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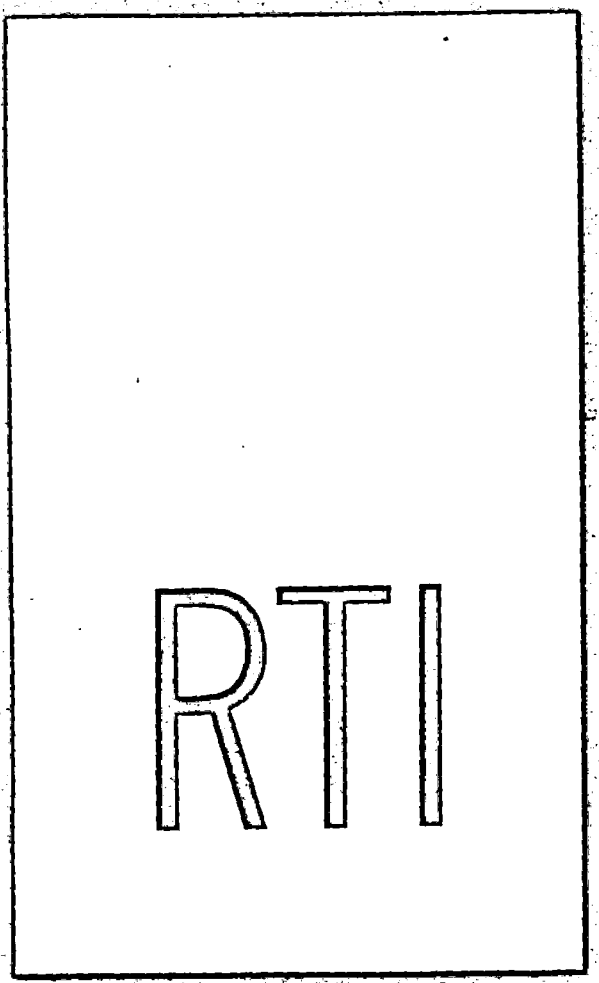


Report of Progress

RESEARCH TRIANGLE INSTITUTE

RESEARCH TRIANGLE INSTITUTE
RESEARCH TRIANGLE PARK
NORTH CAROLINA

July 1961

A UNIQUE EXPERIMENT . . .

Recent years have seen the establishment of a number of independent research organizations whose efforts have been directed toward improving technology, strengthening the economy, and achieving national objectives. Among the newest of these organizations is the Research Triangle Institute, itself a unique and carefully planned experiment.

The Institute was founded at the end of 1958 through the combined efforts of three large universities, the business and industrial community, and the State of North Carolina. Even at the end of a decade of increasing cooperation among academic, industrial, and government interests, the scope of this joint sponsorship was unprecedented.

Of particular importance to the Institute are the Triangle universities. Duke University, in Durham, is a privately-endowed institution. The University of North Carolina in Chapel Hill and North Carolina State College in Raleigh are major elements of the Consolidated University of North Carolina. Administrators and scientists from these schools were deeply involved in the planning for the Institute and continue to participate, both as advisors and as consultants, in its research programs.

Although university-oriented to an exceptional extent, the Research Triangle Institute is an independent organization with its own staff and facilities. It is dedicated to regional service and development, yet its outlook is by no means confined to North Carolina or the South. RTI performs research for national and international as well as local clients.

The Research Triangle Institute began to assemble its staff only two years ago, shortly after its incorporation as a nonprofit organization. A growing staff of professionals and supporting workers is now engaged in research programs in economics and statistics, mathematics and engineering, chemistry and physics.

In December 1960 the Institute occupied the first permanent building on its own 288-acre campus in the center of the 5,000-acre Research Triangle Park. From its windows, the columns of a new RTI laboratory can now be seen rising against a background of pine forest. Already thriving in the academic-research environment of its parent universities, RTI is preparing to render significant service in the challenging years to come.

At this point in its life, the Research Triangle Institute needs introduction to a wider circle of friends: identification and location, characterization as to purposes, and description of technical interests and activities. It is the purpose of this report to perform that introduction.

A STIMULATING ENVIRONMENT . . .

Although organized as an independent nonprofit corporation, the Institute is a closely related part of North Carolina's Research Triangle. This area of exceptional cultural resources is defined physically by the lines that join three of the large research universities of the state: Duke University in Durham, the University of North Carolina in Chapel Hill, and North Carolina State in Raleigh.

The Triangle universities possess an impressive collection of talents, interests, and facilities, concentrated in an area less than thirty miles across. Their existence in close proximity has created for the Triangle community an atmosphere in which intellectual activities thrive. This stimulating environment is the singular asset which assures the continued development of the Research Triangle program.

THE TRIANGLE CONCEPT . . .

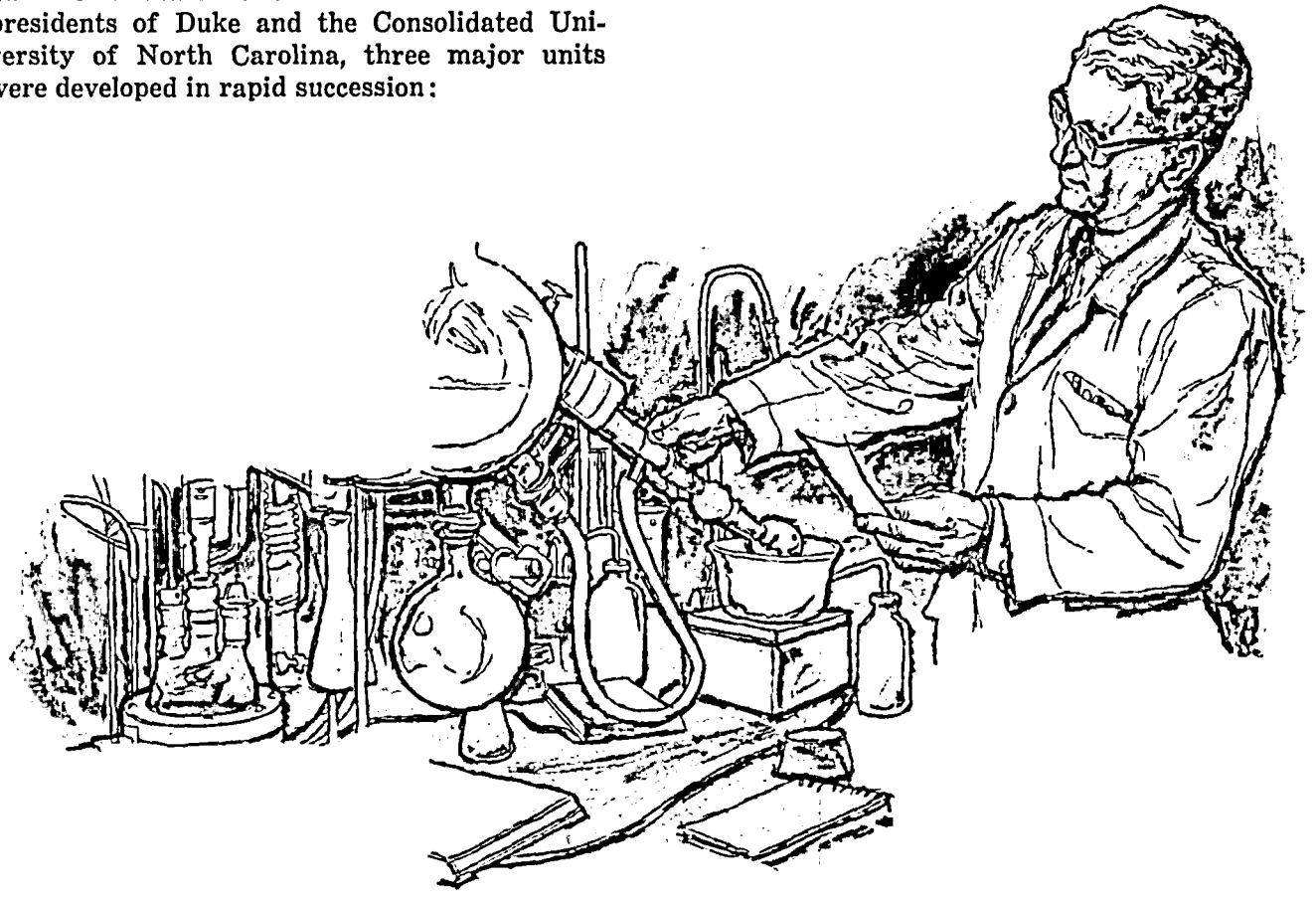
The Triangle concept has been a promising device for initiating and expanding activities within this favorable environment. Under the active guidance of state and industrial leaders and the presidents of Duke and the Consolidated University of North Carolina, three major units were developed in rapid succession:

