GRADUATE PROGRAMS IN TEXTILES

at

North Carolina State University

1979

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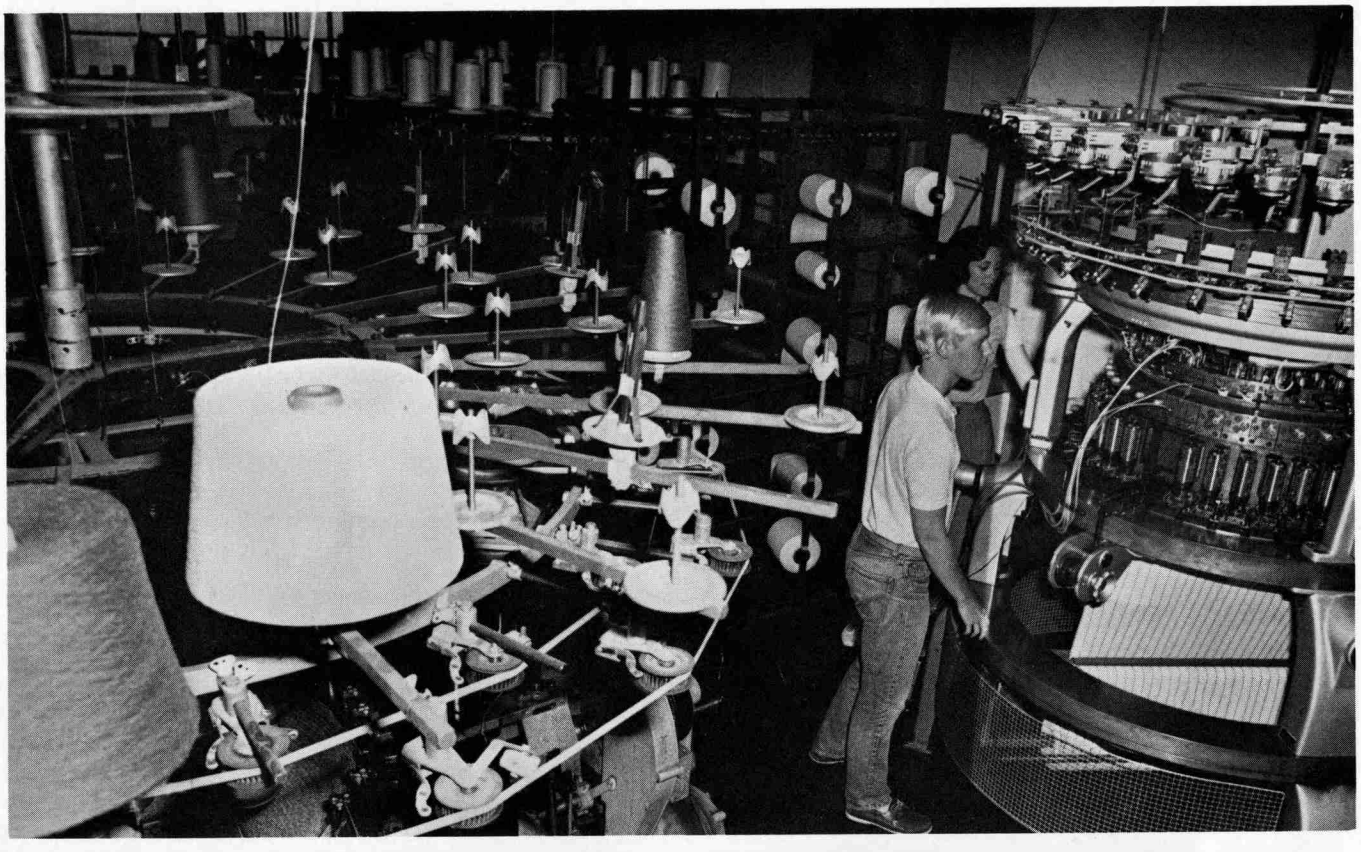


Introduction

Graduates with advanced textiles degrees consistently have been in short supply, even in periods when the level of business activity has been lower than normal. All estimates indicate that this demand not only will continue but will actually increase. Even at the Ph.D. level there is no prospect of an oversupply of graduates for many years to come, in contrast to the current existence of an oversupply of Ph.D. graduates in several areas of traditional physical science and the prediction of future oversupply in others. The reason for this outstanding demand for textiles students at all degree levels is the rapid growth of a broad spectrum of industries which are involved in textiles in some form or other. Examples include products for use in medicine, recreation, aerospace, transportation, environmental control, public safety, construction, and direct consumer necessities. In short, the field of textiles is a vast one involving not only very large manufacturing corporations but thousands of smaller businesses in all aspects of textiles.

The School of Textiles at North Carolina State University offers graduate programs leading to the degrees of Master of Science in the Departments of Textile Chemistry and Textile Materials and Management, the professional degree of Master of Textiles in the Department of Textile Materials and Management, and the Doctor of Philosophy degree in the interdepartmental program in Fiber and Polymer Science, which includes Textile Science. It also is associated with a multidepartmental program leading to the degree of Master of Science in Management. These degree programs may be undertaken by good students with a variety of undergraduate educational experience. Normally, students otherwise meeting the requirements of the graduate school and with Bachelor of Science degrees with majors in textiles, the physical sciences, or engineering will qualify for the graduate degree programs. Typically, our graduate students have had undergraduate degrees in the fields of textile science, textile technology, textile engineering, textile chemistry, chemistry, physics, mathematics, chemical engineering, electrical engineering, mechanical engineering, engineering physics, or materials science. Students with certain other backgrounds may also qualify after any deficiencies are remedied. *Students applying to North Carolina State University will be considered without regard to race, sex, creed, or national origin.*

An important part of graduate study in textiles entails course work to acquire more specialized and advanced knowledge. However, except for the Master of Textiles and Master of Science in Management programs, an equally important purpose of graduate study is to develop the ability to do research—to learn to analyze unsolved problems, to decide which problems are worth pursuing, and finally to solve a problem that has never been solved before. The traditional mechanism to achieve this goal is thesis research, in which the graduate student works in close

association with one or more faculty members on a research project of interest to both. In choosing a school to carry out your graduate study and research, you should keep in mind the following important questions:

1. What is the quality and the breadth of interest of the faculty who will guide your graduate program?
2. What is the quality and breadth of the research being done?
3. How much interaction is there between faculty advisor and graduate student?
4. To what extent are graduate students financially supported?
5. How modern and available are research facilities, computer facilities, and library facilities?

