

1963



RESEARCH TRIANGLE INSTITUTE

MEMORANDUM


September 9, 1963

TO: RTI Staff

FROM: George R. Herbert

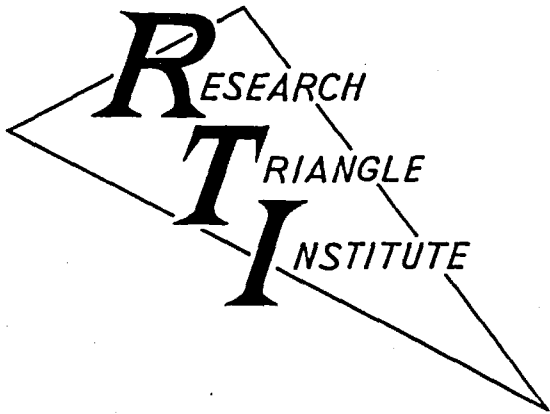
Attached is a copy of the "just-published" Current Report. As you know, it has been over two years since there has been a general publication describing the Institute's operations. This Report therefore attempts to describe the Institute's history, its current programs and capabilities, and something of our hopes for the future.

So far, copies of this Report have been mailed only to the members of the Boards of the Triangle organizations. Later this week copies will be sent to appropriate news media and we will then have general distribution to a mailing list of nearly 4,000 names.

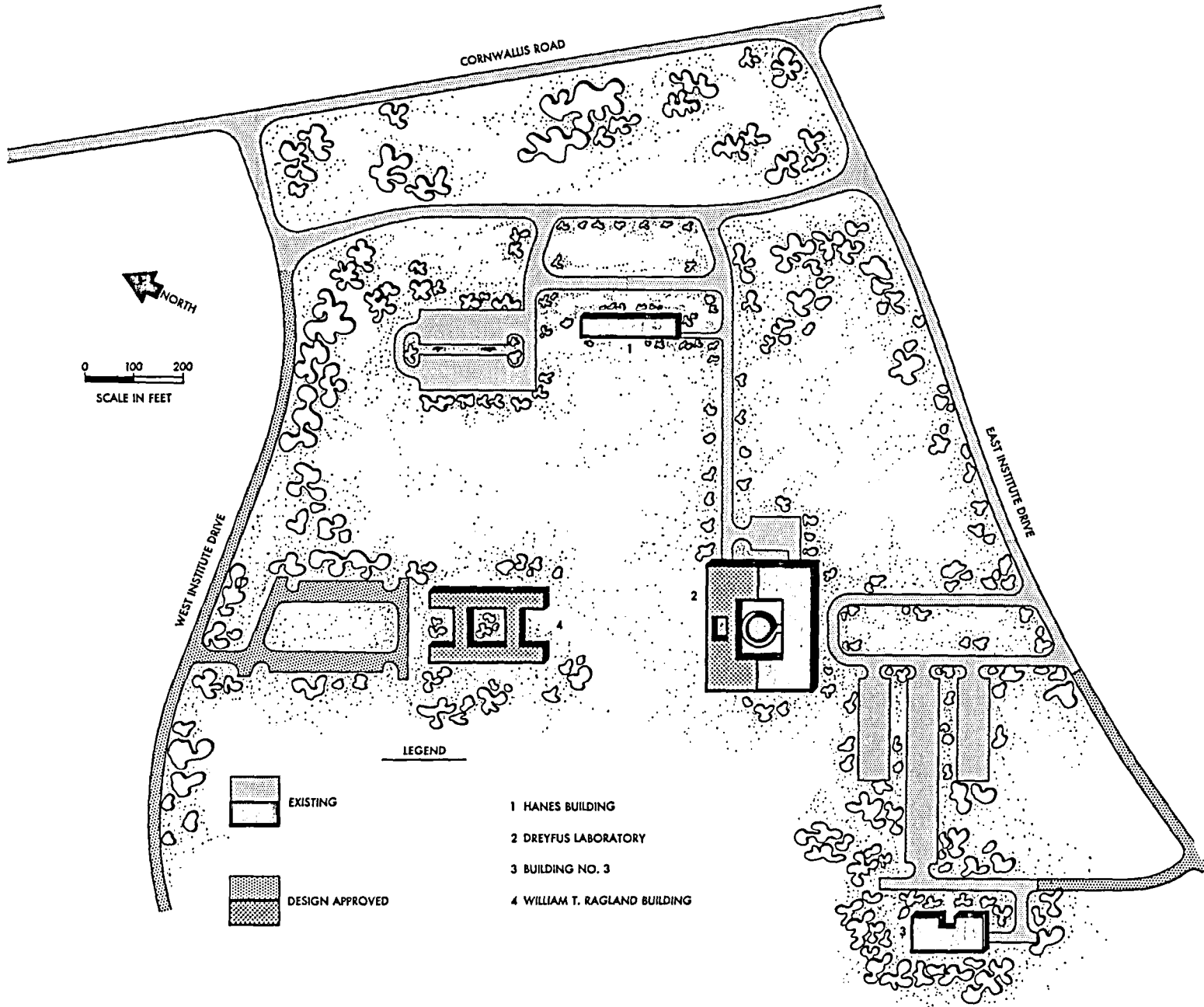


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CURRENT REPORT



RESEARCH TRIANGLE INSTITUTE
 RESEARCH TRIANGLE PARK
 NORTH CAROLINA

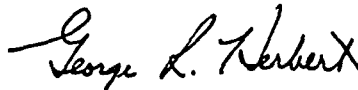
September 1963

The inherent responsibilities of any research organization also are opportunities for scientific contributions to the well-being and security of all mankind. Discovery and application of new scientific knowledge are vital to maintenance of military strength, the ultimate conquest of space, full utilization of the nation's economic potential, and development of regional resources.

The success of the Research Triangle Institute is measured by the extent to which its research programs contribute to total national and regional efforts and add to the world's fund of basic knowledge.

As it exists today, the Research Triangle Institute is the product of the efforts of many individuals and organizations. Paramount among these, of course, are the staff members whose ability, experience, and dedication have created a research organization of national stature. They, in turn, are indebted to the individuals, corporations, and foundations whose contributions to the Research Triangle Foundation provided the resources for establishment and expansion of the Institute; to the Research Triangle Foundation, itself; to the farsighted leaders of state government who have encouraged and supported the growth of RTI; and to the Institute's parent universities and their faculties. Without the research environment of the Triangle universities, which nourishes RTI's program, and without the cooperation and assistance of the faculties, the Institute's accomplishments of the past four years would have been impossible.

The following pages, then, constitute a report of progress from the staff to the countless individuals and organizations that have been partners in the creation of the Research Triangle Institute. Simultaneously, this is a report to the companies, government agencies and foundations which have supported research at the Institute and to those who may benefit from the Institute's future research activities.



PRESIDENT

Review to Date

The Research Triangle Institute is one facet of North Carolina's answer to the challenges of an emerging and expanding industrial economy. The Institute, and the total program of which it is a part, results from the recognition that there are cause-and-effect relationships between strong universities and the expansion of research activity and between research and industrial growth.

For years it has been recognized that one of North Carolina's most valuable assets is the unique concentration of three major universities, close neighbors on the northern edge of the comparatively prosperous Piedmont Crescent. Forming a triangle less than thirty miles on a side, the University of North Carolina in Chapel Hill, Duke University in Durham, and North Carolina State in Raleigh combine strong academic faculties with significant research programs and facilities. Also of importance, the very existence of these schools creates an environment attractive to research activities of industry and government and within which such groups may expect to function with optimum effectiveness.