1. *The Research Triangle Park,* a corporation which owns and is developing a 5,000-acre tract of land centrally located in the geographical triangle, exclusively zoned for research, and available as building sites for industrial and government laboratories.

2. *The Research Triangle Foundation,* a nonprofit corporation which holds complete ownership of the Research Triangle Park and administers the funds originally contributed for the development of the research resources of the area.

3. *The Research Triangle Institute,* an independently staffed and operated research organization with its own campus at the center of the Park.

Late in 1958 the Research Triangle Foundation conducted a brief and highly successful fund-raising campaign which produced nearly two million dollars. From this fund, the Institute's campus was developed, its first building was erected, and $500,000 was provided to meet operating costs during the early period of the Institute's growth.



THE PURPOSE OF THE INSTITUTE . . .

The purpose of the Research Triangle Institute, as quoted from its Articles of Incorporation, is "to establish and operate, in close proximity to or in conjunction with research facilities of the Consolidated University of North Carolina and Duke University, additional facilities for research in the physical, biological, medical, mathematical, agricultural, economic and engineering sciences, and thereby to promote the educational and scientific purposes of these two universities jointly; to encourage, foster, conduct and contract to conduct investigations and research in such sciences; and to publish or disseminate where appropriate information and data arising from such investigations and research."

Both the corporate structure of the Institute and its pattern of growth reflect the serious intention to develop activities cooperatively with the university research community. Membership on the Institute's Board of Governors and on its Executive Committee is drawn equally from academic and industrial circles. Monthly meetings of the Executive Committee regularly include reviews of Institute progress and plans so as to assure a meaningful relationship with the established research programs of the area. Thus, for example, the Institute's new programs in chemotherapy are being developed in full recognition of the related projects in organic chemistry and biochemistry at the neighboring schools and in clinical chemotherapy at the university hospitals; programs in statistics are coordinated with those of the U. N. C. Institute of Statistics; and RTI's new polymer research center, financed by a grant from the Camille and Henry Dreyfus Foundation, is being planned with the assistance of chemists and textile researchers from academic and industrial laboratories in the region.

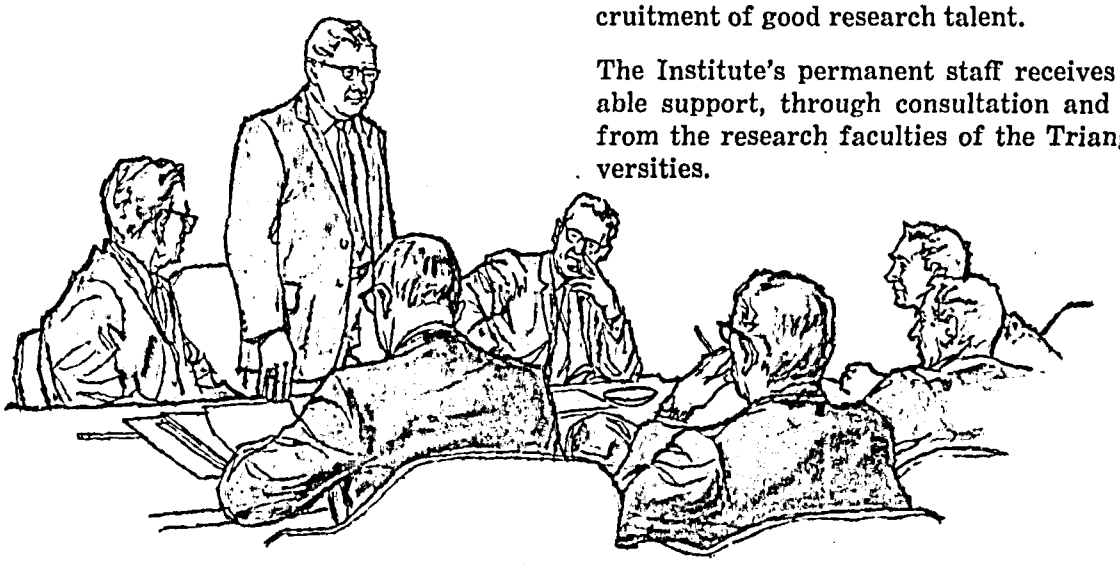
Although they are designed to complement the existing research effort in the Triangle area, the activities of the Institute are not limited to local or regional projects. The first completed research study, in 1959, was performed for Stanford University, a continent away. RTI field teams have roamed the wheat country of Kansas and the plateaus of the Colorado Rockies, as well as the Carolina Piedmont. A current project has given RTI the opportunity to assist a new nation of West Africa in dealing with one of its serious economic problems.

THE STAFF OF THE INSTITUTE . . .

The staff of the Institute is approaching one hundred as this report is written. More than half hold academic degrees beyond the bachelor's level, and a quarter hold doctorates. Sixty colleges and universities, located in thirty states and foreign countries, are represented. Members of the professional staff have had research experience in a wide range of disciplines and have come to RTI from positions widely distributed over the United States in industry, education, and government service.

The Institute is now entering a period of rapid expansion, building on the centers of competence already established. Experience thus far demonstrates that the academic atmosphere of the Triangle area and the vigorous challenge of the new venture combine to assure successful recruitment of good research talent.

The Institute's permanent staff receives invaluable support, through consultation and review, from the research faculties of the Triangle universities.



Organization For Research . . .

To administer the Institute's programs, five divisions and laboratories have been established to date, with general areas of competence and interest as indicated below:

Operations Research Division

—Studies of man-machine systems in operation.
—Preparation of mathematical decision models.
—Research in the management sciences.
—Evaluation of weapon systems.
—Studies of economic resources.
—Analysis and design of information retrieval systems.

Statistics Research Division

—Statistical studies in the social, biological, physical, and engineering sciences.
—Research in sampling theory.
—Design and analysis of experiments.
—Studies of response errors.
—Studies of reliability of components and systems.
—Studies of clinical tests and methods.
—Evaluation of programs and surveys.