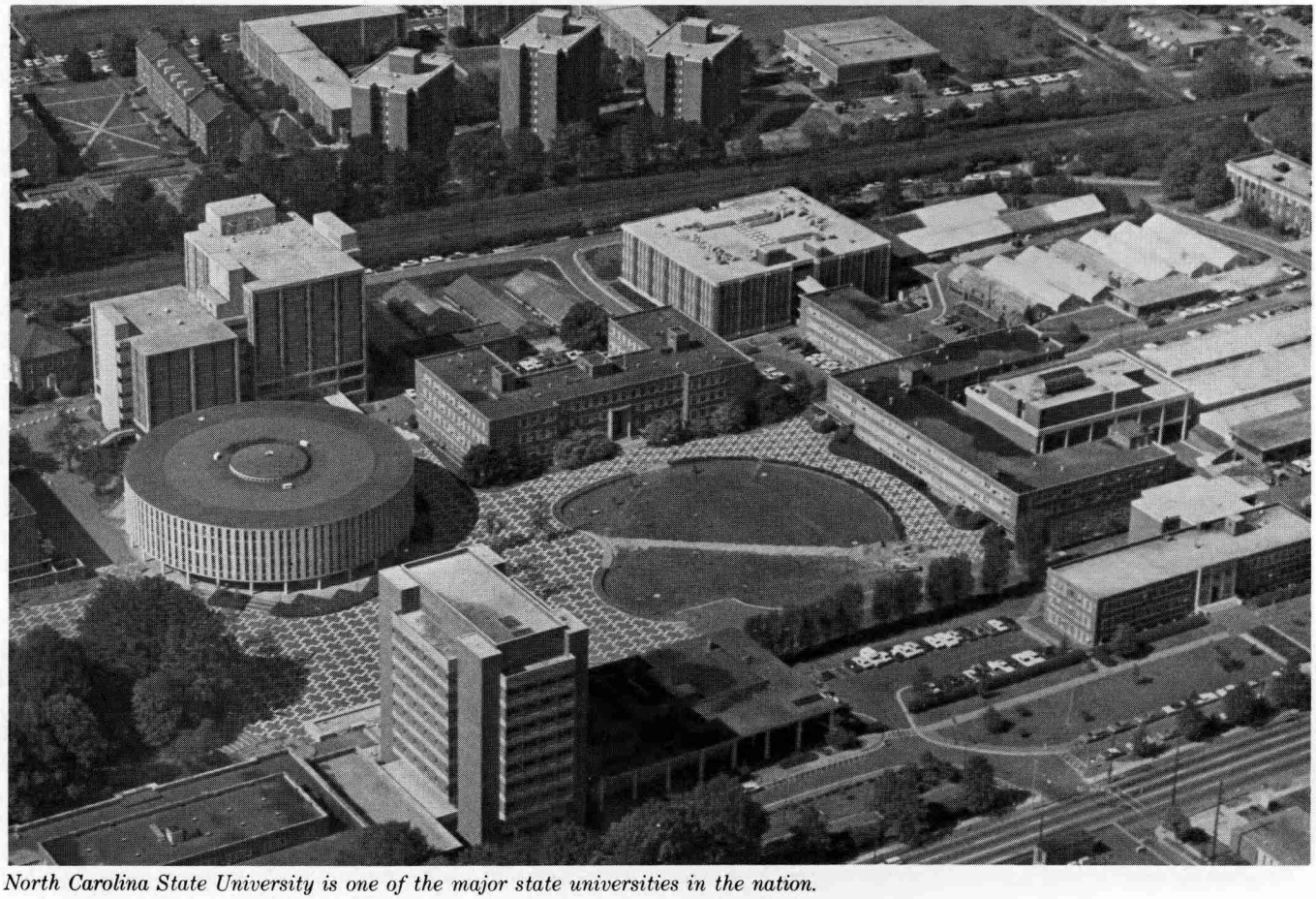
As you read this brochure we hope that some of these questions will be answered for you with respect to the School of Textiles at North Carolina State. We feel that our programs provide an excellent environment for graduate study in textiles in that they combine the facilities, quality, and breadth of research of a large university with the close student/faculty interaction possible at a relatively small, closely knit school.

For your convenience, several postage paid cards requesting application forms are enclosed in the back of this brochure. If these have been exhausted or if you have further questions, please write or phone: Dean, School of Textiles, North Carolina State University, Raleigh, North Carolina 27650 (919/737-3231).

North Carolina State University

North Carolina State University is one of the major state universities of the nation. It is one of the sixteen constituent institutions of the University of North Carolina and one of two such institutions to be classified as a major research university. As such, it shares the distinctive character of large, Land Grant state universities nationally—broad academic offerings, extensive public involvement, national and international activities, and large scale extension and research programs.

The rich and varied academic program of the university is comprised of some ninety bachelor of arts and science programs, seventy-two master's degree fields and forty-five doctoral degrees. The university offers about 2,300 courses. Its research activities span a broad spectrum of about 700 scientific, technologic, and scholarly endeavors, with a budget of about twenty million dollars annually. Extension programs of the university are similarly diverse and include urban affairs, marine sciences, environmental protection engineering, industrial and textiles extension, agricultural extension, and many others. There are 120



North Carolina State University is one of the major state universities in the nation.

campus buildings in a central campus of 596 acres. The university's total enrollment is about 18,000. There are approximately 14,000 undergraduates and 4,000 graduate students. All fifty states and some seventy-five foreign countries are represented at the university.

North Carolina State University is one of the three Research Triangle universities along with Duke University and the University of North Carolina at Chapel Hill. In the thirty-mile triangle formed by these three universities is the 5,000 acre Research Triangle Park, which is recognized as one of the nation's unique centers for the research activities of private industries and governmental agencies, an area where some of the nation's outstanding minds work in an atmosphere dedicated to the principle that research and education are necessary forerunners to industrial growth. The Research Triangle Institute (a subsidiary of the three universities), and the Triangle Universities Computation Center, a large central facility for the extensive computing centers of the institutions, also are located in the Research Triangle Park.

The School of Textiles

The School of Textiles at North Carolina State University has long been recognized as one of the most modern and best equipped university-based textile institutions in the world. It now supplies one-third of all textile graduates educated in the United States. Founded in 1899, the school has an enrollment of close to 700 undergraduate and graduate students and operates on an annual budget of slightly over two million dollars. For many years, industry and government have recognized the school by supplying funds for research projects that have brought great benefit to industry and the citizens of North Carolina.

The School of Textiles is one of only six schools in the United States offering graduate programs in textiles. In addition to outstanding facilities and equipment valued at over ten million dollars, the school benefits from a faculty that has a unique combination of broad experience and wide diversity of academic background. Faculty credentials include engineering, education, mathematics, fiber and polymer science, chemistry, physics, statistics, economics, home economics, textile technology, law and design. Over 90% of the graduate faculty hold doctoral degrees and this, combined with an average of approximately ten years of industrial experience per faculty member, gives the School of Textiles a faculty that is both strong in practical experience and uniquely qualified for academic teaching and research.

The School, founded in 1899, is one of the most modern and best equipped university-based textile institutions in the world.

Graduate Programs in Textiles —General Requirements

Students with academic undergraduate degrees in textiles, the physical sciences, mathematics, or engineering and who have at least a B average in their undergraduate major will normally qualify for admission into the graduate program of the School of Textiles. For those students with a limited textile background, some familiarization effort will be expected. This effort may require formal course study in advanced undergraduate and graduate textile courses or it may involve some other means. The details are worked out for each student individually, with an attempt to minimize extra time required in the degree program.

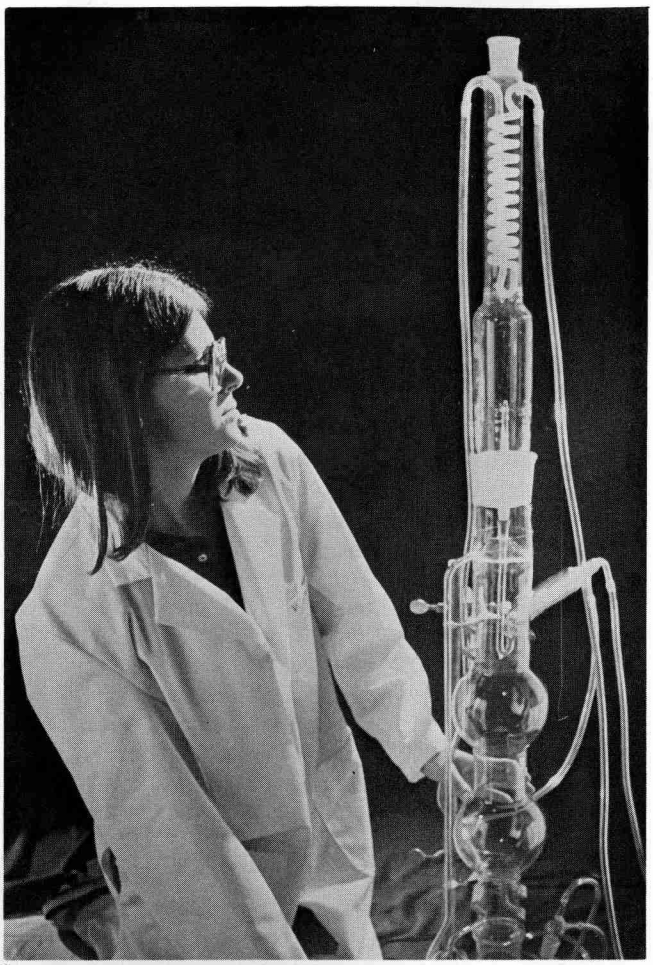
Master of Science Degree

The School of Textiles offers programs leading to the Master of Science degree in the departments of Textile Chemistry and of Textile Materials and Management. These programs of study include a minimum of thirty semester hours of advanced courses, including six semester hours devoted to a thesis based on research conducted by the student. There is no foreign language requirement. The plan of course work and the research activities for the Master of Science degree are designed to prepare the student for a career in research, development, or other technical phases of the textile allied industries, although many graduates go into management, sales, and similar non-technical phases. Students may minor in one or more of a number of associated fields.