During the latter years of the 1950s a committee of university and business leaders planned a pro-

gram to utilize the assets of the university community to accelerate industrial and economic growth. At the end of 1958, these plans were given form and substance by the establishment of the non-profit Research Triangle Foundation and its wholly-owned subsidiary, the Research Triangle Park.

Public-spirited private and corporate groups had provided the Foundation with contributions totaling \$1,500,000, an amount which rose later to nearly \$2,000,000. The Park began development of its centrally located, 5000-acre tract of land to provide sites for new research laboratories; and the Foundation fostered the establishment, by the three universities, of the Research Triangle Institute as a separate non-profit scientific research entity.

Significant developments followed rapidly, and now, less than five years later, many tangible results illustrate the progress made to date and provide evidence of the promise which the Research Triangle program holds for the future.

Throughout the region, Triangle signs direct the visitor along new access roads to the center of the

Park. Here, among tall pines, are the first of the laboratories to locate in this research-oriented community: Chemstrand Research Center, the U.S. government's Forestry Sciences Laboratory, and the new laboratory of the American Association of Textile Chemists and Colorists.

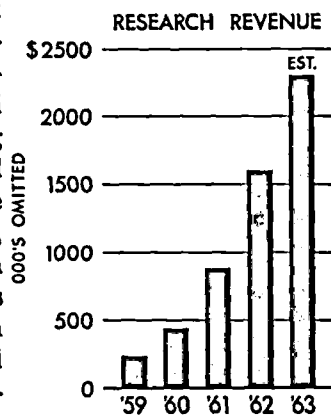
At the center of the Park is the campus of the Research Triangle Institute, the northern end of its 280 acres bustling with activity. Broad parking areas flank the two occupied buildings, and an expanse of green lawn spreads to knolls where new construction is in progress. Beyond lie open woodlands waiting for the future.

Dedicated to regional and national service through advancement and application of scientific knowledge, RTI's development—both quantitatively and qualitatively—has justified the hopes and efforts of its early planners. During each of its

first four years, the Institute's contract research volume has doubled in size; more than 140 research projects have been initiated; and the growth of staff and of facilities has created a significant new research resource.

The two permanent buildings already erected provide 41,000 square feet of space about equally divided between laboratories and offices. Also, the Institute leases 13,000 square feet of excellent laboratory space near the Park. A third building is under construction on the Institute's campus and plans are being completed to start a fourth building late in 1963. Upon completion of these new structures, the Institute will occupy 90,000 square feet of laboratory and office space.

The following pages describe some of RTI's active research programs. While incomplete, these examples may give some indication of the broad scientific interests shared by the research staff and a sample of the excellent equipment that is available. Hopefully, the reader will also gain an understanding of the Institute's objectives, the nature of its operations, and the extent of its capabilities.



Areas of Research

By the end of four years the list of research projects active at the Institute has grown too long to be discussed fully in this report. The paragraphs and the pictures that follow have been selected to illustrate the variety of capabilities and interests represented on the professional staff, and to give some detail about a few research studies.

PERFORMANCE EVALUATION

A team of mathematicians, statisticians and engineers is developing a new and rewarding approach to the problems of evaluating the expected performance for complex electromechanical systems. With support from the National Aeronautics and Space Administration, a probabilistic model has been developed and applied to typical system elements. The approach emphasizes comprehensive testing of sub-components, and use of the derived information to predict the level of reliability that will be realized for the assembled system, where tests on the latter would be costly and often impossible. Application of the model has been made to the gyro-stabilized inertial guidance platform of a satellite launching system, and detailed laboratory studies have been conducted on related equipment to evaluate the degradation of performance with time.

ELECTRONIC RELIABILITY

Using a very similar approach, electronics engineers and senior statisticians are relating the performance parameters of electronic circuits with the parameters of their component parts. The study is being performed for the U.S. Army Signal

Supply Agency, Fort Monmouth, and will result in practical methods for estimating the reliability of electronic circuits while they are still being designed.

RELIABILITY REVIEWS

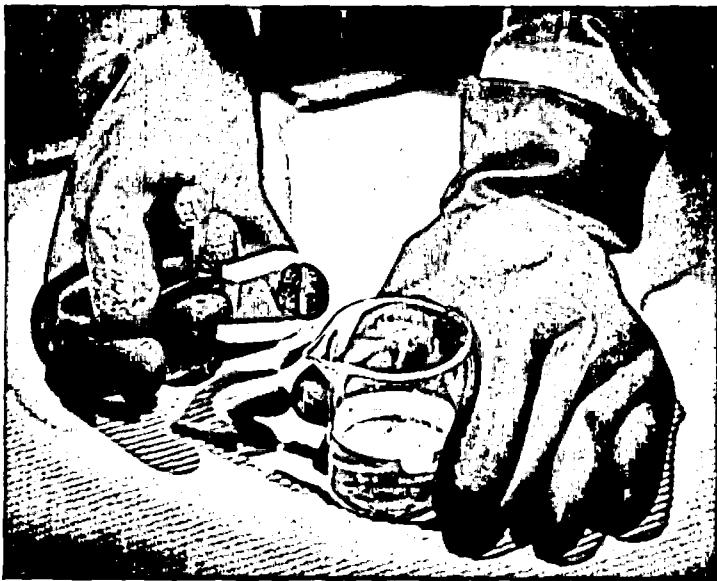
Early in 1961 the National Aeronautics and Space Administration asked RTI to provide an abstracting and review service for technical literature on reliability. Now in its third year, this service has provided concise abstracts and critical evaluations of over eight hundred selected current articles. The distribution list totals 821 and includes major libraries, all NASA and Department of Defense contractors, and other research and development groups.

MICROELECTRONICS

The expansion of the Institute's research activities into solid state electronics has been focused on microelectronics. One example is the integrated semiconductor circuit which is a compact solid structure comparable in size to a transistor. It performs all the functions not only of the transistor, but also of the various associated components normally used in a conventional circuit. Research on integrated devices has the general objectives of lower cost, enhanced reliability, and a decrease in the size necessary to implement an electronic function. The complexity of the function to be performed and of the structure itself makes the performance assessment, processing, and design of integrated devices more difficult. Means are now being sought for eliminating device



1 Engineers operate an antenna tilt stabilization assembly to obtain gyro drift data for NASA reliability study.



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complexity through research on the distributed electronic properties of materials.

These functional electronic structures have been the subject of a rapidly developing new technology which has generated a large amount of information in the last few years. As an aid to all the groups working in this area, the Aeronautical Systems Division, U.S. Air Force, is supporting an RTI project to organize the available information pertinent to the design and fabrication of electronic structures. The product is a comprehensive series of concise and timely reports, supplemented by research that extends and confirms the available information where needed. These reports are distributed directly to a list of recipients provided by the Electronic Technology Division, ASD.

