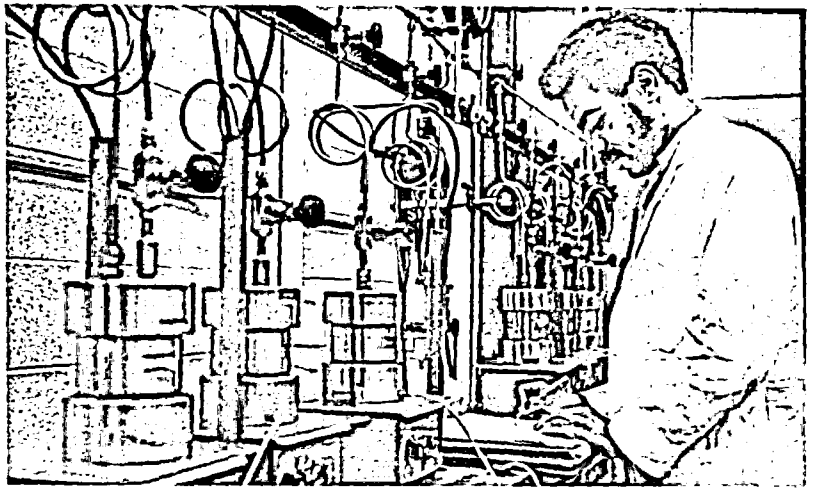
Laser technology is used in development of a prototype integrated circuit optical inspection system.

RTI conducts the random sampling analyses and exercise administration for the National Assessment of Educational Progress. A study of unprecedented scope, the assessment's goal is to measure how much America's schoolchildren know and how much they are learning. Other educational research includes a planning model for North Carolina's community college system based on projected changes in the state's population mix, employment categories, and job training requirements.

The rare Chinese tree Camptotheca acuminata *is the source of a novel alkaloid named* camptothecin *that has proved effective in preliminary clinical trials against some types of cancer. Isolation, identification, and structural determination of the pure substance were first reported in RTI's continuing cancer chemotherapy program. At the time, only two specimens of the tree were known to exist in the United States.*



Fluidized sewage treatment and continuous filtration waste processing applications for water quality improvement are among cooperative programs undertaken jointly by RTI and its parent universities.



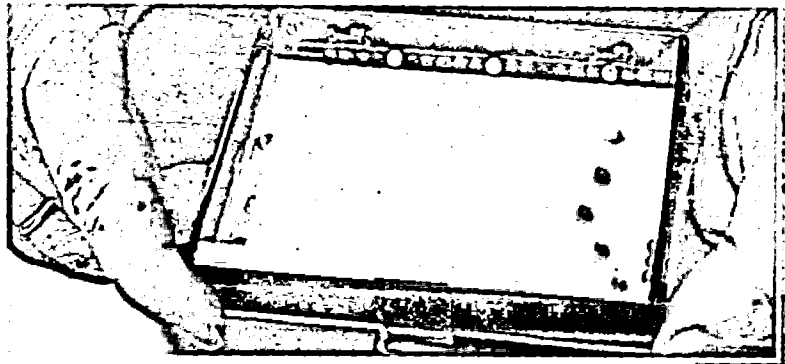
Water desalination—a row of test cells for reverse osmosis membrane evaluation. Other research covers solid waste management, water pollution, and chemical processing systems.

The measure of RTI project performance lies in the capabilities of a research staff which combines practical experience in business, industry, and government with academic training in fields that range from air chemistry to zoology.