Programs of study may be arranged to develop a broad background in three general areas: textile materials science and technology, production and marketing management of textiles, and textile chemistry. Those students interested in the first of these may emphasize areas such as fiber, yarn, and fabric formation, mechanical and physical properties of fibers and textile structures, and testing and quality control. Programs leading to the Master of Science degree in textile chemistry will emphasize dyeing and finishing materials and processes, fibers and other polymers, or process measurement and control. In the area of production and marketing management, the program emphasizes the applications of quantitative decision methods, including operations research and computer techniques, to the textile industry. Programs in this area normally terminate within the School of Textiles with a master's degree but may be structured to provide suitable backgrounds for students wishing to do further graduate work in the areas of economics and business, industrial management, industrial engineering, or business administration.

Master of Textiles Degree

The minimum requirement for a Master of Textiles degree is the satisfactory completion of thirty-three semesters hours of advanced courses. There is no thesis or foreign language requirement, although a final comprehensive oral examination is required. This program offers the student advanced professional training with emphasis on management, quality or manufacturing control, technology, machine design, or textile design. It is expected that this degree program will be particularly attractive to those who have some professional experience between the time of their undergraduate degree and the time that they apply for this degree program.



The School offers ample laboratory space for research.

Master of Science in Management

The degree of Master of Science in Management is a unique offering by North Carolina State University. It is a multidepartmental program combining the resources of several technical areas within the University. The degree program is designed to permit the student to acquire the principles of management decision making and to provide the student with the opportunity to extend the foundation principles of management to the functional areas in which he may work. The extension is accomplished by electing 12 to 15 hours in a technical option from the total of 30 hours of graduate course work required of each student. The 12 to 15 hours would be in courses designated by an advisory committee of faculty members from the participating departments. These courses will make up what is titled the technical option for each student's degree program. The technical option will be designed to form a coordinated pattern of study developing professional capabilities in the

specified field of work. A 12 to 15 hour sequence of textile courses can be used to form this technical option. Further details are available upon request.

Doctor of Philosophy Degree

This program is a multidisciplinary one, bringing together the disciplines of mathematics, chemistry, physics, and engineering for the development of independent scholars versed in the field of polymer, fiber, or textile science. The program is administered by the School of Textiles and leads to the degree of Doctor of Philosophy. Students majoring in the physical sciences, mathematics, textiles, or engineering and having at least a B average in their undergraduate major will normally qualify for admission.

The polymer, fiber, and textile sciences are concerned with polymeric materials, fibers produced from them, textile assemblies in one, two, and three dimensional forms, and the chemistry of dyeing, finishing, and other textile wet processes. This broad field of study permits a wide range of useful concentrations. The candidate is expected to penetrate deeply into one area of specialization and to acquire a reasonable perspective in other relevant areas. Generally, specialization occurs within the area of (1) polymer chemistry and synthesis, (2) fiber and polymer physics and physical chemistry, (3) structural mechanics of textile materials, or (4) chemistry of dyes, finishes, and their processes. The student's research is based within one of these areas of specialization, or another suitable one.

As soon as possible after admission to the program, an advisory committee chaired by a member of the fiber, polymer, and textile science faculty of the School of Textiles is formed to develop with the student a plan of study designed to enable him or her to acquire the comprehensive knowledge required to pass a series of qualifying cumulative examinations.

There are no fixed credit-hour requirements for the Doctor of Philosophy degree. Students are admitted to candidacy for the Ph.D. degree after passing a series of written cumulative examinations, completing a scholarly critique of existing knowledge in the field of specialization, and orally defending a research proposal. A written examination in a minor field may be accepted in place of the scholarly critique. The candidate must pass one foreign language examination, and an acceptable thesis based on original research and successful defense of the thesis before an advisory committee and other interested graduate faculty is required.

D. H. Hill library is a major resource for study and research for the whole state of North Carolina.

Graduate and Upper Level Undergraduate Course Offerings

Offerings within the School of Textiles

Environmental Aspects of the Textile Industry
Advanced Microscopy
Color Science
Textile Chemical Technology
Textile Chemical Analysis
Textile Printing
Chemistry of Fibers
Fiber Formation—Theory and Practice
Theory of Dyeing
Organic Chemistry of High Polymers
Physical Chemistry of High Polymers—Bulk Properties
Physical Chemistry of High Polymers—Solution Properties
Polymers, Surfactants and Colloidal Materials
Radiation Chemistry and Technology of Polymeric Systems
Diffusion in Polymers
Non-Conventional Fabric Structures
Modern Developments in Yarn Manufacturing Systems
Textured Yarn Production and Properties
Knitwear and Hosiery Manufacture
Advanced Knitted Fabric Design
Analysis of Knitting Systems and Fabric Properties
Warp Knitting Systems
Advanced Weaving
Advanced Woven Fabric Design
Fabric Styling and Design
Textile Cost Control
Sales Management for Textiles
Management Decision Making for the Textile Firm
Textile Labor Management
Textile Instrumentation and Control Systems
Yarn Processing Dynamics
Textile Quality Control
Theory and Practice of Knitted Fabric Production and Control
Warp Knit Engineering and Structural Design
Production Mechanics and Properties of Woven Fabrics
Mechanical and Rheological Properties of Fibrous Material
Physical Properties of Fiber Forming Polymers, Fibers and Fibrous Structures
Characterization of Structure of Fiber Forming Polymers
Market Research in Textiles
Advanced Textile Testing
Synthetic Fibers
Physical and Mechanical Properties of Knitted Fabric
Fabric Development and Construction
Mechanics of Twisted Structures
Mechanics of Fabric Structures

Typical Course Offerings Outside the School of Textiles

MATHEMATICS AND STATISTICS
- Experimental Statistics for Engineers
- Experimental Statistics for Biological Sciences
- Introduction to Matrices
- Introduction to Linear Algebra
- Advanced Mathematics for Engineers and Scientists
- Numerical Analysis
- Differential Equations

CHEMISTRY AND CHEMICAL ENGINEERING
- Physical Chemistry
- Cellulose Industries
- Analytical Chemistry
- Chemical Instrumentation