Measurement and Controls Laboratory

—Investigation of industrial uses of radioisotopes.
—Design of instrumentation for problem-solving.
—Development of techniques for measuring moisture.
—Study of mechanisms of fatigue failure.

Natural Products Laboratory

—Extraction and isolation of compounds occurring naturally in plants.
—Elucidation of structure of complex organic compounds.
—Organic synthesis, particularly of steroid hormones.
—Development of organic structures for possible therapeutic effectiveness.

Camille Dreyfus Laboratory

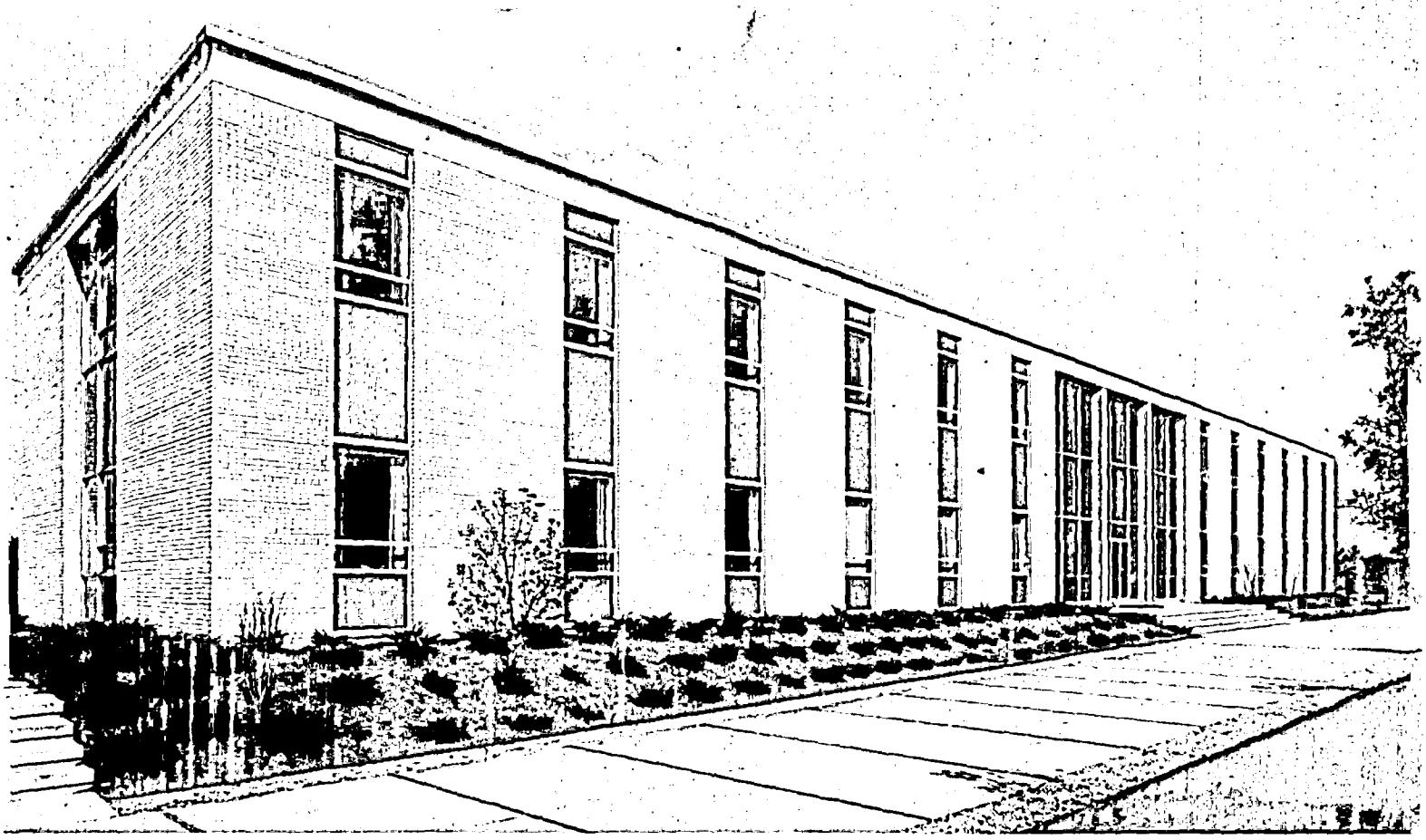
—Research in polymers, especially investigation of structures and physical properties of high-polymer substances.

This divisional organization provides a framework for lending administrative guidance and support to the Institute's research programs and for developing staff capabilities. The functional leadership of a given program or project is normally provided by an individual researcher, however, and the work is accomplished by a team of the best talent available from all sources, regardless of division or other affiliation. The projects described in later pages of this report therefore only approximately reflect the administrative structure shown above.

THE CLIENTS WE SERVE . . .

Listed below are some of the organizations with which research contracts have been established.

Department of Agriculture
Army Research Office, Durham
Office of Isotopes Development, Atomic Energy Commission
Bell Telephone Laboratories, Inc., Whippany, New Jersey
Bureau of the Census, Department of Commerce
Douglas Aircraft Company
Drexel Furniture Company
Frankford Arsenal
National Institutes of Health
National Science Foundation
North Carolina State College
University of North Carolina
Picatinny Arsenal
Medical College, University of South Carolina
Stanford Research Institute
Stanford University
Union Carbide Chemicals Company
Union Carbide Nuclear Company
Virginia State Library
Western Electric Company



Robert M. Hanes Memorial Building

THE FIRST PERMANENT BUILDING . . .

The permanent facilities of the Institute are beginning to take shape.

After nearly two years in temporary quarters, the administrative and office research groups have moved to the RTI campus in the Park. The first permanent building ready for occupancy was the Robert M. Hanes Memorial Building, which will continue to serve as administrative headquarters for the Institute. Two hundred yards away, the Camille Dreyfus Laboratory is taking form, to be completed in September 1961.

Temporary laboratories have been provided by leasing a new light-industry building near the Research Triangle Park and equipping it for experimental work in chemistry, physics, and electronics. This space has proven so satisfactory that it probably will continue to serve as a staging area for new programs, anticipating additional laboratory construction on the campus.

A LONG-RANGE PLAN FOR GROWTH . . .

From the beginning, the Research Triangle Institute has had a long-range plan for growth. Facilities, staff, and areas of interest are scheduled to expand proportionally along lines that have been generally determined but not rigidly defined.

Future physical facilities for the Institute will be located near the new administration building on the RTI campus. The Institute's 288-acre land reserve in the Research Triangle Park is easily accessible from the Triangle cities and universities and from the Raleigh-Durham Airport, yet it provides a basis for unhampered development, free of extraneous structures and activities. In this revitalizing forest setting, the Institute is now constructing its second permanent building, the Camille Dreyfus Laboratory for polymer research.

The Camille Dreyfus Laboratory is one of a series of buildings that eventually will border a central mall stretching along a pine-topped ridge. Within perhaps ten years, the building program will provide separate quarters for each of the Institute's major research activities. While permanent buildings are being constructed, leased facilities will be used for research groups that cannot be accommodated on the campus.