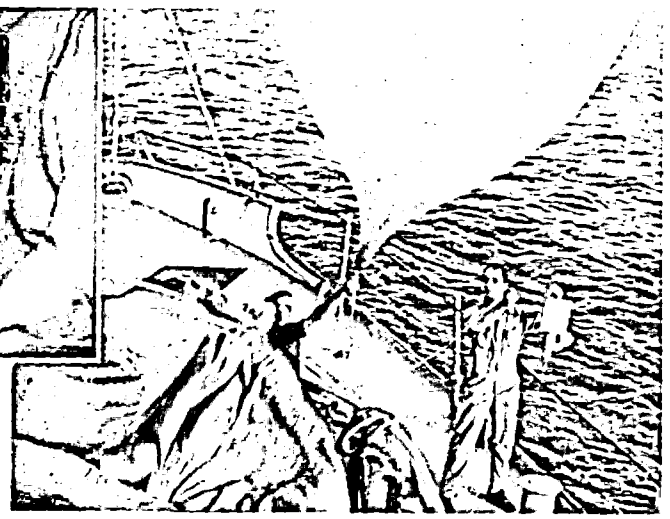
Versatility, imagination, and broad professional backgrounds highlight the qualities that Institute staff members bring to their assignments for industry managers who have operating problems to solve, for business executives looking ahead to the demands of corporate development, and for government officials concerned with program planning and the delivery of public services.

Sixty percent of RTI's staff has professional training. Over one-third of this number holds the Ph.D. More than 50 degree fields are represented, spanning the physical, life, and social sciences, economics, statistics, and the engineering disciplines. In addition—and particularly in environmental pollution, transportation, population, and health-related research—RTI maintains consulting arrangements with nearly 200 faculty members from neighboring universities, colleges, and medical schools.

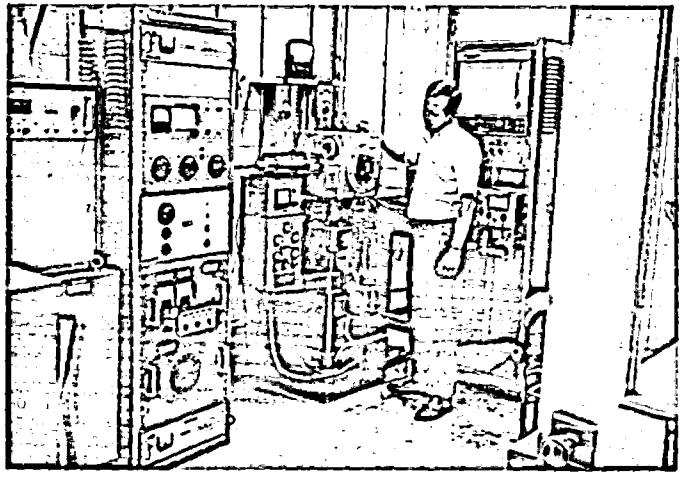
Specialists in many disciplines thus turn their skills to various facets of significant research areas involved in achieving project objectives. This multidisciplinary approach is evident in a series of kidney disease research studies that included: an examination of the direct and indirect economic effects of kidney disease; compilation of the first computerized registry of the nation's hemodialysis patients; benefit-cost analysis of kidney disease treatment programs; and development of new materials for dialysis membrane systems.



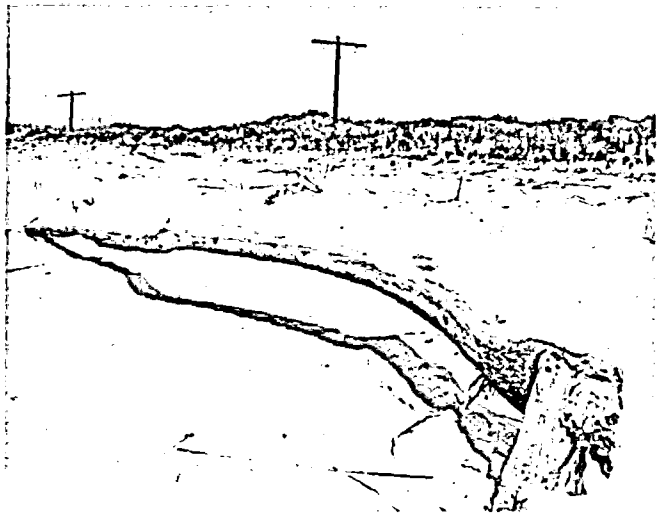
A simple plastic box containing colored beads is the key factor in RTI experiments with randomized response, an interview method that assures complete privacy of answers to questions on sensitive personal subjects. Institute sampling and survey specialists employ the new technique in studies on a number of society's problems, including abortion rates, birth control practices, and drinking-driving behavior.