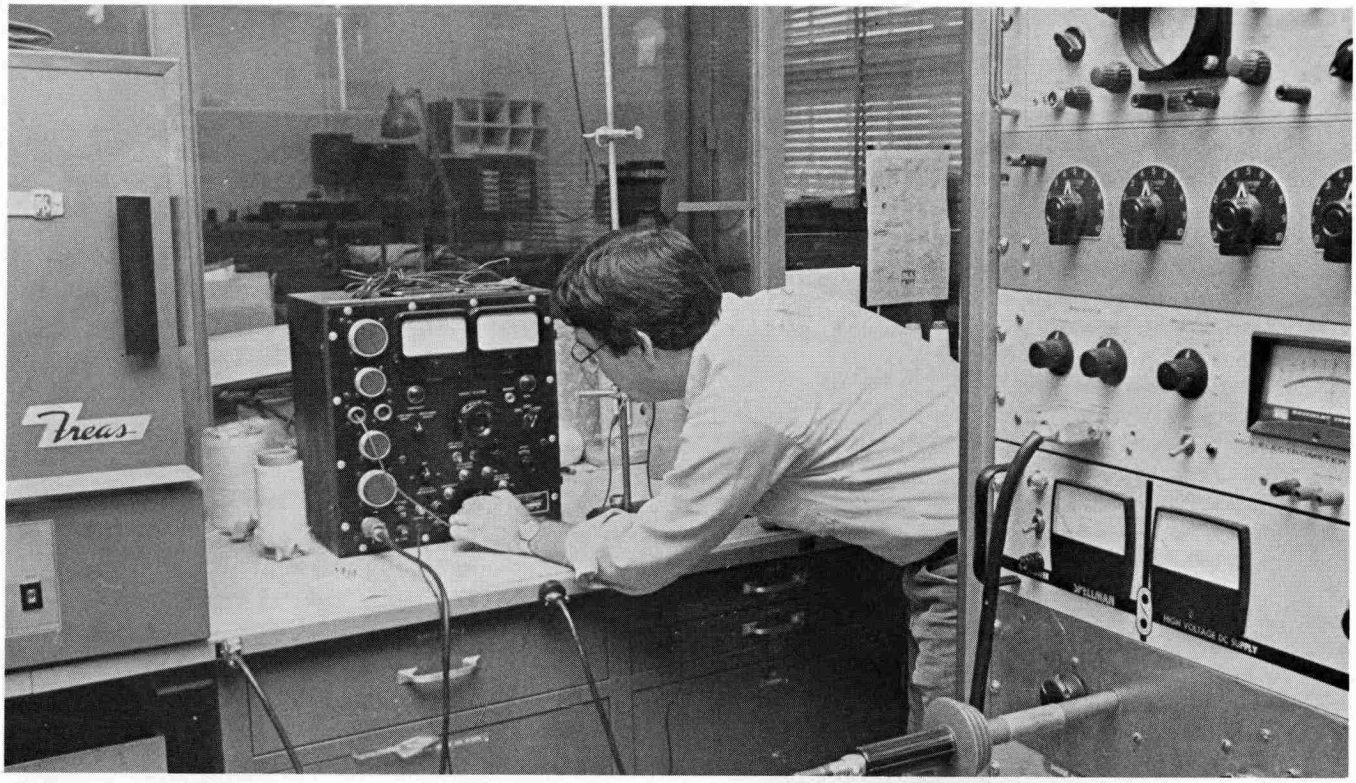
ENGINEERING
- Machine Component Design
- Advanced Machine Design
- Mechanical Engineering Design
- Mechanical Vibration and Control
- Heat and Mass Transfer
- Principles of Automatic Control
- Industrial Noise Control

ECONOMICS AND BUSINESS
- Price Theory
- Income and Employment Theory
- Management Policy and Decision Making
- Long-Range Planning in Business and Industry
- Economic Development

Seminars and Speakers

Since both the School of Textiles and North Carolina State University are nationally and internationally recognized in research, a wide variety of distinguished visitors come to the campus each year to present seminars. Examples of recent seminar offerings within the School of Textiles are listed below.

Dr. Denney Freeston, Jr. *Georgia Institute of Technology*	"The Transverse Properties of Fibers"
Dr. Menachem Lewin *Israel Fiber Institute*	"Flame Retardance of Cellulose by Sulfation—Phosphorylation"
Dr. William J. Bailey *University of Maryland*	"Biodegradable Polyamides"
Dr. John D. Ferry *University of Wisconsin*	"Viscoelastic Properties of Very Dilute Polymer Solutions"
Dr. M. Battigelli *University of North Carolina*	"The Medical Aspects of Byssinosis"
Dr. R. W. Postlethwait *Veterans Hospital, Durham, NC*	"Experimental Studies of Surgical Sutures"
Dr. Norman R. S. Hollies *Gillette Research Institute*	"Clothing Comfort Measurement"
Dr. Dusan C. Prevorsek *Allied Chemical Corporation*	"Quantitative Interpretation of Mechanical and Diffusive Properties of Fibers"
Dr. H. D. Weigmann *Textile Research Institute*	"Liquid-Induced Structural Changes in Polyester Fibers"
Dr. P. J. Stevenson *Monsanto Textiles Company*	"Some Aspects of Non-woven Technology"
Dr. Raymond F. Boyer *Midland Macromolecular Inst.*	"Transitions & Relaxations in Amorphous & Semicrystalline Polymers and Copolymers"
Dr. Hosny A. Soliman *University of Alexandria*	"An Engineering Approach to Open-End Spinning"
Dr. R. H. Peters *University of Manchester*	"The Dyeing of Polyesters"
Dr. David W. Wood *Burlington Industries, Inc.*	"Analytical Detection of Heat Treatments For Synthetic Fibers and Fabrics"
Dr. Richard S. Stein *University of Massachusetts*	"Dynamic Orientation Measurements of Crystalline Polymers"
Dr. John Skelton *FRL, An Albany International Company*	"Bending Properties of Fabrics"
Dr. Gregory S. Yeh *University of Michigan*	"Morphology and Kinetics of Strain-Induced Crystallization"
Dr. Victor Kabonov *Soviet Union*	"Experimental Studies of Molecular Motion in Polymeric Solutions by Fluorescent Quenching"
Dr. Paul J. Flory *Stanford University*	"Molecular Conformation and Morphology of Polymers"
Dr. Jack Hoffman *National Bureau of Standards*	"Theory of Folded Chain Lamella"
Dr. Anton Peterlin *U. S. Department of Commerce*	"Ultra High Modulus and Strength of Fibrous Polymers"
Dr. Michael Jaffe *Celanese*	"Structure and Properties of Aramid Fibers"
Mr. L. T. Haddock *Southern Technical Institute*	"Computer Applications in Apparel Manufacturing"
Dr. David K. Roylance *Massachusetts Institute of Technology*	"Ballistic Impact of Textile Structures"
Mr. David W. Cox *Cotton Incorporated*	"The Continental Drift of the World Textile Industry"
Dr. Peter Popper *E. I. du Pont de Nemours & Co.*	"Effect of Friction on Processing Performance & Mechanical Properties of Textiles"
Mr. Richard S. Roberts *Celanese Corporation*	"Textile Filament Polyester—Business Problem or Opportunity"



For many years, industry and government have recognized the School by supplying funds for research projects that have brought great benefit to industry and the citizens of North Carolina.

Research Facilities

Nelson Hall and David Clark Laboratories house the School of Textiles teaching and research facilities. These outstanding facilities are valued at over ten million dollars. Nelson Hall, which provides teaching and laboratory facilities for the Department of Textile Materials and Management, contains equipment for long and short staple processing, filament yarn extrusion, knitting, weaving, tufting, and non-conventional fabric forming processes. In addition, there are completely equipped laboratories for physical testing, textile physics studies, and for research in the structure of polymers, fibers, and textile structures.

Also located in Nelson Hall is the Department of Textile Chemistry radiation laboratory with a Cobalt-60 source.

The Burlington Textiles Library in Nelson Hall has a collection of 16,000 bound volumes and 260 current journal subscriptions and is considered one of the most extensive collections of textile and related literature in the country. Its physical facilities include a reading lounge, individual study carrels, seminar room, photocopy equipment, microfilm/fiche readers and video playback units. Specialized resources include: *Textile Technology Digest, World Textile Abstracts, Color Index,* Harriss Fabric Collection, technical bulletins of the fiber producers, and selected industry market studies. The library staff provides reference assistance including interlibrary loans and computerized searches of textile data bases.

David Clark Laboratories provides teaching and research facilities for the Department of Textile Chemistry. These include both research laboratories and pilot plant facilities for research in polymerization, dyeing, finishing, polymer evaluation, process evaluation, process control, and color science. David Clark Laboratories also houses a 500 kV electron accelerator.

Computing facilities available to students and faculty in the School of Textiles are outstanding. In addition to a number of micro- and mini-computers which have specialized uses, particularly in the direct analysis of laboratory data, the facilities of the Triangle Universities Computation Center are available. This facility, jointly owned by North Carolina State University, Duke University, and the University of North Carolina at Chapel Hill, is located in the Research Triangle Park and is equipped with an IBM 370/165. Use of this computer by remote terminals or direct access is particularly easy to accomplish.

The School of Textiles offers ample laboratory space for research and most of the major equipment required is located in the school or in cooperating departments on campus. Specialized equipment includes thermal analysis facilities (DSC, TGA, TMA), X-ray diffraction facilities, chromatographic equipment, rheometers, color science and fiber physics instrumentation, equipment for fiber extrusion, yarn formation, texturing, fabric formation, physical and mechanical testing, polymer and dye synthesis, microscopy, spectroscopy, and acoustical testing. Facilities for UV, gamma and electron irradiation are available, as are machine and electronic shop facilities. In addition, extension electron microscopy and NMR facilities are available elsewhere on campus.