The technical growth of the Institute for the foreseeable future will be based largely on the

logical extension of programs already initiated, with emphasis on those areas in which RTI may make unique contributions. This emphasis upon areas of specialization reflects the conviction that a new research organization should be particularly concerned with developing its singular strengths, even though current research requirements in many fields exceed the capacity of existing research groups. Striving for excellence in fields where initial advantages exist is good competitive strategy, and it also improves the prospects of the united research attack on the unknown. Furthermore, it assures for the Institute the same satisfaction that is so important to an individual: that of performing well in an area of unusual competence.

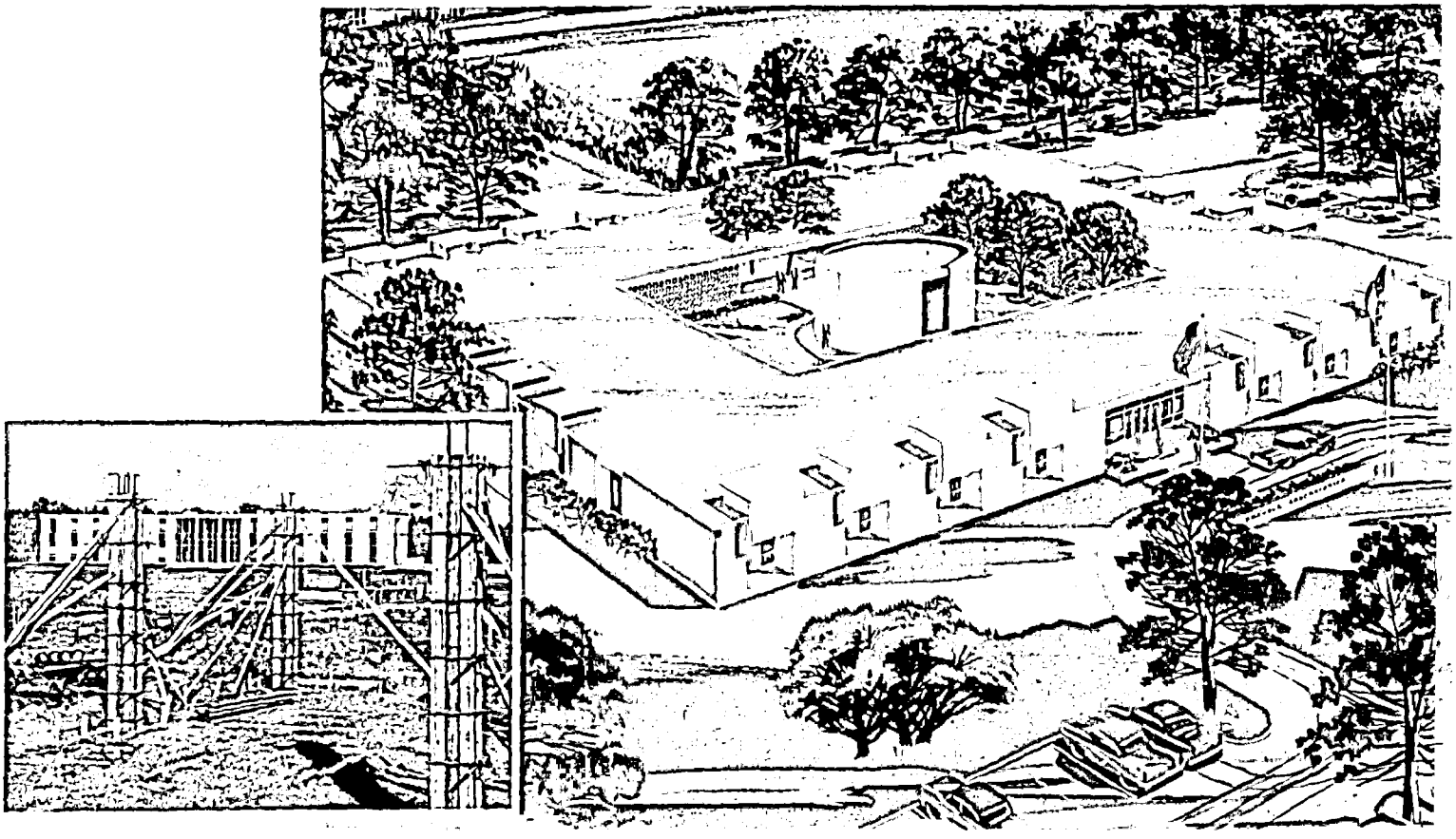
The Camille Dreyfus Laboratory occupies a special place in plans for future expansion of the Research Triangle Institute. With support of a $2,500,000 grant from the Camille and Henry Dreyfus Foundation, this memorial laboratory is now being constructed and staffed to engage in a broad program in the field of polymers, including specifically investigations of structures and physical properties of high polymers.

CAMILLE DREYFUS LABORATORY

Architect's drawing of the Institute's Camille Dreyfus Laboratory. This drawing shows the complete building; the unit now under construction consists of the front half of the building and the circular auditorium in the central court.

The Camille Dreyfus Laboratory will provide laboratories and offices for RTI scientists engaged in fundamental research in polymers. The auditorium will be available for technical and scientific meetings held in the Research Triangle area.

Funds for the building and for support of a basic research program were contributed to the Institute by the Camille and Henry Dreyfus Foundation. The Laboratory is named in memory of Dr. Camille Dreyfus, Founder of Celanese Corporation of America.



OPERATIONS RESEARCH

Growing attention has been paid in recent years to the application of scientific techniques of study to man-machine systems. The systems may be such varied operating entities as manufacturing plants, toll stations at bridges, bombardment air forces, department or food stores, mail-order houses, or truck farms.

The basis for this growing attention is the observation that sociomechanical operating systems frequently possess surprisingly regular behavior in some aspects. Therefore, when such operating systems are subjected to quantitative measurement and study, it is frequently found that underlying relationships involving causes and effects can be discovered and measured. The understanding of these causes and effects can then be employed by management to provide better service to the public, to increase profits, improve efficiency, or achieve other goals.

Typical operations research studies at the Research Triangle Institute include:

1. A program directed toward the development of a quantitative decision model that can be used in the selection of the most appropriate maintenance support plan for individual items of ordnance equipment. This model will be applicable to existing and newly-developed material, including major end items, secondary end items, and assemblies. It will improve the identification and handling of items, and also help in establishing criteria that should be considered in developing new equipment designs.

2. Collaboration with a large furniture company to provide planning, guidance, and review of operations research studies being carried out by the manufacturer's own research and engineering staff. A study to determine economical production-lot sizes has been done, and it is being expanded to provide a method of inventory control and eventually a method for long-range production scheduling. Recently, recommendations were made relating to the economics of high-frequency heat for kiln-drying lumber with reference both to additional drying capacity and to need for kiln replacement.

3. An analytical study of the effectiveness of certain classes of weapons with respect to specific targets and operating conditions. Results of this study are expected to help in reaching decisions regarding military requirements and weapons performance specifications.

DESIGN AND ANALYSIS OF EXPERIMENTS

The increasing complexity of research, development, and production requires systematic and economical methods for obtaining information on which to base important decisions. Because of this need, work in the statistical design and analysis of experiments is becoming increasingly important to industry.