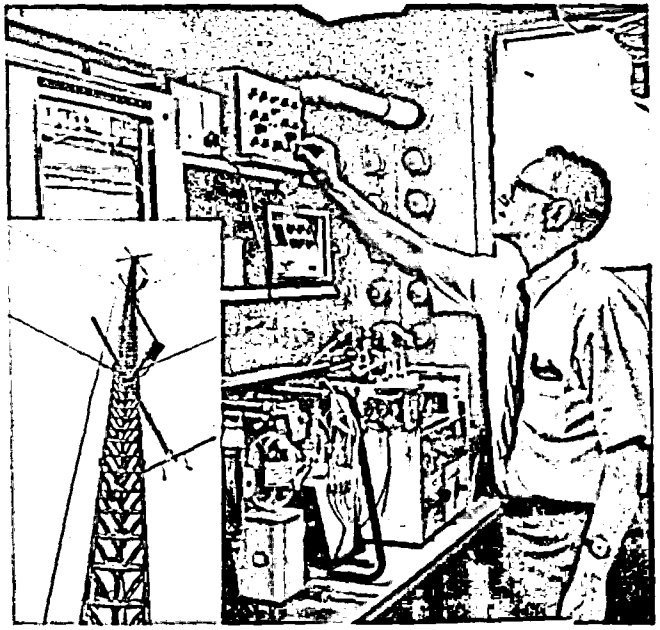
Oceangoing meteorological research includes RTI participation in the BOMEX and TEKTITE II expeditions to the Caribbean.



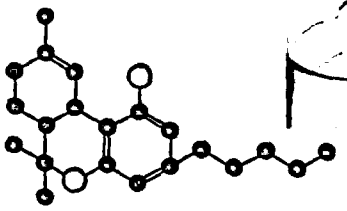
Electron gun simulates space radiation effects on plastic films.

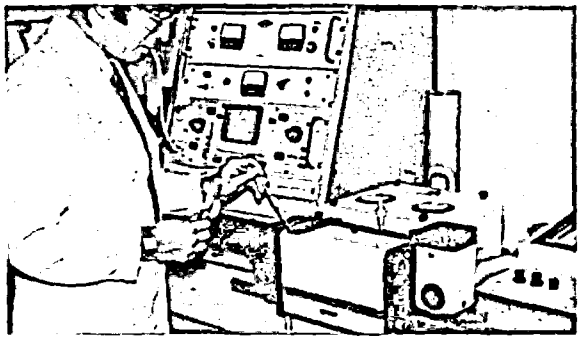


Conservation, recreation, economic forecasting, educational needs, and population and employment growth trends are leading subjects of RTI research for the State of North Carolina and surrounding areas. The Institute's Office of State Planning and Regional Development works closely with many state and regional agencies on long-range strategies and practical methods to assure the most effective use of human, financial, and natural resources.

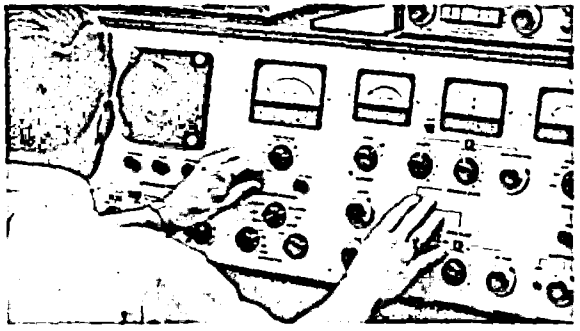


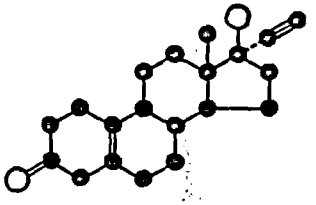
Air pollution research, a priority at RTI, extends from the upper atmosphere to the ocean surface, from meteorological theory to stack effluent analysis, and from detection of trace gases to formulation of national emission standards. Three typical projects are: estimating the economic effects of air quality control enforcement, field evaluation of an array of pollutant monitoring devices, and correlating human exposure to nitrogen oxides with the prevalence of chronic respiratory diseases.