Graduate Student Support and Expenses

Financial aid is readily available, particularly for United States citizens or for foreign nationals with permanent visas. This aid takes the form of teaching and research assistantships and of a limited number of fellowships. Stipends range from $4,200 to $4,700 for a nine-month period for students in the master's degree programs or for beginning students in the Ph.D. program. Ph.D. students, after admission to candidacy, may be appointed to assistantships at stipends between $4,650 to $4,950 per nine-month period. Opportunities for summer work at approximately these same monthly rates are commonly available. In addition, because of the size and cosmopolitan character of Raleigh, there exist numerous opportunities for the employment of spouses.

Tuition and fees for North Carolina residents are $291.00 per semester. Non-residents pay $1,147.00 per semester, except for some highly qualified applicants who may be eligible for special tuition rates currently equivalent to resident rates. A fee of $10 is required with each application for admission.

Residence hall rooms for single students rent for $245.00 per semester and board is estimated at $525.00 per semester. Married students' apartments on campus range from $85-$113 per month, plus utilities. In addition, living accommodations are available off campus. The Office of Residence Life assists students in obtaining off-campus accommodations.

Married student housing is available on campus for a reasonable price.

Graduate Life

About 95 graduate students are in residence in the School of Textiles graduate programs. Of these, about twenty-five are in the Ph.D. program. Approximately 10% of the students are women and 25% are from foreign countries. Most students are from North Carolina but many other states are represented. Approximately 85% of all graduate students are supported by fellowships or research and teaching assistantships.

Graduate students in the School of Textiles are both eligible and encouraged to join the Textile Association of Graduate Students (TAGS). This group functions as a voice for all graduate students in the School of Textiles in dealing with problems concerning graduate education. In addition to sponsoring various social events which are designed to acquaint faculty and graduate students as well as spouses, TAGS serves as a valuable clearinghouse of information for new students and publishes a booklet entitled "Graduate Student Information," which contains a variety of information of interest to a new graduate student.

Both North Carolina State University and the surrounding area offer a complete array of cultural and educational activities, seminars, lectures, conferences, theatrical and athletic events. Of particular interest for students is the University Student Center which includes two theatres, a craft center, game rooms, and various student offices and meeting rooms. The Student Center offers programs that include training in all aspects of theatre, plays produced by students, instruction in independent work and crafts, a

The Textile Association of Graduate Students sponsors various social events designed to acquaint faculty and graduate students as well as spouses.

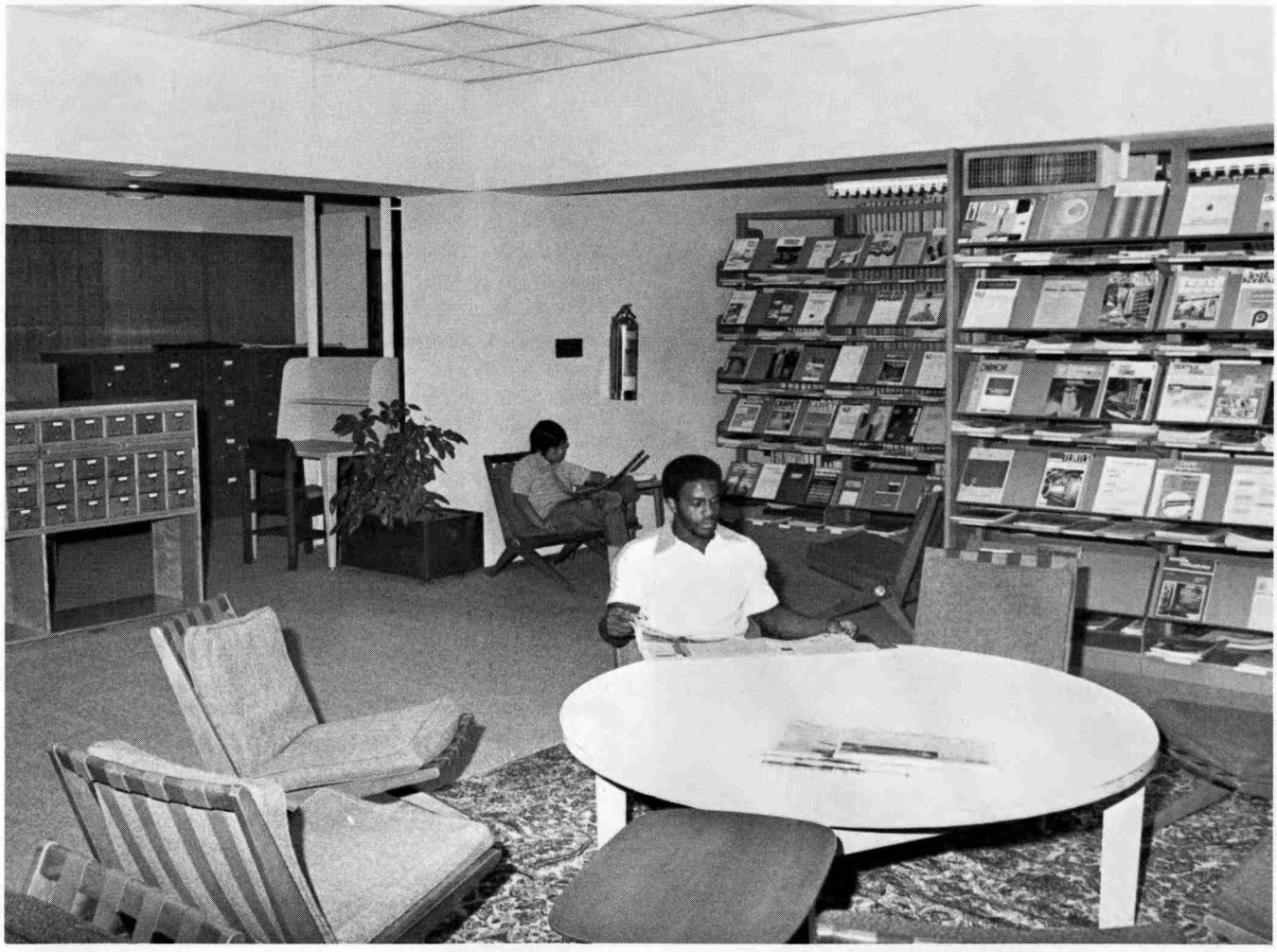
wide range of professional performances in jazz, pops, folk, and classical music, dance, and theatre. Other student committees present lectures, films, games, tournaments, cultural programs, coffee houses, gallery exhibits, and opportunities for volunteer services.

Raleigh is nearly equidistant between the Atlantic Ocean to the east and the Appalachian Mountains to the west. Both offer substantial opportunities for recreation within a driving time of two to four hours. In addition, Raleigh is served by extensive air, bus, and train facilities, allowing transportation to such metropolitan centers as New York City, Washington or Atlanta with minimum difficulty. Raleigh is the state capital of North Carolina and as such is the home of numerous governmental, financial, and cultural institutions. Raleigh's location in North Carolina's Research Triangle allows widespread opportunities for interaction with students and faculty of Duke University and the University of North Carolina at Chapel Hill, as well as with a variety of research institutions within the Research Triangle itself.