The Research Triangle Institute is conducting research to develop new designs to study how changes in certain factors affect a product or process. For example, in textile production, changes in temperature, pressure, humidity, duration of the process, raw materials used, and other factors affect the strength and softness of a fabric. In a typical experiment, specimens of fabric are produced under various conditions, and strength and softness determinations are made on each specimen. The results are then analyzed to learn the effects of changing the factors.

Screening designs are also being prepared at RTI for situations in which only a few factors out of many affect a response variable. These designs are analogous to the procedure used in screening a number of persons for a rare defect which can be detected by a blood test. Samples of blood from a group of the persons are pooled and a single test is made. If the result is negative, no further testing is done, but if it is positive, each individual whose blood entered the pooled sample is tested. Two-stage group screening designs of this kind are characterized by the expected number of runs and the expected number of effective factors which are identified.

CONTROL AND OPTIMIZATION OF INDUSTRIAL PROCESSES

Industrial processes may be divided into two general types: (1) processes producing changes in the physical characteristics (form, shape, and size) of materials with no alteration in their chemical composition, and (2) processes involving alterations in the chemical properties of materials. Modern statistical techniques have been extremely useful in the control and optimization of both types.

Processes of the first type are found in the mechanical piecepart industries — electronics, cotton and wool textiles, and furniture, to cite a few. The second type of process occurs in the chemical, refining, metallurgical, mineral, and synthetic textile industries, among others.

A project aimed at the development of techniques for the first type of process is an investigation of inspection sampling plans to assist in determining whether manufactured items meet the quality levels required for acceptance. The use of performance records and experimentation to illustrate the application of these plans is also being studied.

Another study under way at the Research Triangle Institute is aimed at developing better statistical methods for use in chemical process and product development. Methods are being sought for the design of experiments for screening variables, for seeking maxima subject to certain constraints, for estimation of process variance components, and for automatic process optimization.

PROGRAM EVALUATION

In our society, man and his environment are both subjected to the influence of "action" programs. Examples are advertising programs, educational programs, extension programs, and programs for the conservation of natural resources. Programs of this kind are usually undertaken because a need can be clearly demonstrated, but there is often little or no attempt to assess their effectiveness. The Research Triangle Institute is now doing research on methods for evaluating the effectiveness of such programs.

In the vital area of science education there are countless unknowns with respect to both sides of the teacher-pupil relationship. The Institute recently conducted a study of two programs designed to stimulate the learning process both for undergraduate science majors and their teachers by providing them with direct experience in current research. An analytical survey and two experimental designs were devised as an approach to evaluating these two programs.

SAMPLING

The technique of sampling is used for making inferences about an entire group on the basis of a small representative part. Several projects in which the Institute designed the appropriate sample are described below. In some cases, RTI also conducted the field work and helped with the analysis of the data.

1. Design of optimum patterns for exploratory drilling in the field of geological prospecting. Maps of mined-out areas were studied to determine whether correlations existed between the locations of the ore bodies, and theoretical studies were made concerning the possibility of estimating ore reserves from drill-hole data.

2. Design of an area probability sample of households to obtain basic data on household composition, race, income, and food-buying habits for subsequent studies on the patterns of consumer food purchases.

3. Survey of dental procedures among a group of practicing dentists and dental assistants in selected areas of four states to evaluate the dental assistant training program of a school of dentistry.

4. Participation in a nationwide effort to evaluate the 1959 Census of Agriculture with particular respect to the numbers of farms missed and the acreage of selected crops missed. Reasons for their omission were determined, and basic data were presented for exploitation in other studies of the Census.

5. Construction of a sampling method using randomly selected access points during randomly selected periods of time for estimating hunting pressure on the land and the amount of game taken from the North Carolina State Game Management areas.