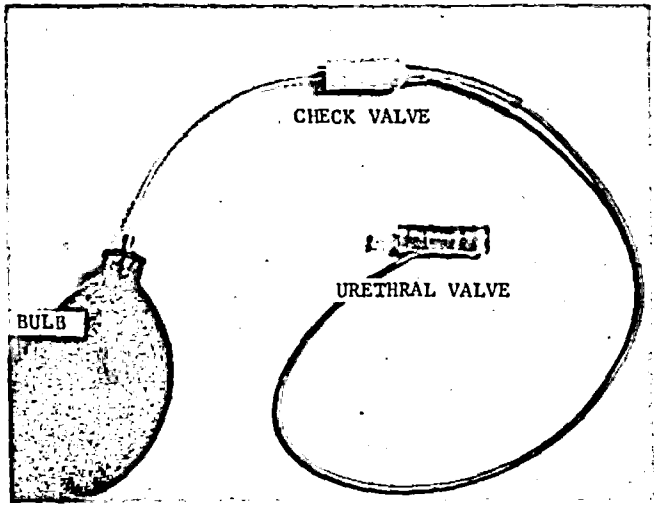


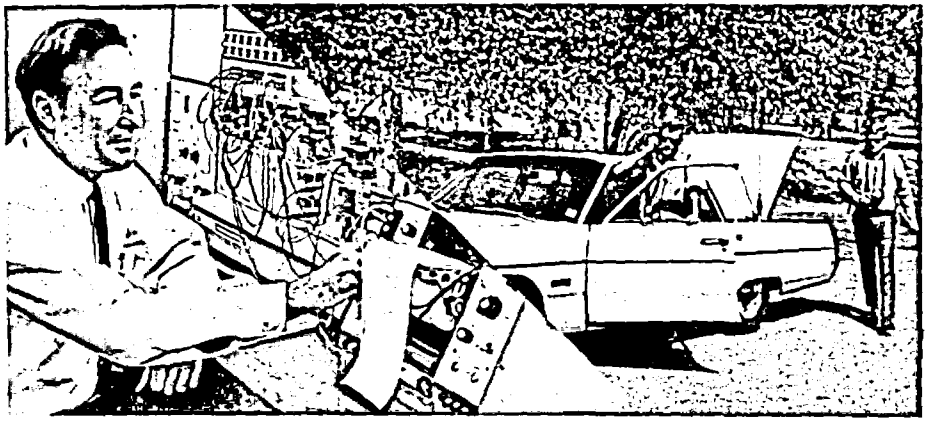
A dual wavelength, split beam spectrophotometer, above, and MS-902 high resolution, double focusing mass spectrometer, below, are among the analytical tools available for RTI laboratory investigations. These are symbolized by structural diagrams of norethynodrel, left, and Δ^9-tetrahydrocannabinol, right. Norethynodrel is one of the steroids used in oral contraceptives, THC is the biologically active constituent of marihuana.





An aerospace pressure tube valve reengineered as a prototype system for urinary control is one of some sixty space-to-medicine technology transfers achieved by RTI's Biomedical Applications Team. The NASA-sponsored BATeam applies advances in space research to the needs of medical science. Other transfers include painted-on electrodes for electro-myograph muscle therapy (see photograph inside front cover), and an improved closed-circuit television monitoring system for heart research.





Transportation studies include analyses of the role of speed deviation as a contributing factor in automobile accidents, and radar techniques for aircraft collision avoidance systems. RTI also publishes a monthly review of current literature on traffic flow theory and controls. A major effort in safety research is a 3½-year pilot evaluation of various countermeasures against drinking drivers.

Project and program activity at RTI is administratively organized into five major divisions and laboratories. Primary responsibility for contract performance on each study or subject area of effort is assigned on the basis of predominating research interest and capability.