ORGANIC CHEMISTRY

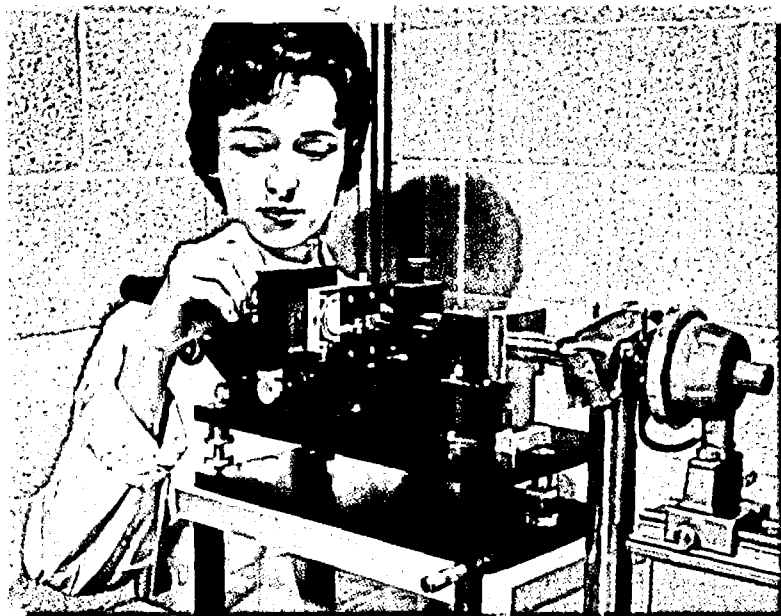
Institute scientists are engaged in several studies involving various aspects of organic chemistry, making up a broad program that is biological in orientation. An array of new, structurally modified steroids is being produced and tested for hormonal and anti-tumor properties; compounds are being synthesized with structures that may prove effective in reducing the damaging effects of radiation upon living cells; a rapid and extensive search is underway to find, isolate, and identify anti-tumor agents present in growing plants; crude extracts obtained from natural products are bioassayed for pharmacological activity; a family of new chemicals is being prepared for possible agricultural applications. This group of closely inter-related projects derives support from several sources: the Cancer Chemotherapy National Service Center of the National Institutes of Health; the

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2 A silicon wafer is prepared for anodic oxide growth in the Solid State Laboratory. 3 Chemists in the Natural Products Laboratory examine a portion of a steroid spectrum. 4 Large truck terminal is utilized for on-the-spot study of loading operations. Determination of unused capacity was part of a Transportation Study for the Office of Emergency Transportation of the Department of Commerce.



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U.S. Army Medical Research and Development Command; the U.S. Army Chemical Center, Edgewood Arsenal; Union Carbide Chemicals Company.

TRANSPORTATION

In order to carry out mobilization or other measures, it is necessary that the government agencies concerned have a current picture of the existing transportation posture and of the amount of reserve capacity available. Under a contract with the Office of Emergency Transportation of the U.S. Department of Commerce, information has been collected regarding the operations and equipment inventory for railroads, both freight and passenger; inland waterways, towboats, barges and vessels of carriers; and motor vehicles, common and contract carriers. The information was analyzed and the reserve of unused capacity calculated. These studies revealed a number of specific areas in which research could be profitable to civilian as well as military transportation problems.

CIVIL DEFENSE

A substantial effort has been devoted to studies in support of the Office of Civil Defense. Much of the work has been directed to providing the information needed by OCD in establishing its immediate operating plans. Procedures have been developed for full use of the nation-wide data on available shelter areas. Studies of the health and medical conditions associated with shelters have been completed. The situations prevailing soon after nuclear attack, and the resources available for coping with those situations, have been studied, leading to recommended procedures for mutu-

al aid and recovery.

POLYMERS

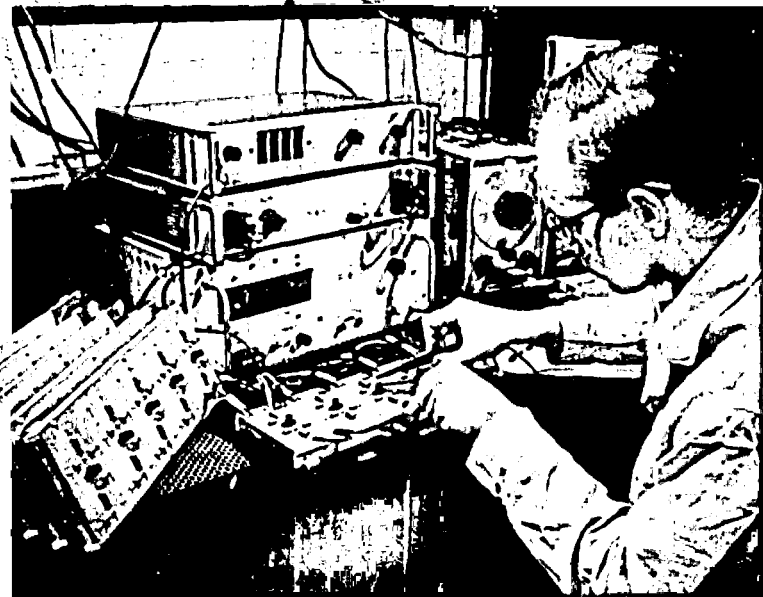
A broad and fundamental program in polymers (the macromolecules that have made possible the myriad of new plastics and synthetic fibers now available) is concerned about equally with physical and chemical problems relating to polymer structures. The chemistry program emphasizes polymer synthesis and measurement and control of polymer structure: characterization of graft polymers, steric measurement, control of branching and molecular weight. Physical properties investigations include studies of morphology and dynamics of polymers in the solid state, deformation studies, and research on solution properties. Sponsored originally by the Camille and Henry Dreyfus Foundation, this general program is also supported by the Celanese Corporation of America, and has been extended to include specific but still fundamental studies for several agencies, including the U.S. Department of Agriculture, the Atomic Energy Commission, and the Nonmetallic Materials Division, Air Force Materials Laboratory, Aeronautical Systems Division.

AGRICULTURAL STATISTICS

The Nigerian Government requested that the U.S. Agency for International Development provide guidance in instituting a sound agricultural statistics program in their country. Under an agreement with AID, an RTI staff member was sent to Nigeria for four months to examine the situation there. Following his recommendation three RTI statisticians have taken up residence in Nigeria and are developing the program with the Federal Office of Statistics in Lagos, through



5 Small angle x-ray diffraction camera is loaded for use in investigation of annealing of polyoxymethylene. 6 Diffusion constants are being measured in a study of the mechanism of water vapor transport in high polymers. 7 RTI statistician Walter Hendricks is greeted by staff members of the Nigerian agricultural Statistics Office. He is accompanied by the chief Nigerian statistician and the local United Nations Economic Consultant.



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8 Performance parameter measurements are conducted on experimental circuits used in a project for developing and demonstrating a reliability prediction technique. 9 Vacuum and steam are adjusted on a precision still. For the pickle industry, lespedeza extract is being studied for its properties as an enzyme inhibitor, under a U. S. Department of Agriculture contract.

which it will be administered.