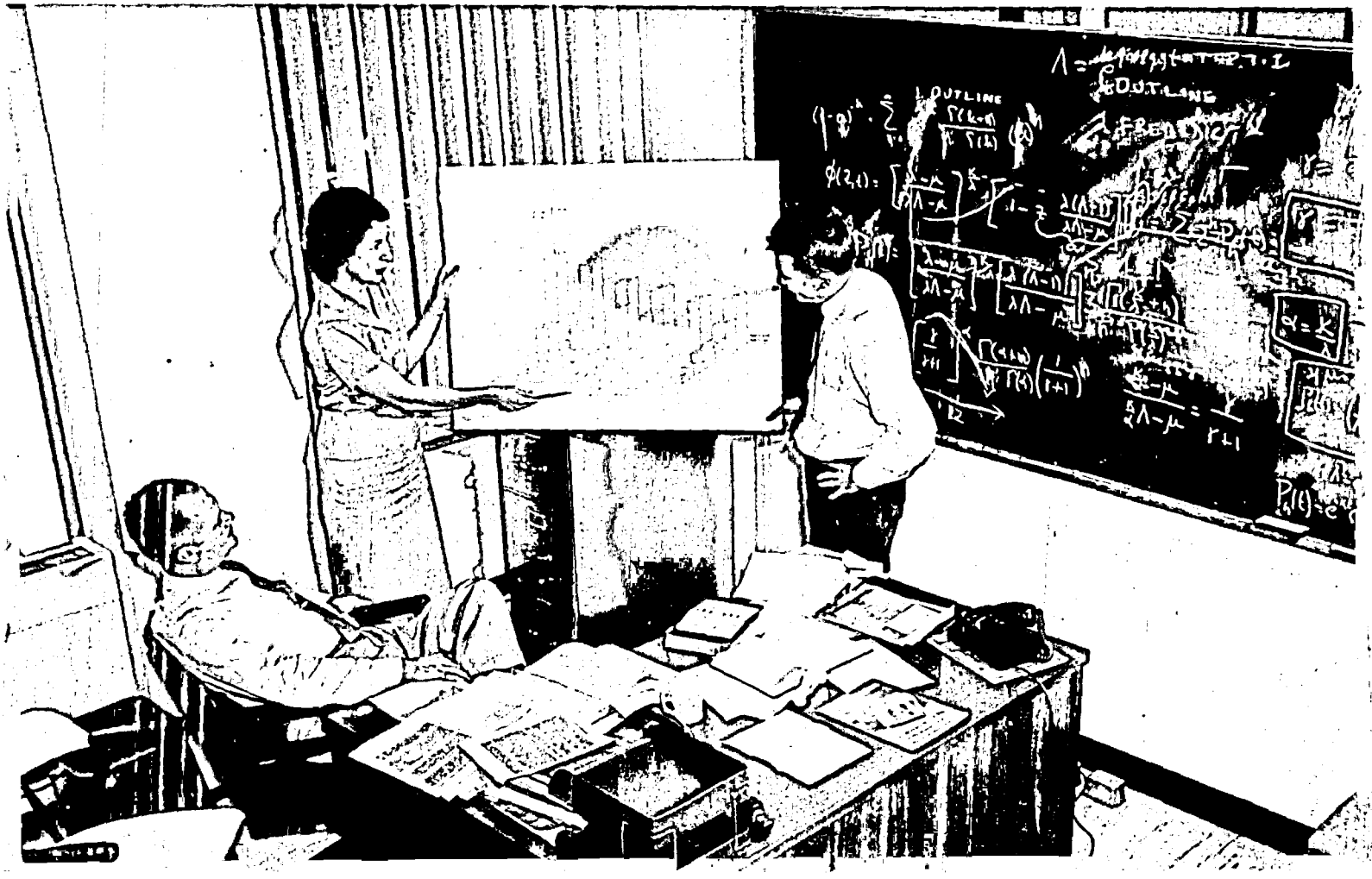
RELIABILITY STUDIES

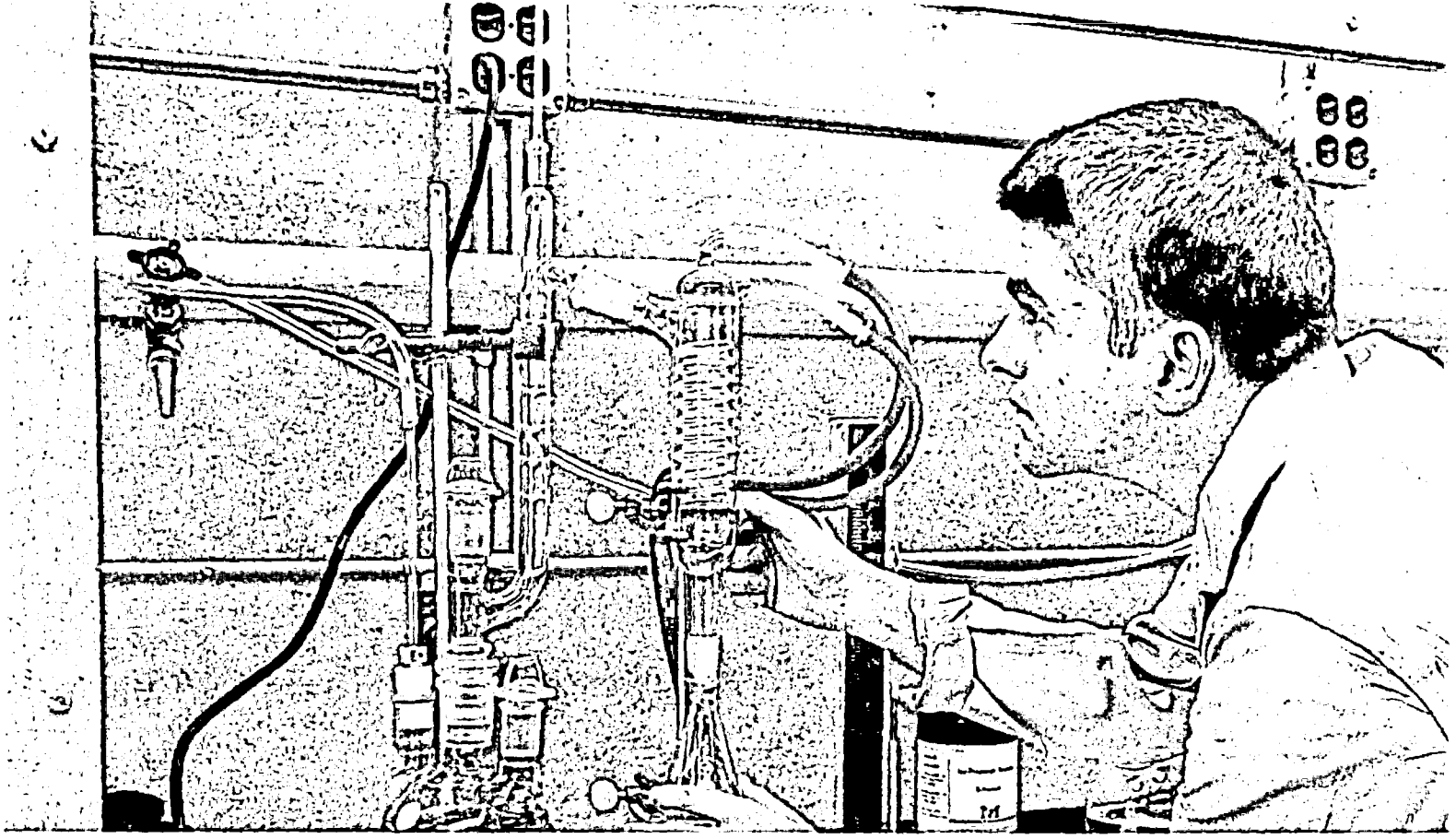
Electronic systems have become increasingly complex in recent years and are required to perform more significant tasks than ever before. These changes underscore the vital need for reliable performance.

A number of mathematical, statistical, and engineering methods are useful in evaluating reliability. These methods have been used successfully in identifying changes that would improve reliability, such as changes in design, in production methods, in storage and handling procedures, and in the conditions and methods of using the systems.

Institute research effort in this field is directed toward a threefold objective:

1. Adaptation of known mathematical, statisti-





cal, and engineering methods and development of new methods for solving the problems of evaluating and improving the reliability of parts, components, and systems.

2. Application of these techniques in specific field activities to learn how they may be employed most effectively.
3. Exposition and dissemination of proven methods in a form that will make them useful where the problems occur.

RTI is currently working on a project to develop appropriate methods to estimate the reliability of electronic parts, components, subsystems, and systems; to develop procedures that indicate which subsystems should be modified in order to produce the greatest improvement in the performance of the system; and to provide general statistical advice concerning problems which arise in the development, manufacture, and testing of systems and subsystems.

STATISTICAL THEORY

Members of the RTI staff are conducting a number of studies in statistical theory, including investigations of:

1. The effects of non-normality in linear least squares regression.
2. Randomization and linear least squares regression.
3. Exact and approximate distributions for the Wilcoxon Statistic with ties.
4. Goodness-of-fit tests on a circle.
5. Multivariate classification.
6. Allocation of sampling units in elementary balanced designs without the use of cost functions.

NATURAL PRODUCTS CHEMISTRY

From the beginning of recorded history, man has been interested in the therapeutic action of naturally occurring substances, especially crude plant drugs. In modern times, and with increasing emphasis in the last decade, attention has focused on the problem of isolating specific compounds from such sources. Organic chemists have been successful in isolating and determining the structure of many of these compounds and have synthesized a number with proven pharmacological activity.

The Institute staff in natural products chemistry comprises a group of organic chemists with biochemical orientation who are experienced in isolating and elucidating the structure of complex

substances of natural origin and in applying synthetic organic chemistry to chemotherapy. The background of the group specifically includes research and publications in the following fields: animal and plant nutrition, fat soluble vitamins, plant pigments, cardiac glycosides, saponins, sapogenins, sterols, heterocycles, terpenes, alkaloids, flavonoids, polypeptides, and organic sulfur compounds.

In the current war against cancer, chemotherapy offers certain promising lines of attack. Some natural products of plant origin have given indications of effectiveness against some forms of malignancy and are being hopefully evaluated. RTI is now engaged in programs in this area of research as well as in the general field of organic chemistry. Work is currently in progress on the preparation of a wide variety of plant extracts which will be tested for potential anti-tumor activity, and on the synthesis of novel steroid hormones which will be tested for anti-tumor, anti-arthritic, estrogenic, progestational, and androgenic activities. Other areas of interest include the elucidation and synthetic modification of certain antibiotics which have anti-tumor activity, the synthesis of a series of novel amino-sulfhydryl compounds to be biologically tested for anti-radiation activity, and the determination of methods for isolating naturally occurring compounds in pure form after they have been extracted from their source materials.