Within the complexities of today's business, economic, and social systems, however, client objectives increasingly call for an intermingling of professional backgrounds that cuts across organizational lines and combines the talents and experience of staff members of many skills and disciplines. Flexibility in matching its research resources with requirements that span many scientific fields is a key element in RTI's approach to the problem-solving needs and planning goals of its clients.

As new priorities and interests develop within the Institute, small interdivisional teams assess the resources and opportunities on which to base the formation of new programs. Studies in population, air pollution, water pollution, state planning, and transportation are examples of major activities that have been established through intensive Institute-wide planning.

Institute research sponsors include federal, state, and local government agencies, foundations, public service organizations, and industrial clients ranging from local companies to national corporations.

Contracts typically originate from exploratory discussions between the sponsor and RTI staff members. Specific proposals are then prepared by a professional project team and approved by RTI management. Each proposal contains an outline of work, technical staff scheduling, and an estimate of project duration and cost. Close contact is maintained with sponsors through frequent meetings and informal communications, as well as through regular written reports.

STATISTICS RESEARCH DIVISION

Statistics is a scientific system for the design, collection, organization, analysis, and interpretation of numerical information as a basis for inference and decision-making. Statistics research seeks to improve the methodology of these operations, and to apply its techniques to problems facing mankind. It aims at a surer knowledge and definition of the variables that control physical, industrial, and social systems, and that influence the quality of life.

At RTI one of the nation's largest and most versatile groups of research statisticians combines advances in experimental design, sampling, statistical theory, modeling, and survey methods with systematic approaches to the complex planning, operating, and problem-solving decisions of its clients.

Major programs stress educational, economic, environmental, and behavioral statistics, and comprehensive population studies covering vital rates analysis, family planning, nutrition and health, census evaluation, and population control measures.

Emphasis is also given to research on systems and device reliability, traffic safety, environmental pollution health hazards, employment and manpower, health care resources, and industrial production and processes.

Dr. Alva L. Finkner
Director

CHEMISTRY AND LIFE SCIENCES LABORATORY

The merging interests of medical science and chemistry are exemplified in Research Triangle Institute's Chemistry and Life Sciences Laboratory, where professional scientists of several disciplines work closely together on basic programs in drug metabolism, natural products chemistry, synthetic organic chemistry, biochemistry, and pharmacology.

Extensive studies are carried out in investigations of biologically active compounds, with particular emphasis on isolation, structure determination, synthesis, and mode of action. The preparation and evaluation of new materials for pharmacological testing, and applications of organic chemistry to the solution of biological problems are major interests.

Notable contributions are being recorded by the Laboratory staff in studies on anticancer agents, oral contraceptives, active constituents of marihuana, antimalarials, a variety of hormonal substances, analgesics, barbiturates, and agricultural materials.

The excellent instrumentation and specialized equipment resources available for Chemistry and Life Sciences program include an MS-902 high resolution, double-focusing mass spectrometer with on-line computer system operated by RTI as a regional analytical center in conjunction with the Triangle universities.

Dr. Monroe E. Wall
Director

OPERATIONS RESEARCH AND ECONOMICS DIVISION

RTI's operations research and economics programs are directed at the decision-making, problem-solving, and planning processes of business, industry, and government.

Systems analysis, mathematical modeling, engineering, and statistical and computational techniques are among the capabilities of a staff representing many professional disciplines. Division scientists seek to identify the patterns of interaction that occur within social and economic operating systems. They define and evaluate alternative choices that face corporate, institutional, and public policy managers in making decisions that require a productive synthesis of needs with resources, feasibility with economy, and effectiveness with cost.

Programs include industrial and financial systems, economic forecasting, medical services, health economics, environmental systems, state and regional planning, transportation technology, and highway and traffic safety.

National-regional-urban analyses cover population, manpower and employment trends, educational needs, natural resources, community health services, and recreation planning. Other subjects of primary interest are economic aspects of air and water pollution, production and distribution systems, civil defense preparedness, and information systems.

Dr. Jay T. Wakeley
Director

CAMILLE DREYFUS LABORATORY

RTI's Camille Dreyfus Laboratory is one of the major research groups in the United States giving emphasis to investigations in the physics and chemistry of polymers.