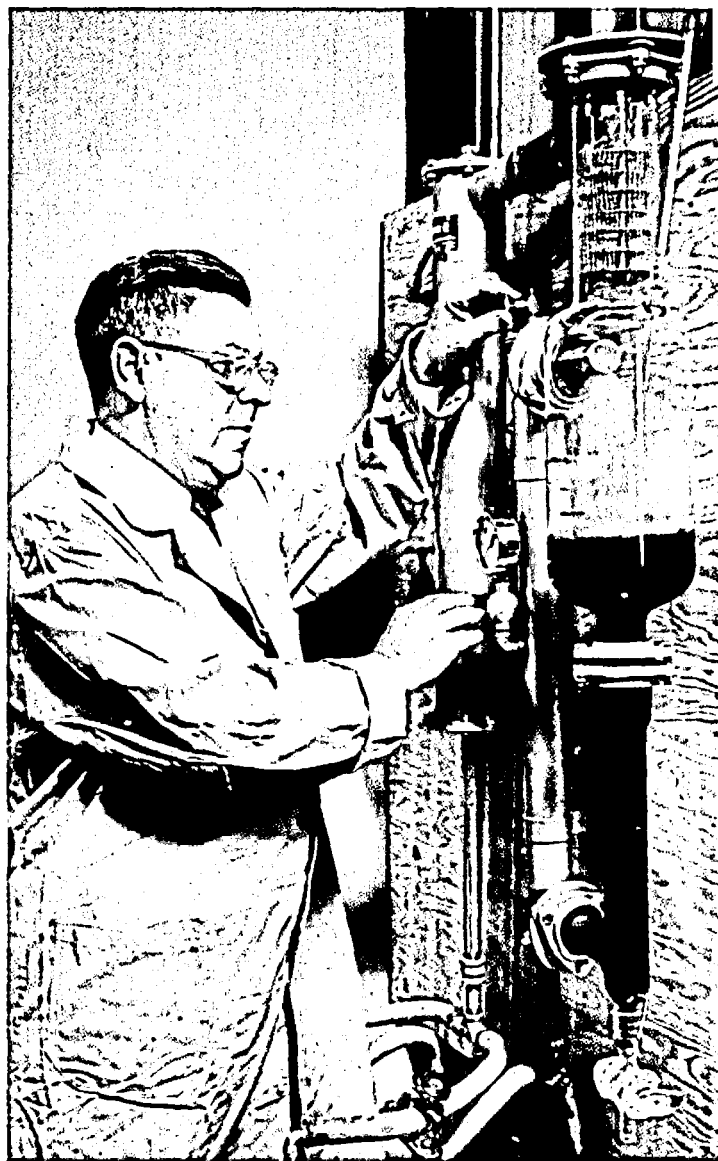
PUBLIC HEALTH STATISTICS

A staff scientist has visited the Jeremie District of Haiti for the Haitian-American Tuberculosis Institute to design a sample for estimating the percentage of people in that district who show a positive tuberculin reaction, and the percentage who have manifest tuberculosis. Those in the sample showing a negative reaction will serve as experimental subjects for a new vaccine to be tested.

RADIO-RELEASE ANALYSIS

A new concept has been developed recently which offers promise of wide application in microanalysis. Called "radio-release," the concept takes advantage of the extreme sensitivity possible in detection of radioisotopes to make possible the quantitative measurement of minute quantities of non-radioactive materials in fluid streams. In practice, the fluid is passed through a small column where the material of interest reacts chemically with a suitable isotope. The reaction releases into the stream an equivalent amount of the isotope, whose concentration can be readily measured. The result is a number proportional to the concentration of the stable material originally present.

This radio-release technique is used in an instrument which allows the accurate determination of dissolved oxygen in waters irrespective of their salt content. The technique has been used in the measurement of minute concentration of vanadium ions in water. It is also being investigated as a technique for the measurement of very low levels of water vapor in the atmosphere and other gases.

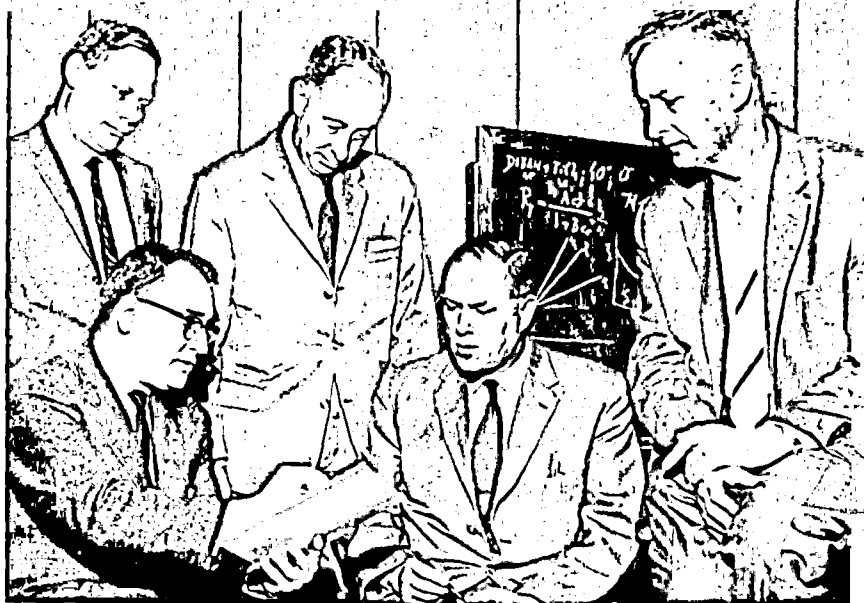


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Personnel

"A research organization is only as good as its staff." This often-quoted truism has special significance to a new institute striving to achieve a position of scientific eminence in the nation's rapidly expanding research community. The process of selecting and assembling the initial senior staff, therefore, has been the most important single undertaking of the Institute's early years. RTI's success in recruiting a staff of nationally prominent scientists, during its first four years, has demonstrated the validity of the thesis on which the Research Triangle was established. It has been evident that the research-oriented university environment of the Triangle community is attractive to scientists and engineers; and, with this advantage, RTI has been able to recruit selectively the people who will provide leadership in the years ahead.

The growth of the Institute's research staff and programs has been paralleled, of course, by an

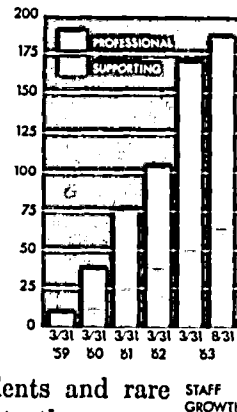


10 Dr. Harald Cramer, University of Stockholm, discusses an interesting application of the theory of extreme values with Dr. Gertrude Cox, Director of the Statistics Research Division. 11 Scientific Advisory Committee of the Camille Dreyfus Laboratory review polymer research programs. From left to right: Dr. Vivian Stannett, Associate Director, CDL; Dr. C. G. Overberger, Polytechnic Institute of Brooklyn; Prof. G. Smets, University of Louvain, Belgium; Sir Harry Melville, Secretary to the Department of Scientific and Industrial Research of the United Kingdom; Dr. Anton Peterlin, Director, CDL.

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increasing number of papers published in scientific journals and periodicals and by staff participation on boards and committees of national scientific organizations and of federal agencies.