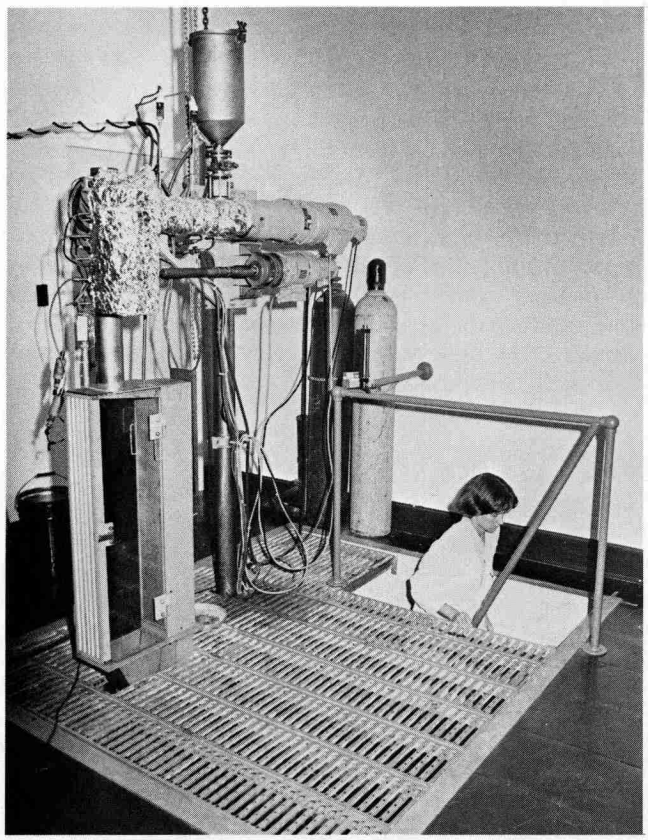
Raleigh is the state capital of North Carolina and the home of numerous governmental, financial and cultural institutions.

Research Programs

Industry, the State of North Carolina, and several agencies of the Federal Government support research in the School of Textiles at an annual level close to one million dollars. Major long-term research efforts include work aimed at reducing energy consumption in the finishing of textiles by using radiation chemistry processes in place of wet processes; increasing the energy efficiency of yarn and fabric production; identifying sources and reducing overall mill noise levels; identifying sources of cotton dust in processing, proposing ways of minimizing cotton dust exposure of textile workers, and identifying the mechanisms by which cotton dust exposure contributes to the phenomenon of byssinosis. Other research includes such varied subjects as the effect of moisture on the properties of composite materials used in space programs and the preservation of textiles of historical and cultural interest. In addition, a large number of smaller scale research programs are in progress, ranging from fundamental studies in polymer and fiber science through developmental studies of textile machinery, processes, and materials to studies of the economic structure of the textile industry and its customers.



The Burlington Textile Library has one of the most extensive collections of textile and related literature in the country.



Approximately 85% of all graduate students are supported by fellowships or research and teaching assistantships.

Teaching and research facilities are valued at over ten million dollars.

Graduate Faculty

Subhash K. Batra, *Associate Professor of Textile Materials and Management*

Gordon A. Berkstresser, III, *Associate Professor of Textile Materials and Management*

David R. Buchanan, *Professor and Head of Textile Materials and Management*

David M. Cates, *Professor of Textile Chemistry*

David W. Chaney, *Dean, School of Textiles*

John A. Cuculo, *Professor of Textile Chemistry*

R. Alan Donaldson, *Assistant Professor of Textile Materials and Management and Design*

Carl L. Dyer, *Associate Professor of Textile Materials and Management*

Aly H. M. El-Shiekh, *Professor of Textile Materials and Management*

Paul D. Emerson, *Professor and Head of Textile Machine Design and Development*

Raymond E. Fornes, *Professor of Textile Materials and Management*

T. Waller George, *Professor of Textile Materials and Management*

Richard D. Gilbert, *Professor of Textile Chemistry*

Perry L. Grady, *Associate Professor of Textile Materials and Management*

Thomas H. Guion, *Associate Professor of Textile Chemistry*

Bhupender S. Gupta, *Professor of Textile Materials and Management*

Dame S. Hamby, *Burlington Professor and Associate Dean of Textiles Extension and Continuing Education*

Solomon P. Hersh, *Charles A. Cannon Professor of Textile Materials and Management*

Charles D. Livengood, *Associate Professor of Textile Chemistry*

Peter R. Lord, *Abel C. Lineberger Professor of Textile Materials and Management*

Ralph McGregor, *Cone Mills Professor of Textile Chemistry*

Gary N. Mock, *Assistant Professor of Textile Chemistry*

Mansour H. Mohamed, *Professor of Textile Materials and Management*

Mendel L. Robinson, *Associate Professor of Textile Materials and Management*

Morton R. Shaw, *Assistant Dean for Textile Research*

William C. Stuckey, Jr., *Associate Professor of Textile Materials and Management*

Michael H. Theil, *Associate Professor of Textile Chemistry*

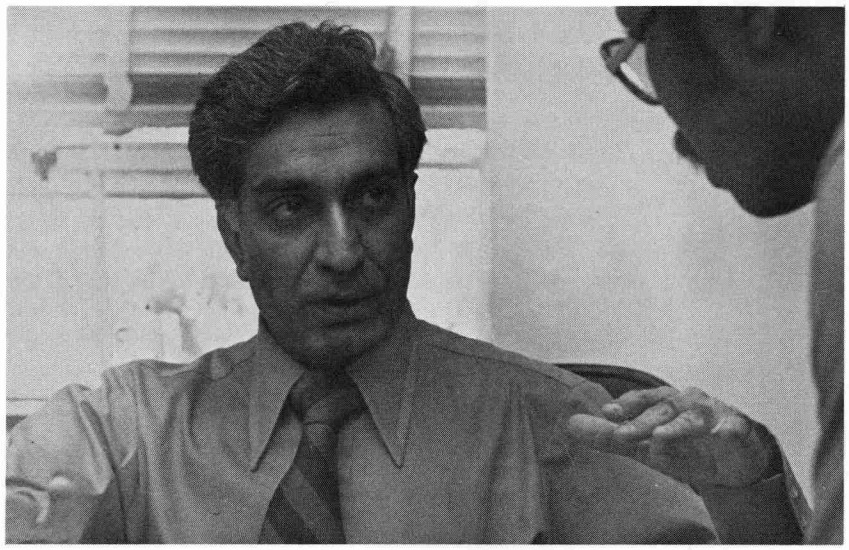
Charles Tomasino, *Associate Professor of Textile Chemistry*

Paul A. Tucker, *Associate Professor of Textile Materials and Management*

William K. Walsh, *Professor of Textile Chemistry*

Wilson M. Whaley, *Professor and Head of Textile Chemistry*

Faculty Research Interests



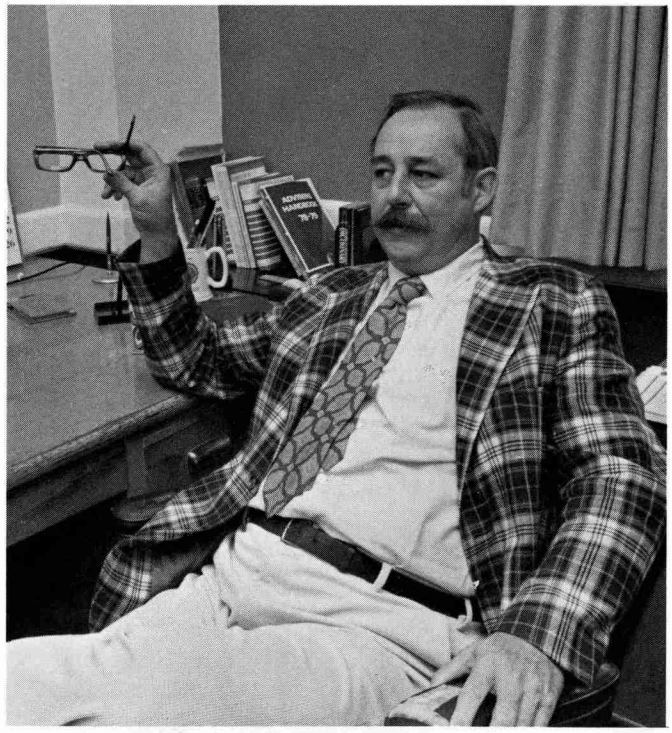
Subhash K. Batra

Associate Professor of Textile Materials and Management

B.S. (Textile Technology) 1957, Delhi University, India
S.M. (Textile Technology/Mechanical Engineering) 1961, Massachusetts Institute of Technology
Ph.D. (Mechanics) 1966, Renssalaer Polytechnic Institute
S.M. (Management) 1977, Massachusetts Institute of Technology

In general my research interests include (1) gaining a better understanding of the mechanical behavior of fiber-forming polymers, (2) mechanical analysis and interpretation of the behavior of textile structures such as yarns and fabrics, and (3) the mechanical aspects of machine-material interactions during fiber processing. In the same vein, I am also interested in developing a better understanding of the business and technological structure of the textile industry, globally and in the U.S.A.