The Laboratory was established in 1961 with the assistance of an initial $2.5 million grant from the Camille and Henry Dreyfus Foundation as a memorial to Dr. Camille Dreyfus, founder of the Celanese Corporation and a pioneer in polymer-based industrial development.

Together with continuing attention to fundamental research, Camille Dreyfus Laboratory scientists direct their skills and experience to a growing number of applied studies on polymer structures and properties. These include the synthesis, characterization, and degradation of polymers, radiation effects, transport phenomena, polymer rheology, polymer morphology, plastic deformation and fracture.

Applications areas of special interest are membranes for water desalination, organoboron flame retardants for fibers and films, conducting polymers, protective coatings, polymer additives for drag reduction, and photodegradable polymers. Health-related research covers blood compatible polymeric substances, improved hemodialysis membrane materials, and hydrogel models of biological systems.

Dr. Anton Peterlin
Director

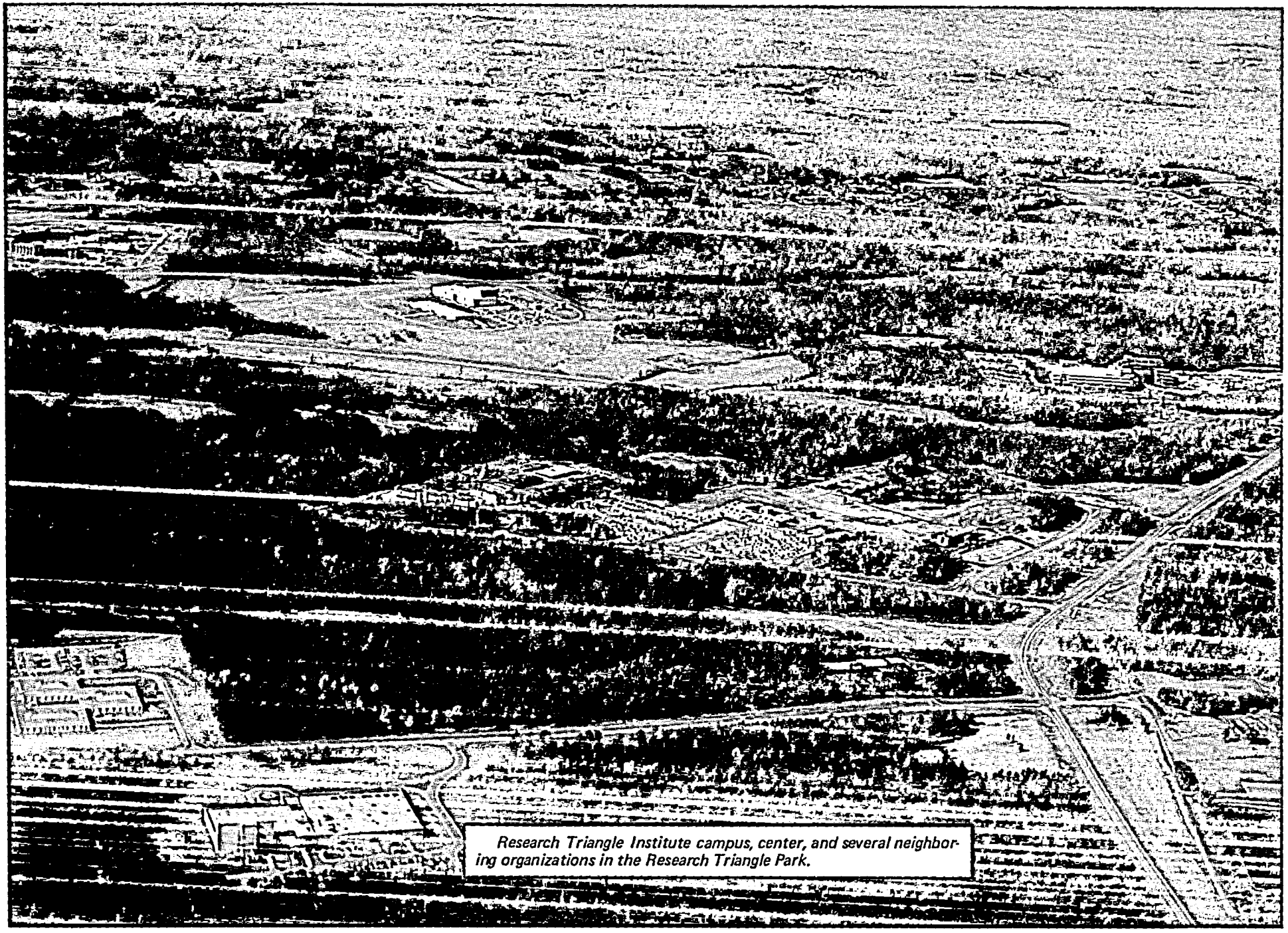
ENGINEERING AND ENVIRONMENTAL SCIENCES DIVISION

RTI scientists and engineers serve both industry and government by rapid response applications of advanced technology to the solution of immediate practical problems, as well as by studies in more basic areas of the engineering and environmental disciplines.

Projects range from meteorological and pollutant measurements at field sites to intensive laboratory investigations of electronic phenomena. Industrial programs have included complex electromechanical control systems, technology surveys, and design and fabrication of specialized electronic instrumentation. Other research covers materials and sensor development, electromagnetic propagation analyses, satellite data interpretation, optical image processing, space research experiments, remote sensing, oceanographic expeditions, and a variety of air pollution activities.

Significant effort is directed toward applying advanced aerospace technologies to biomedical engineering, air pollution, and the marine sciences. Comprehensive reports have been prepared on silicon integrated device technology, systems reliability, and air pollution emissions. Other activities include solid earth geophysics, radar system studies, air traffic control and collision avoidance systems, radiation effects, and automatic data processing.

Dr. Robert M. Burger
Director



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

NORTH CAROLINA'S RESEARCH TRIANGLE . . .

> ". . . is the central fact in the state's economic future. There is nothing quite like it anywhere else, in fact, in spirit, or in purpose."—Luther H. Hodges, Chairman, Research Triangle Foundation; Governor of North Carolina, 1954-1961; United States Secretary of Commerce, 1961-1965.