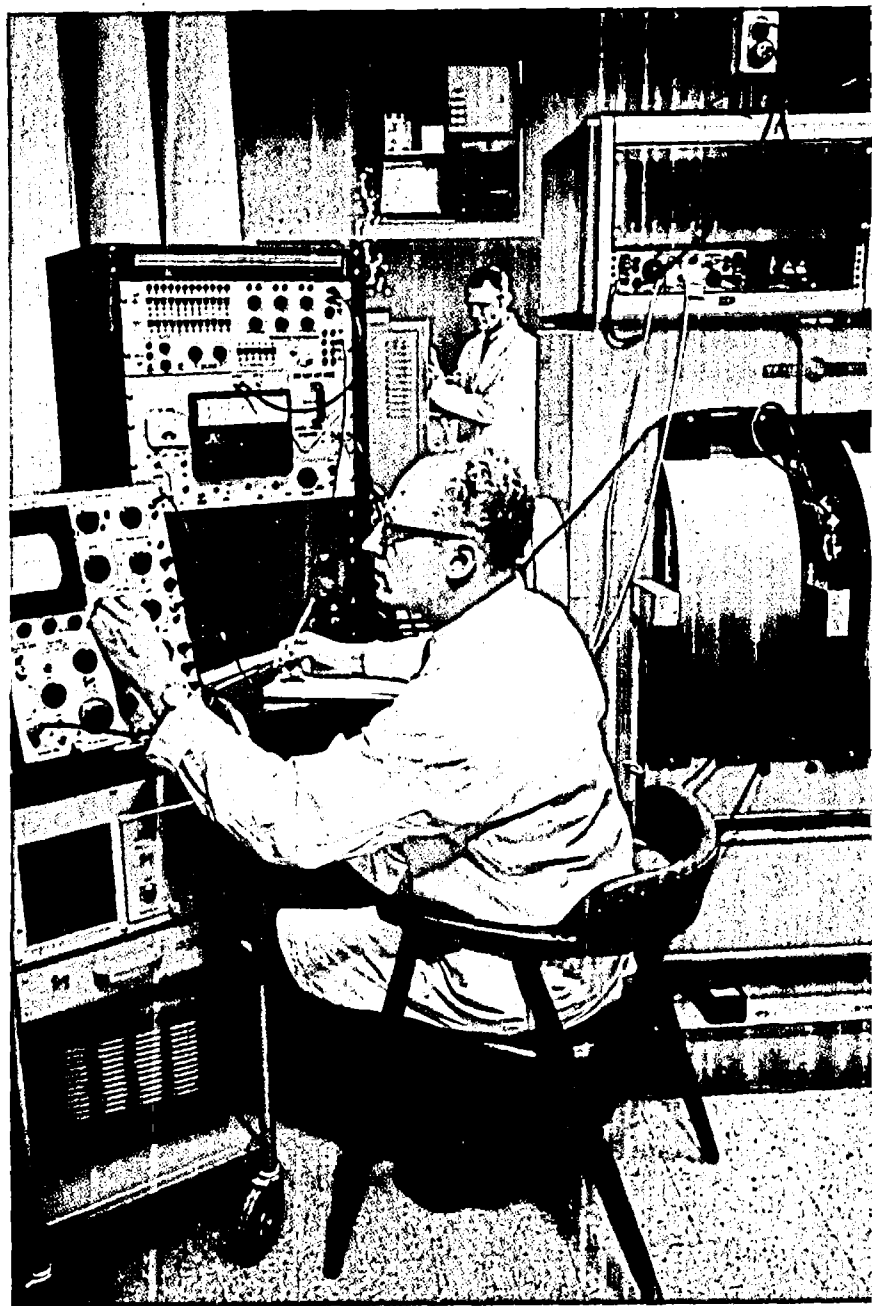
The chart shows only the numbers and the rates in this process of building staff strength; it can give only a suggestion of the fact that the early investment has been in senior professionals. (Nearly half of the members of the professional research staff hold Ph.D. degrees.) Such a chart omits entirely the vital spread of talents covering most of the recognized disciplines. It treats as an impersonal unit the statistician who has devoted a career to teaching useful applications of the subject; the physicist who combines curiosity with experimental talent and business sense; the chemist with an interdisciplinary foot solidly established in the plant and animal kingdoms; any one of the other individuals with unique talents and rare combinations of interest, devoted to the process of "finding out." All of these are small increments on the bar chart. They are, however, the essential elements for RTI's future. The real story is suggested by the paragraphs of this report and will be fully told only by the studies and reports that will appear in the years ahead.



Camille Dreyfus Laboratory

The Camille Dreyfus Laboratory, completed late in 1961, was founded through a generous grant from the Camille and Henry Dreyfus Foundation as a research memorial to one of the great pioneers of the man-made fiber, chemical and plastics industries. The Laboratory is established as an international center for long-term, fundamental research in polymer science. Research being pursued will help to establish a base of knowledge from which come the products and industries of the future. The staff team, united for the attainment of these goals, includes both promising young researchers and a carefully selected group of senior scientists with international reputations in the physics and chemistry of polymers. Several of the staff contribute their knowledge and experience as Resident Visiting Scientists on six-month to two-year appointments.

At the present time the program of the Laboratory combines the synthesis and characterization of well defined polymers with studies of the physical properties of these materials. The availability for the first time of polymers and oligomers of known or reasonably inferred structure permits detailed inquiry into the relationship between molecular structure and physical properties.



12 NMR spin echo apparatus and magnet are being tuned for resonance prior to taking relaxation time measurements in polypropylene.

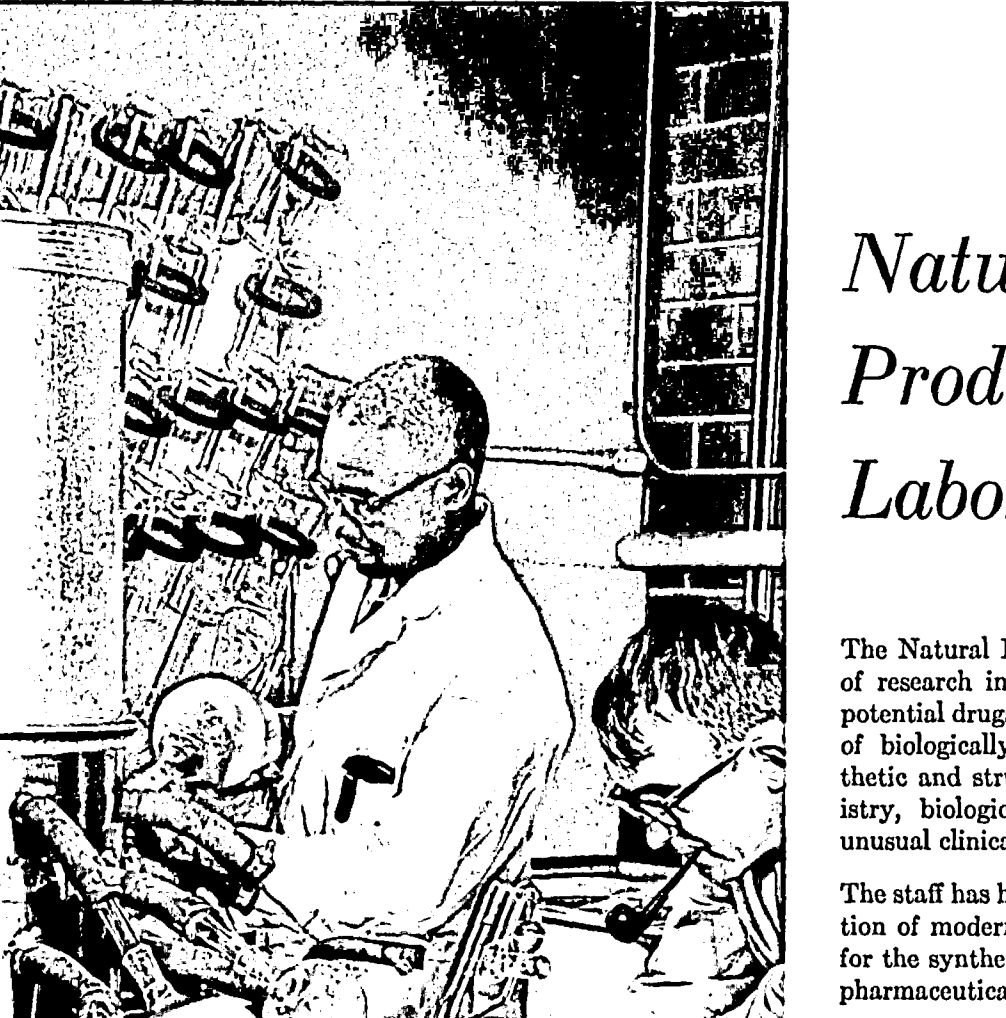
Natural Products Laboratory

The Natural Products Laboratory has programs of research in screening the plant kingdom for potential drugs, the isolation and characterization of biologically active natural substances, synthetic and structural problems in organic chemistry, biological assays of plant extracts, and unusual clinical chemistry analyses.