My current research activities are focused on the problems of measurement and control of dust generated during the processing of cotton.



Gordon A. Berkstresser, III

Associate Professor of Textile Materials and Management

B.S. (Textiles) 1954, North Carolina State University
M.B.A. (Human Resources Management) 1970, Baruch College
Ph.D. (Business) 1978, City University of New York

Current research centers on the behavior of people in industrial and/or product oriented settings. In general, the research is concerned with the behavior of people as individuals and in small groups and their interactions within industrial organizations and with the products of industry.

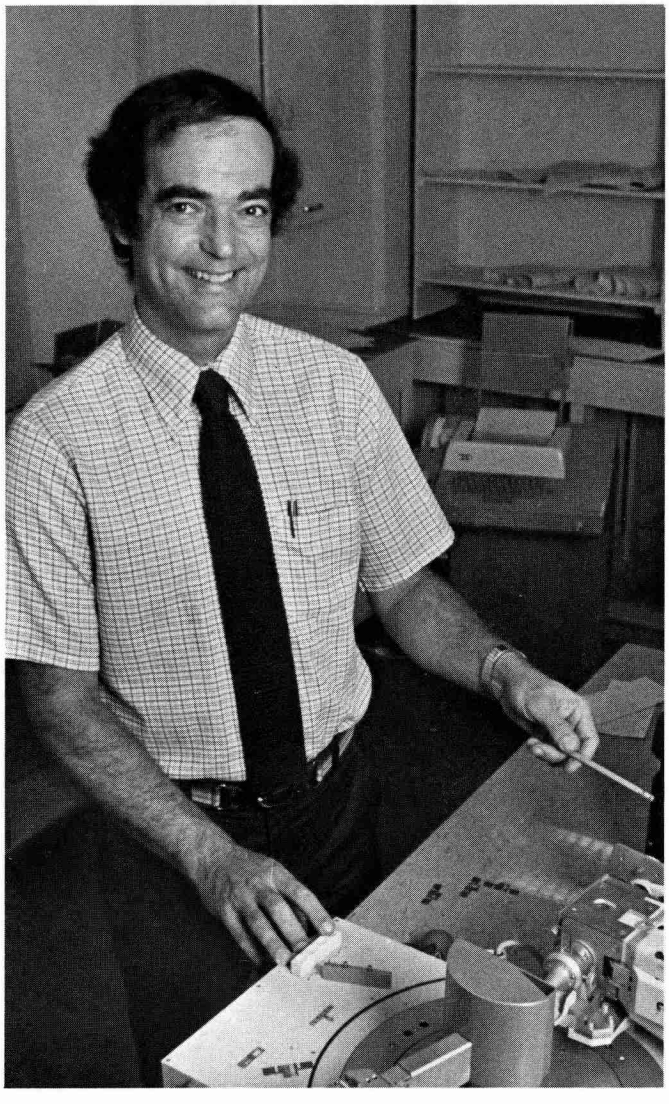
Specific areas of current research projects include the following:

1. Interactive effects of opinion leadership in the dissemination of products. The effects of such behavior on peers within the reference group and the interaction with people in other reference groups over measured periods of time are compared to behavior of people not being influenced by opinion leaders.

2. Family consumption behavior—joint decision-making of husband/wife dyads in the purchase of household textile products for family use. Uses a select group of behavioral variables (roles, norms, power, conflict, and perceived risk) to determine the effects of marketing efforts on the search, identification, decision-making, and purchasing behavior of families.

3. Employee assistance programs in industrial organizations. This research studies the effectiveness of programs designed to help people in industrial organizations solve personal problems which interfere with their productivity. The effects of the organizational climate upon the behavior of employees and interactions between individual and groups are central to this research.

Research projects in the planning stage focus on product development and the management of technological change within industrial organizations.



David R. Buchanan

Professor of Textile Materials and Management

B.S. (Chemistry) 1956, Capital University
Ph.D. (Physical Chemistry) 1962, The Ohio State University

My research interests are centered about the structure and physical properties of textile materials and the role that these play in the application of textiles to various products. Specific research interests include:

1) Studies of crystalline microstructure and the arrangement of microstructural elements in textile fibers by the use of wide- and small-angle X-ray diffraction.

2) Analysis of non-crystalline fiber structure through studies of the glass transition temperature and its dependence on polymer type, crystalline microstructure, molecular orientation, moisture, and solvents.

3) Analysis of structure from studies of the temperature dependence of shrinkage forces in fibers, yarns, and fabrics.

4) Physics of combustion in multicomponent textile structures, such as polyester-cotton blends, with particular emphasis on the nature of interactions between components in the several stages of combustion.

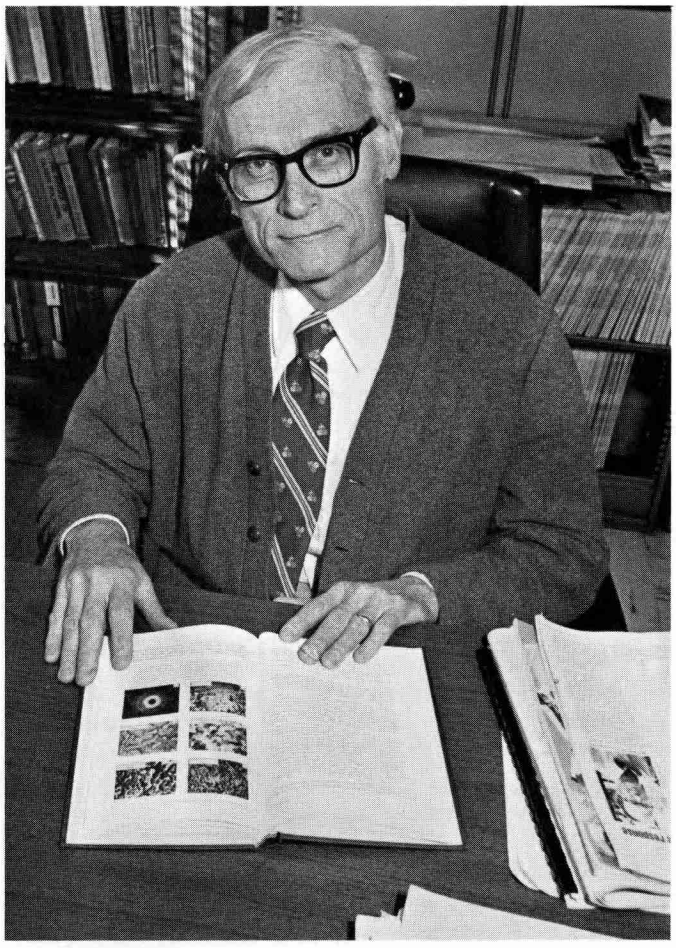
5) The application of textile products to energy conservation in buildings, particularly at windows. This includes evaluation of both standard and novel window treatments for energy conservation characteristics and separation of conduction, convection, and radiation-based heat transfer mechanisms in complex window systems.