ISOTOPE APPLICATIONS

Radioactive isotopes, increasingly available in the last few years from nuclear energy sources, are serving many useful purposes. They measure dimensions, locate boundaries and discontinuities, monitor industrial processes, diagnose physical ailments, and administer treatment. There are many problems in industry and medicine and in the field of public service which isotopes are uniquely equipped to handle.

The Research Triangle Institute is developing new uses for radioisotopes under the sponsorship of the Atomic Energy Commission. Existing applications and techniques are also being adapted for specific conditions and brought to the attention of industrial groups. Recent projects include studies of:

1. *Wood technology.* Defects in timbers, such as knots or voids caused by decay, can be detected by irradiating the timbers with gamma rays and observing the scattered radiation. Intensity of the scattered beam varies with changes in the density of the wood. It is possible thus to check the soundness of railroad ties in place, to detect the presence of rot in a telephone pole, or even to determine the quality of standing timber.

2. *Thickness measurements.* The thickness of a thin (0.5 micron) film of metal deposited on a nonmetallic substrate can be measured by beta ray back-scattering. A similar method can be used to measure (and control) the amount of coating material applied in paper finishing.

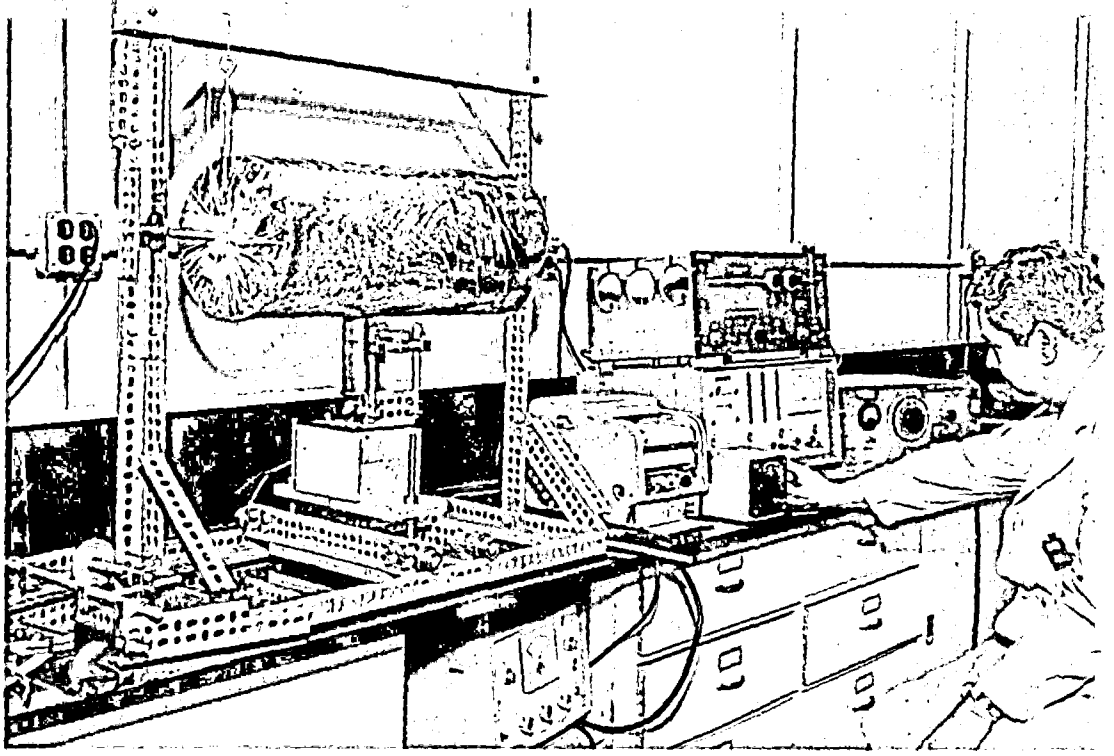
3. *Counter designs.* Scintillation counting of radiation offers the advantages of sensitivity and energy discrimination but depends on the use of photomultiplier tubes which require stringent high-voltage stability and must be handled carefully. A photosensitive Geiger counter is now under development at RTI for use in those applications where energy discrimination is not essential. This counter will combine the sensitivity of the photomultiplier with the ruggedness and circuit simplicity of a Geiger-type counter. The new counter will enable lower intensity radiation sources to be used in many industrial applications.

Flexible Geiger counters have been built which can be twisted into intricate configurations without impairing their performance. These counters can be made in almost any length and will find use in radioactivity monitoring equipment and in industrial measuring devices.

4. *Tritium counting.* Tritium is a very useful radioactive tracer which is normally obtained for measurement in the form of water. However, conventional techniques for measuring tritium in water require cumbersome and expensive equipment. RTI has developed a new method by which the water is introduced in vapor form directly into a simple Geiger counter. This new technique provides sensitivity comparable to that obtained by earlier methods, in addition to simplicity and economy.

MEASUREMENT OF MOISTURE

Traditional methods for determining the moisture content of bulk materials (grain, tobacco, fibres, soil, etc.) are awkward and inaccurate. The Institute has developed several new techniques for improving the measurement of moisture.



As part of its program in radioisotopes, RTI developed a measuring procedure based on the principle of neutron moderation. The moderation (or slowing) of neutrons in a medium indicates the amount of hydrogen present, since fast neutrons lose kinetic energy most readily when they collide with hydrogen nuclei. The amount of hydrogen present is in turn an index to the moisture content of the medium. Application of this technique has given accurate results even with organic matter such as corn.

Another approach to the problem led to use of a single electrode capacitance element in an electronic circuit. Changes in moisture cause variations in the capacitance of the circuit, which can be converted to readings of moisture content.

A third approach, most promising for organic materials, depends upon the attenuation of a transmitted microwave beam. This method has been used successfully both with selected samples and with bulk quantities.