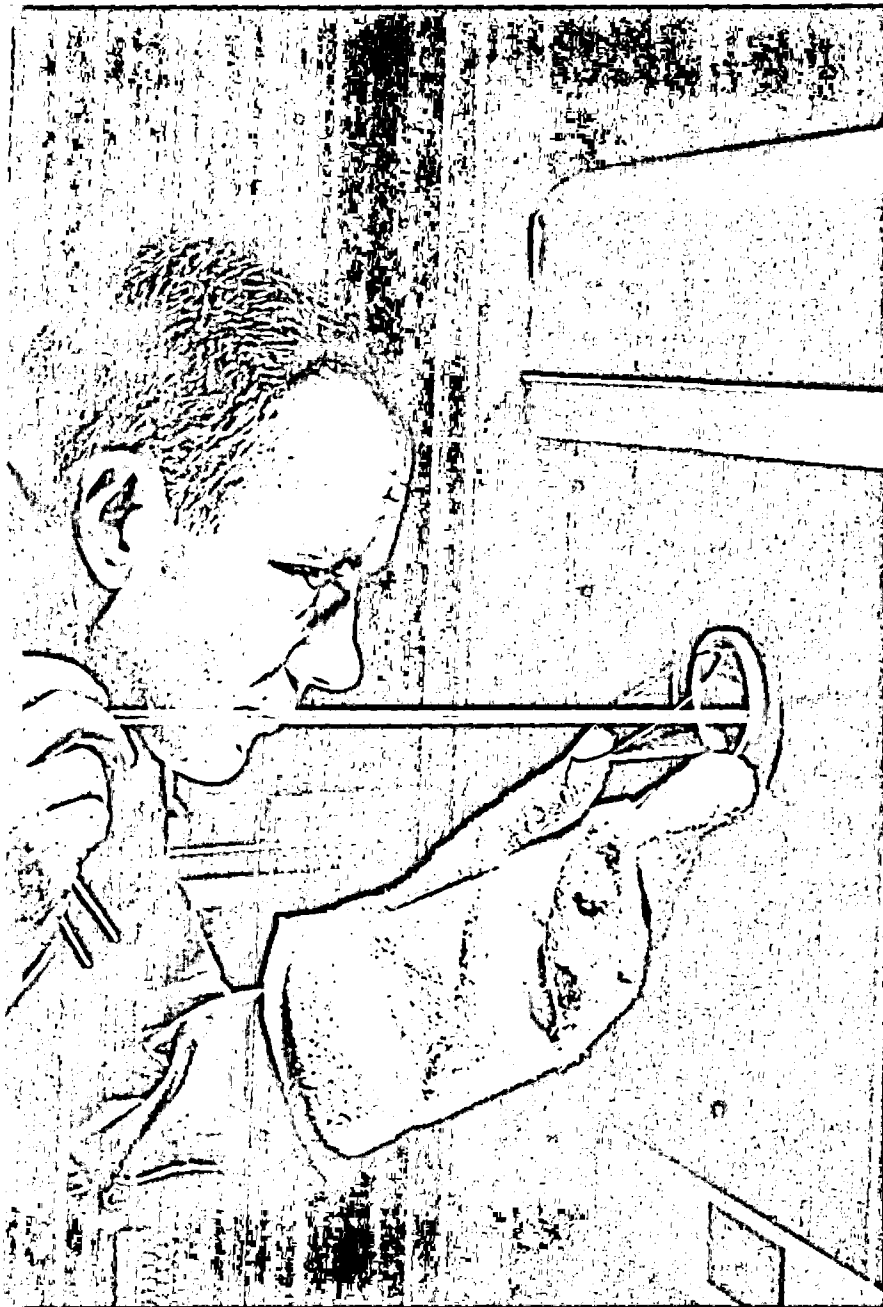
The staff has had broad experience in the application of modern chemical and biological methods for the synthesis of hormones and other types of pharmaceutical products and intermediates.

New members of the steroid and flavanoid series are being prepared and characterized structurally in a search for compounds with hormonal, anti-hormonal, anti-cancer and anti-arthritic properties. The relation between chemical structure and biological activity is under study. Similar programs of synthetic organic chemistry are directed towards the production of anti-radiation compounds and agricultural chemicals.

The evaluation of compounds and extracts for their biological effects requires the use of assay methods that are difficult or rarely used, and that may require amplification. Research is being conducted leading to new and standardized methodology.



13 A freeze dryer is kept under constant vacuum while an additional plant extract is attached. The dried sample is scheduled for anti-tumor testing.



14 Semi-conductor substrates are inserted in a diffusion furnace for an N-type diffusion as a part of a study for the U.S. Air Force.

Solid State Laboratory

The Solid State Laboratory is equipped and staffed to carry out a variety of experimental and theoretical research activities. These range from electronic circuit theory to the study of fundamental solid state phenomena especially as they apply to microelectronics. Experimental capabilities are exemplified by semiconductor diffusion furnaces, an analog computer, vacuum systems, chemical and metallurgical apparatus, and the latest in electronic test and measuring equipment.

Information on the properties of silicon and the techniques for processing it into microelectronic structures is being collected, critically examined, and supplemented by experimental research where necessary. This is being issued in a series of reports on silicon integrated device technology.

Thin film research was initiated by the successful development of a passive component for a commercial client. It is now concentrated on studies of charge transport in thin insulating film structures. These have potential application in a variety of active and passive electronic devices.

Circuit design, performance prediction, and reliability modeling techniques are being developed in co-operation with the Statistics Research Division. The introduction of this probabilistic methodology into electronic and microelectronic design will aid in meeting the performance and reliability requirements of modern complex electronic systems for military, industrial, and space applications.

Operations Research Division

Operations research offers skills and experience which are especially valuable to managers of man-machine operating systems, whether industrial, military, or governmental. Operating systems may be as varied as manufacturing plants, department stores, naval task forces, or federal service bureaus, yet they frequently exhibit surprisingly regular behavior in some respects. Through the use of mathematical models and statistical techniques, RTI operations analysts seek to discover significant patterns of interaction within such systems and to measure the probable effects of alternative courses of action upon entire systems and their elements. The objective is to provide a quantitative basis for decision-making.

On the staff of the Operations Research Division are analysts trained in the methods of operations research and with depth of experience in one or more of the conventional disciplines: mathematics, physics, chemistry, engineering, economics, political science, military science, public health, history, geography, interdisciplinary foreign area analysis, and other fields.

Since its inception in 1959, the OR Division has completed studies in subject areas that include: optimum maintenance procedures for Army equipment, the effectiveness of missile systems, digital computer analyses of blast and radiation effects for both U.S. and foreign areas, the current national transportation posture, the development and evaluation of the National Fallout Shelter Survey, and planning for civil defense under strategic warning.



15 An on-site survey is made as part of a study to determine fallout shielding characteristics for use in improving methods of computing building protection factors.

Measurement and Controls Laboratory

A primary interest of the Measurement and Controls Laboratory has been the application of nuclear techniques to measurement problems in diverse fields. These include water resource and pollution investigations, industrial measurement problems and trace element analysis, as well as the development of new nuclear detectors. The interests of the Measurement and Controls Laboratory are not confined to radioactivity investigations, however, but include chemical engineering, analytical and physical chemistry, and specialized instrumentation.

The "product" of the division is not always a report of a laboratory investigation. For example, two manuals are presently in preparation which will have widespread distribution. One is an engineering handbook of water tracing techniques. A person interested in carrying out a water tracing investigation will be able to refer to this manual for experimental procedures applicable to the peculiarities of the hydrologic system under study. The other manual is intended for use by university chemical engineering departments to teach engineering students the fundamentals of nuclear techniques as applied in industrial process measurement and control.