At the beginning of 1959 there was an area of clay and pine-clad hills in central North Carolina that contained little more than a few creeks and a handful of family farms. Today it is the 5,200-acre Research Triangle Park, familiar and easily recognized as the name for one of the world's major centers of scientific research.

In the 1970's, the pines and farmland have given way to more than $100,000,000 of laboratory and office buildings in a carefully preserved park-like setting. By the beginning of the decade 18 corporations, government agencies, and university-affiliated organizations had chosen the Research Triangle Park as the site for research, development, and scientifically oriented production activities, bringing with them new employment counted in the thousands and combined payrolls high in the tens of millions.

The Research Triangle name was suggested by the location of the campuses and cities of the three major universities that anchor the area—the University of North Carolina at Chapel Hill, Duke University at Durham, and North Carolina State University at Raleigh. The schools are all within 15 miles of the central Park.

The Research Triangle idea began to glimmer in the mid-1950's, rising out of North Carolina's critical need to refuel an economy whose investments, income levels, and taxes were no longer adequate to the demands of a prosperous, forward-looking society.

The Research Triangle hope, now fleshed into solid reality, was that the fortunate geographic clustering of major universities was an asset which could contribute to building a new dimension into the state's future by growing and attracting the kinds of industries that would create the products, services, and markets of the decades ahead.

The link between universities and industrial advance was not discovered first in North Carolina, but the state has made better use of it than most other areas. The Research Triangle Foundation has developed the Research Triangle Park into a national center of technological activity; Research Triangle Institute, focal point of the Park, extends and complements the resources of the universities in the application of knowledge to the problems and opportunities of business, industry, and government.

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Initial funding of $500,000 for RTI start-up operations was provided by the Research Triangle Foundation from contributions made by corporate and individual citizens throughout North Carolina. Other major contributions include grants of $2.9 million from the Camille and Henry Dreyfus Foundation, a series of equipment grants totaling $760,000 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.