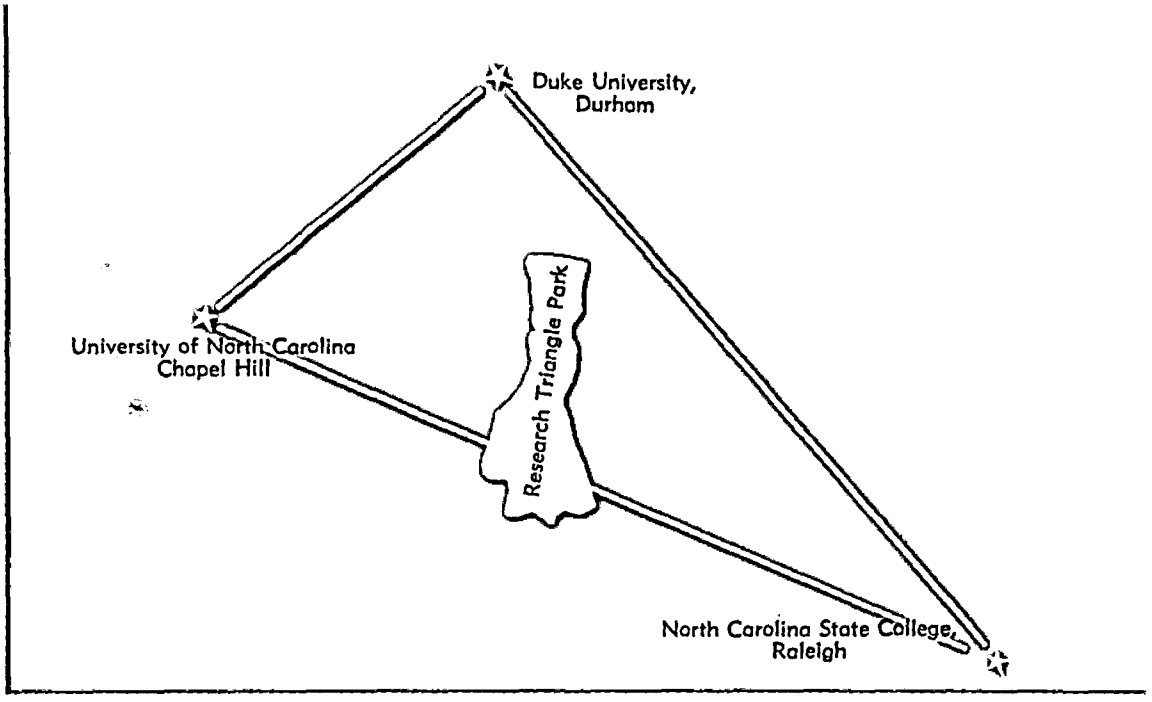
POLYMER RESEARCH

In the fascinating realm of new materials, polymeric substances have had an impressive and expanding role. Most of the newer textiles, plastics, and rubbers—the hundreds of new materials that have made themselves useful and indispensable in our lives—are synthetic products of polymer science.

Polymers characteristically are very large molecules which have similar repeating units. Polymeric substances are almost never pure compounds. Within a given preparation of a polymer there is variation in the lengths of the molecular chains, in the degree of branching, in steric configuration, and in steric conformation. Since polymers have such a complex nature, the methods of the chemist have not been adequate by themselves for studying these materials. Polymer science is therefore an interdisciplinary field, making use of the methods of chemistry, physics, and mathematics.

Polymer science attempts to answer two sets of questions. The first deals with the analysis of polymers. What is their gross structure and chain length distribution, for example, and what is their fine structure, spatial configuration and internal interaction? The second set of questions relates to problems of synthesis and modification. How, for example, can preparations of polymers be made with structures that will enable them to have different functions from existing materials?

The first project in polymer research to be conducted at RTI is a study of short segments of polyacrilonitrile. Segments of controlled length are first being synthesized. Pure isomers will next be isolated, and their steric configurations determined. Measurements made on segments will be used, along with similar measurements on long-chain molecules, to establish the steric configuration of polyacrilonitrile prepared under various polymerizing conditions.



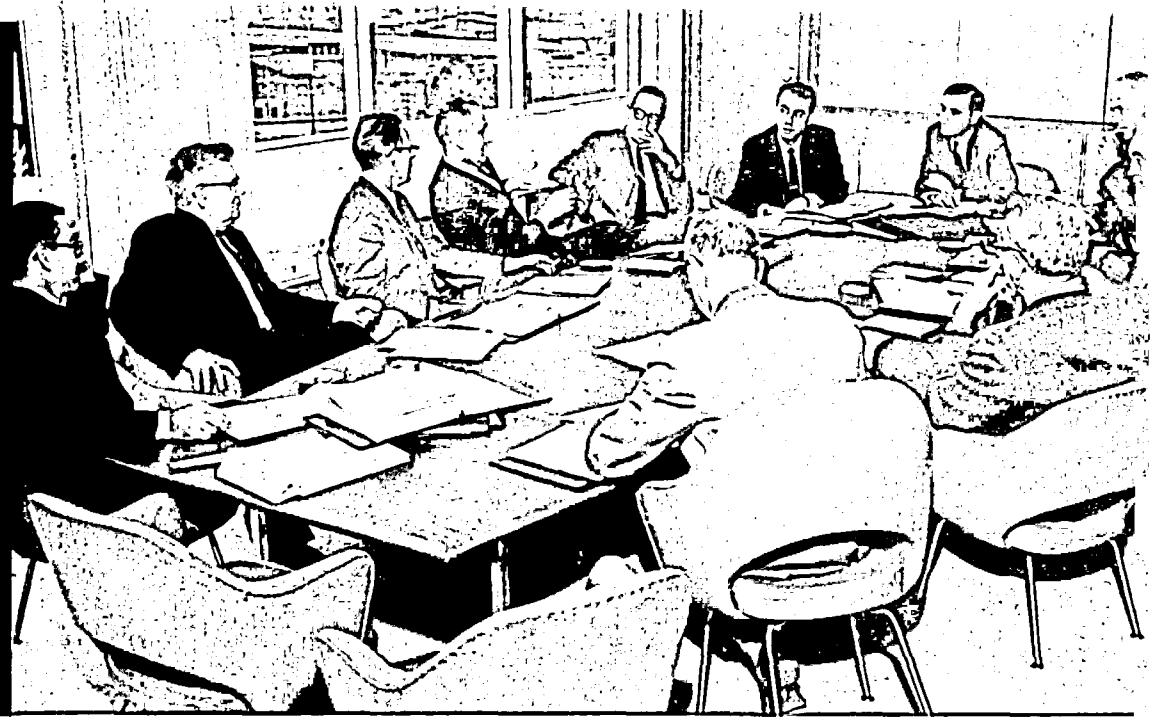
"In a world of uncertainties, in a world whose population is expected to double by the year 2000, we expect our scientists and our research organizations to develop better and more effective techniques for extracting from this small earth the means of a fuller and richer life. We look also to science and research for the means and concepts with which to preserve our democracy. These are monumental tasks. They will not be accomplished by accident nor by wishful thinking.

"The Research Triangle and the Robert M. Hanes Memorial Building represent not only the plan, but also the personnel, the equipment, the organization, and the purposes necessary for exploring this new frontier. Research has done much in the past. More is expected. The Research Triangle is an important part of that future."

The Honorable Luther H. Hodges, Governor of North Carolina,
at the dedication of the
Robert M. Hanes Memorial Building, December 16, 1960

MEETING OF
THE EXECUTIVE COMMITTEE
OF THE
BOARD OF GOVERNORS
RESEARCH TRIANGLE INSTITUTE

reading left to right around the table
S. C. Ashton
Dr. Donald B. Anderson
Dr. Walter J. Peterson
J. M. Wasson
Dr. Marcus E. Hobbs
George R. Herbert
Dr. George L. Simpson
George Watts Hill
Dr. Robert T. Armstrong
Dr. Paul M. Gross
Mr. Frank Daniels
Dr. Hugh W. Hunter



BOARD OF GOVERNORS of the RESEARCH TRIANGLE INSTITUTE

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Dr. Donald B. Anderson*
Vice President, Consolidated University of North Carolina

Dr. Robert T. Armstrong*
Vice President and Technical Director, Celanese Corporation of America, New York

Chancellor William B. Aycock
University of North Carolina

Chancellor John T. Caldwell
North Carolina State College

Harry C. Carter
Vice President, J. P. Stevens & Company, Greensboro

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President, The News and Observer Publishing Company, Raleigh

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President William C. Friday
Consolidated University of North Carolina

Dr. Paul M. Gross*
William Howell Pegram Professor of Chemistry, Duke University

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