Other interests of the Measurement and Controls Laboratory include oceanographic chemistry and instrumentation, tritium dating and instrumentation, the expansion of uses of nuclear techniques in industrial process control problems, and the development of new nuclear detection devices.




16 Adjustments are made on feeder tubes of a radioisotope exchange apparatus developed for determination of dissolved oxygen in water.

Statistics Research Division

Observation of natural and man-made phenomena pervades every human activity. Statistics is the science of planning how observations shall be made, analyzed, and interpreted. The Statistics Research Division, staffed by able mathematicians, statisticians and engineers is conducting research in this science and applying the results to diversified problems in government and industry.

SRD staff are investigating procedures for improving methods of collecting, collating and analyzing data from sample surveys. Research is being conducted to develop new experimental designs to study how a change in certain factors affects a product or process, to study properties of these designs and to determine appropriate analyses for them.

Probability theory has been used to develop methods for predicting the expected number of replacements of major appliances during a warranty period, and is being used for estimating the reliability of complex electromechanical space systems. Mathematical models describing process behavior (e.g., behavior of a catalytic cracking reactor) have been constructed by SRD staff which will allow the development of techniques to control and optimize the process.

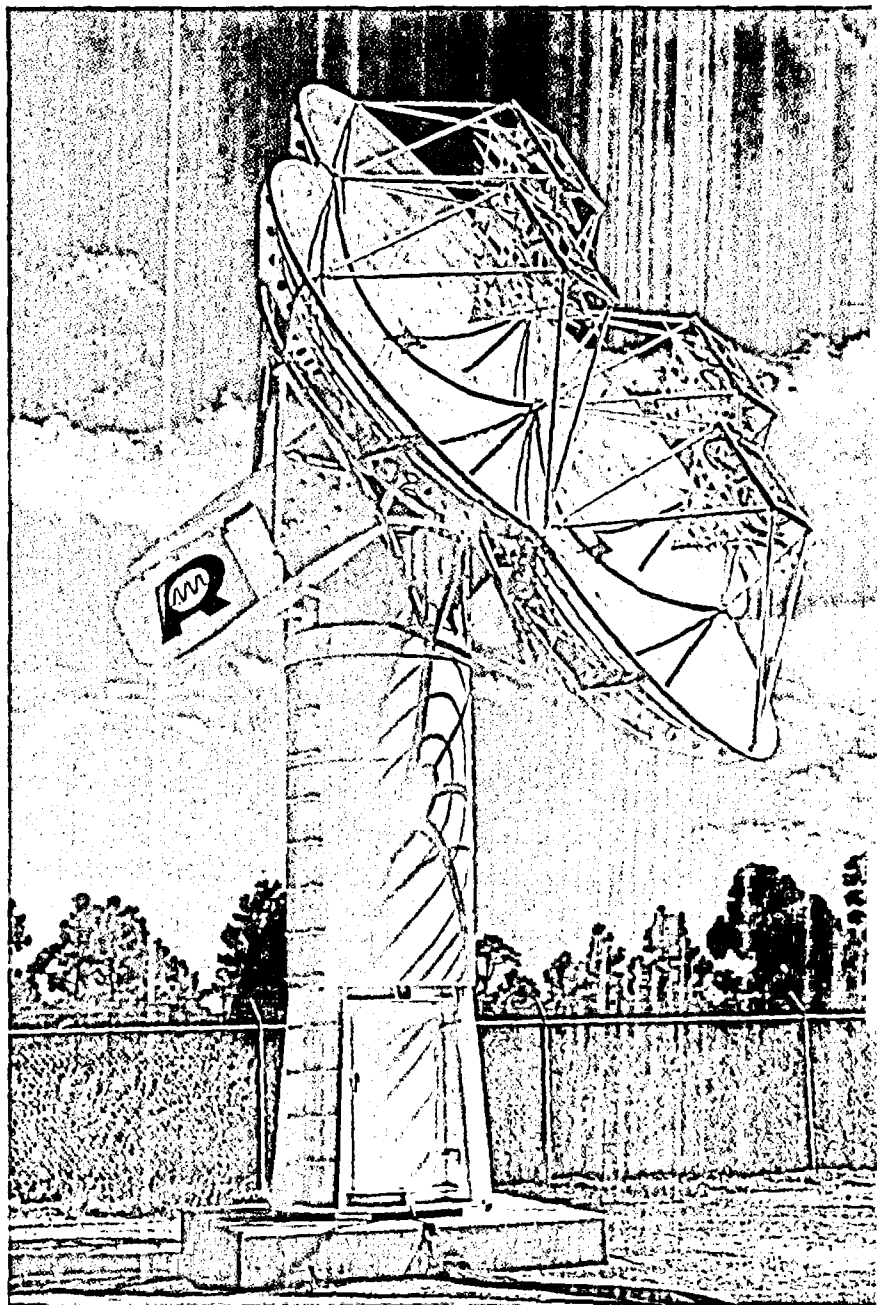


17 A project team, working on a NASA reliability research program, discusses satellite system applications of probabilistic modeling techniques. The chart under scrutiny is a functional diagram developed by RTI that deals with an inertial guidance platform.

Radiation Systems Laboratory

The Radiation Systems Laboratory is the most recent addition to the Institute. Its interests cover the fields of radar, communication, guidance and control, and navigation, with emphasis on specific applications. This Laboratory is building up its staff with technical personnel having the following interests and skills: application of communication theory and statistical theory to the analysis of practical communications and radar problems; field theory as applied to propagation, antenna, and RF component problems; circuit theory and design with emphasis on network and control theory.

With this staff, the Laboratory plans to conduct programs of the following types: feasibility studies of radiation systems (e.g., communications and radar) required to solve specific problems of government or commercial agencies; technical management or advisory services for experimental field stations located in the North Carolina area; development of special components and sub-systems techniques which are needed for meeting future systems requirements; and consultation and services to governmental and commercial agencies.



18 Radiation Systems Laboratory personnel will be engaged in systems studies involving antennas of the type shown above. It is a telemetry, surveillance, and communications antenna developed and manufactured by Radiation Incorporated.

Looking to the Future

The potential represented by an expanding technical staff has brought with it the challenge to provide working quarters and equipment to match. From an office with three people, the Institute has become an organization of seven divisions and nearly two hundred persons, which occupies two permanent buildings on the RTI campus, and fills to overflowing the Annex, a laboratory building located five miles away.

As this report is being prepared, plans for needed space are becoming reality. The third campus structure, now under construction and scheduled to be occupied in early fall of 1963, will provide facilities for the Solid State Laboratory, freeing space in the Annex for expanding programs in biochemistry. A fourth major permanent building is on the drawing boards, to be begun this year. When completed in 1964, it will bring total floor space to approximately 90,000 square feet.

While facilities are catching up with staff, programs continue to proliferate, with resulting demands for more people. Among the most vigorously growing research areas:

The newly established Radiation Systems Laboratory expects to become involved, among other ventures, in problems of communication and control in deep space. The potential is most promising, and will require an extensive investment in staff and facilities, including field installations.

New commitments have been made to broaden the natural products programs, first by an expanded search for naturally-occurring compounds with biological activity and second by study of a variety of ways to evaluate biological characteristics of organic materials.

Our work in systems evaluation is expected to grow as additional engineering talent joins the staff. The combination of advanced engineering analysis with mathematical modeling methods can make unique contributions in the study of system reliability.