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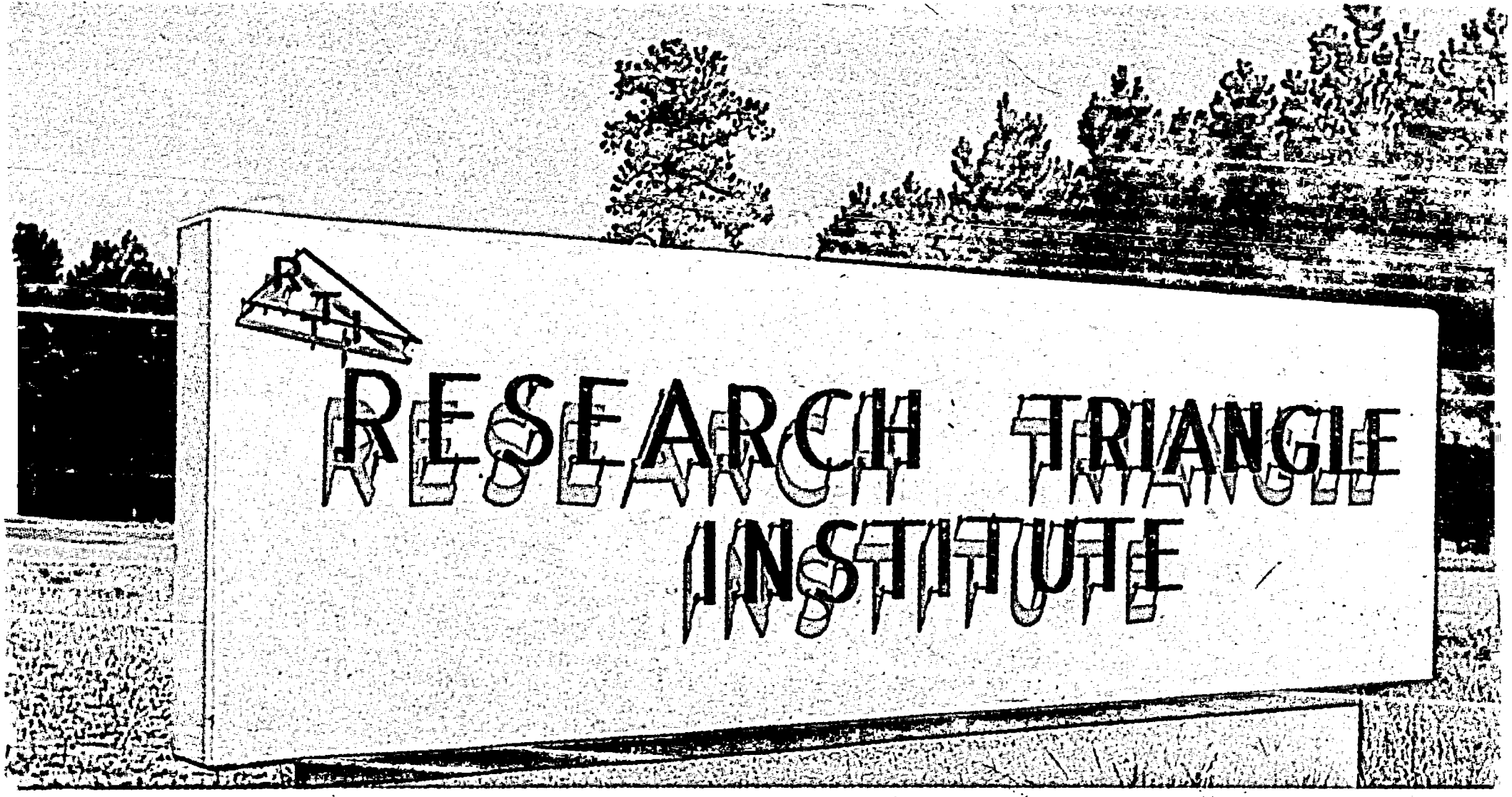

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