The early years have been devoted to developing the wide variety of talents and capabilities now represented on the Institute's staff. An objective for the period ahead will be to apply selectively a significant portion of these capabilities to technical and economic studies primarily oriented to the Southeast.

As this text is being written, the State of North Carolina, through its General Assembly, has established a State Board of Space and Technology, to work closely with the Research Triangle Institute in assuring "that the State will benefit from, and contribute to, economic and technical developments resulting from advances in the space and related sciences." To this challenge and opportunity RTI responds eagerly, confident in the strength of the foundation already laid.

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Assistant Secretary-Treasurer

MRS. ORENE K. GIBSON
Assistant Secretary

SEYMOUR SHERIFF
General Counsel
Gardner, Morrison and Rogers,
Washington, D. C.

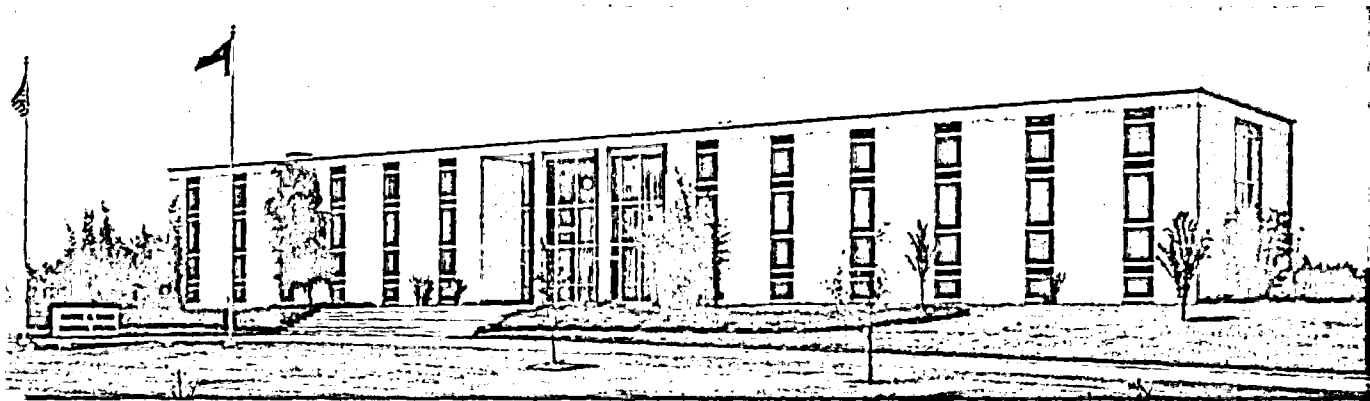
E. K. POWE
Local Counsel
Durham

A Partial Listing of RTI Clients

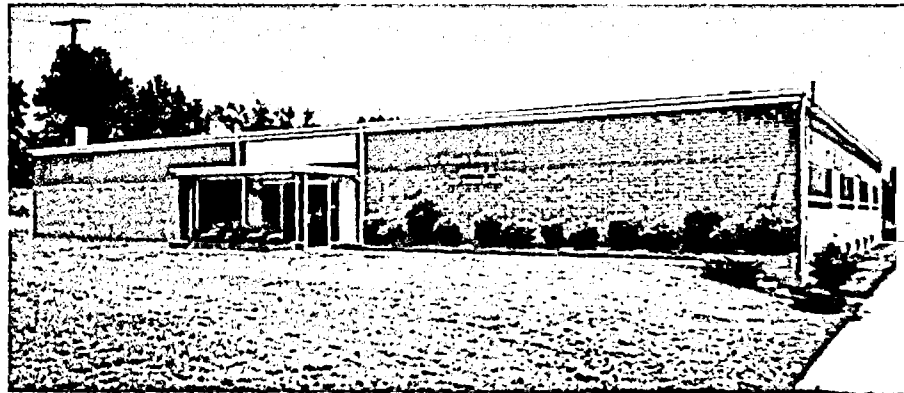
Aeronautical Systems Division, U.S. Air Force
Agency For International Development, Department of
State

Atomic Energy Commission
Bell Telephone Laboratories, Whippany, New Jersey
Bureau of the Census, Department of Commerce
Chemstrand Research Center, Inc.
Continental Can Company, Inc.
Corning Glass Works
Douglas Aircraft Company
Frankford Arsenal
General Electric Company

National Aeronautics and Space Administration
National Institutes of Health
National Science Foundation
Office of Civil Defense, Department of Defense
Office of Scientific Research, U.S. Air Force
Office of the Surgeon General, U.S. Army
The Toni Company
Tidewater Oil Company
Union Carbide Corporation
U.S. Army Chemical Center
U.S. Army Electronics Materiel Agency
Western Electric Company

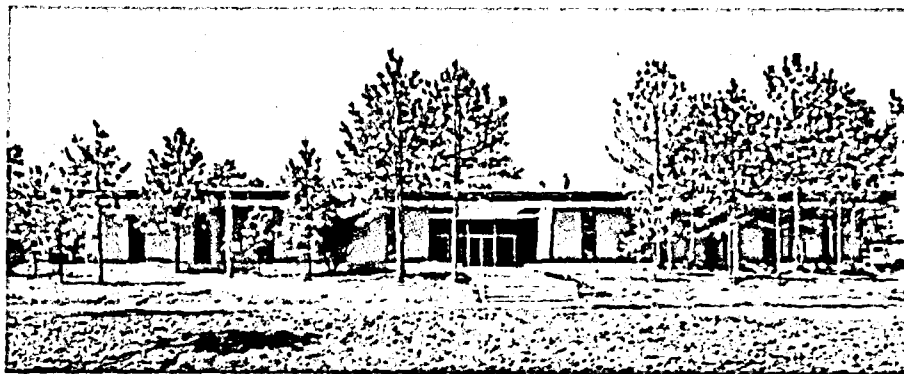


Robert M. Hanes Building
RTI Campus

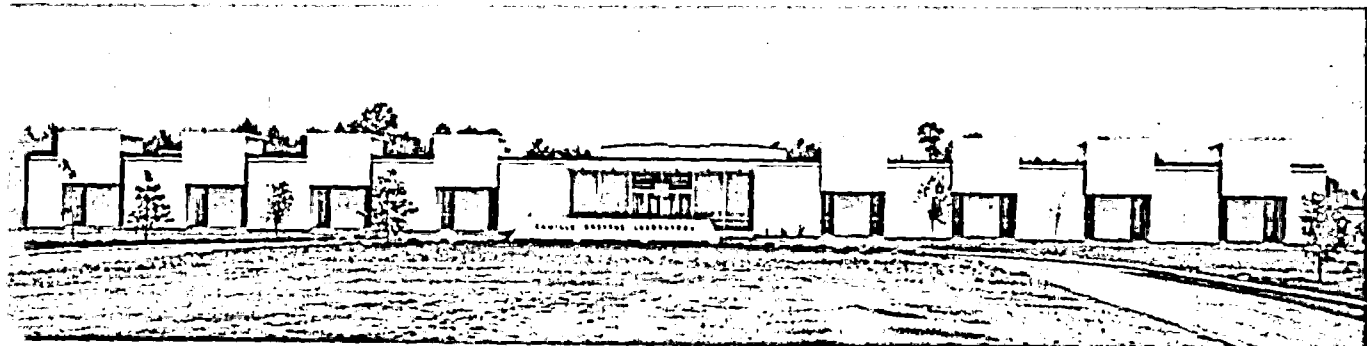


Annex laboratory building
Durham, N. C.

Third campus building
under construction



Camille Dreyfus Laboratory
RTI Campus



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