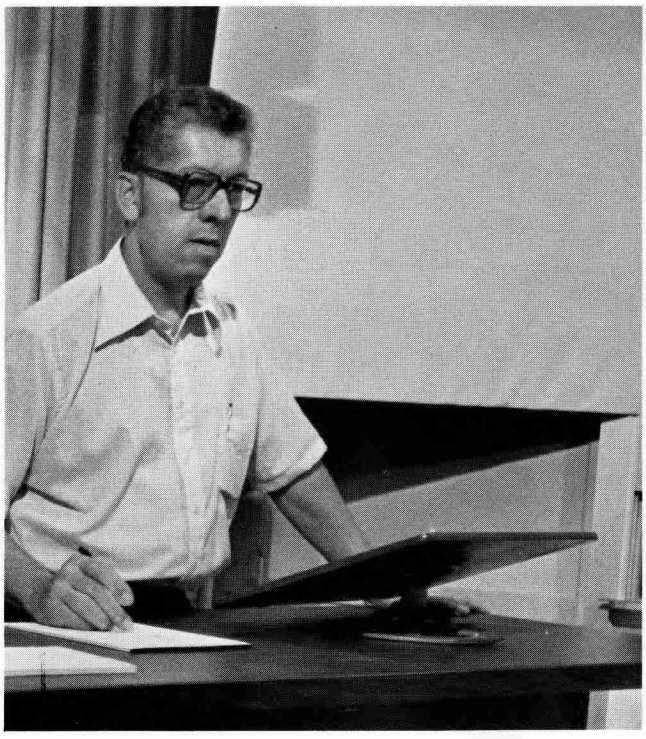
David M. Cates

Professor of Textile Chemistry

B.S. (Textile Chemistry) 1949, North Carolina State University
M.S. (Textile Chemistry) 1951, North Carolina State University
Ph.D. (Physical Chemistry) 1955, Princeton University

Fibers and thermoplastic polymers, in general, undergo structural reorganization upon thermal, plasma, and solvent treatment, as shown by chromatography, microscopy, thermal analysis, and density and infrared measurements. Sorption and mass transport behavior can be manipulated by controlling the conditions of treatment making it possible to tailor membranes, sorption substrates, etc., to fit particular applications in separation and recovery technology. Research interests include sorption, chromatography and substrate structure, thermal analysis, bleaching mechanisms, and fiber science.





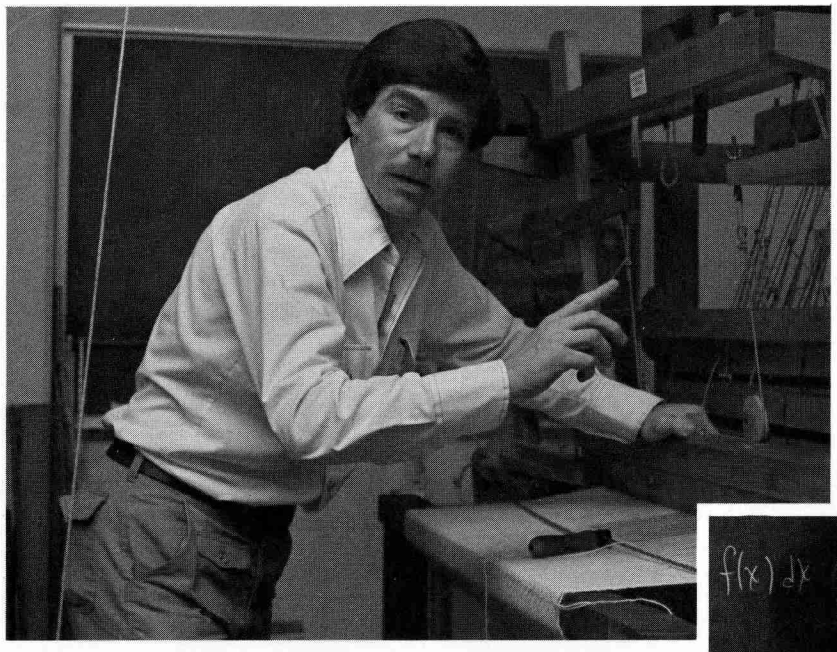
John A. Cuculo

Professor of Textile Chemistry

Sc.B. (Chemistry) 1946, Brown University
Ph.D. (Organic Chemistry) 1950, Duke University

Fiber and Polymer Science represents my general research interest. One specific area involves stress-induced cyrstallization of polymers, with special emphasis on polyesters and polyethylene. We are attempting to develop a melt extrusion procedure that will permit the formation of ultra-oriented fibers from conventional polymers with properties that surpass those of conventionally-processed fibers and which more closely approach the maximal theoretical values of modulus and tensile strength. Simultaneous effort is directed toward broadening the ongoing characterization of the fibrous structures produced, seeking evidence to verify or disprove the existence of the controversial extended chain "continuous crystal" structure so often alluded to in the description of high performance fibers.

The second specific area of interest lies in cellulose research. The interest arose with the discovery of two new reactions of cellulose, one with amic acids and one with anhydride/ammonia, both from aqueous media. The product is a cellulose half-acid ester. Our research in this area led to considerations of solubility of cellulose and cellulose derivatives in "simple" solvents. Currently, our research effort is spent approximately equally in cellulose derivatives and cellulose solubility problems. My group of students and I are planning some interesting experiments in attempts to order cellulose molecules in the "extended-chain" configuration, seeking as in the case of polyesters and polyethylene a morphology rich in the "extended-chain" configuration.



R. Alan Donaldson, M.S.I.A.D.

Assistant Professor of Textile Materials and Management and Design

Honors Associateship (Textile Design) 1966, Scottish College of Textiles

We believe that Design, in its true problem-solving role, acts as an essential catalyst in the evolution of any new product, from the more rarified developmental stages through the practical production and sales process. Investigations may consist of applying new materials to existing processes, such as in the development of new fibrous assemblies for yarns or nonwoven materials, or in taking a more innovative approach to the current use of conventional machinery in the development of new fabrics.

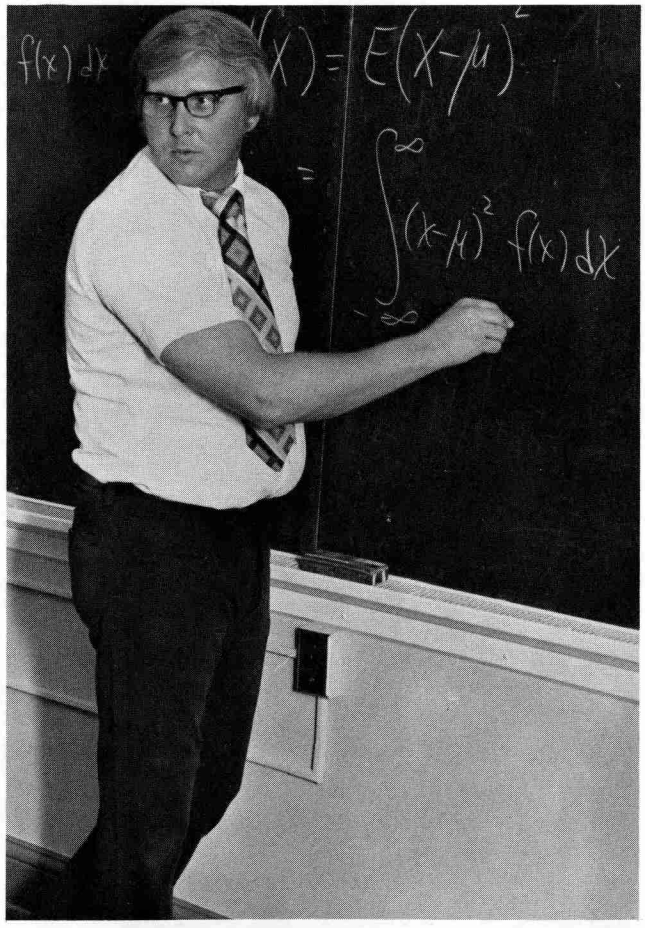
Current studies include the investigation, design and production of leno fabrics, using a combination of new and conventional materials and techniques;

The development and use of new, ultra-fine denier olefin fibers for the production of moisture-wicking "comfort-care" upholstery fabrics exhibiting a high standard of aesthetics within the demands of mass-production;

The development of new types of needle-punched fibrous assemblies designed to provide thermal and sound insulation in the home and office as an alternative to wall paneling and associated wall coverings;

The development of multi-component yarns exhibiting localized areas of high-shrinkage as a unique textural design feature for upholstery and related domestic fabrics.

An impending investigation will deal with the use of computer technology in the prediction and generation of simulated woven fabric colorways and associated modifications due to yarn and fabric structure.



Carl L. Dyer

Associate Professor of Textile Materials and Management

B.S. (Mathematics, Business) 1964, University of Illinois
M.E.S. (Statistics) 1968, North Carolina State University
Ph.D. (Economics and Statistics) 1972, North Carolina State University

My research interests are primarily concerned with analysis, policy and decision-making in the areas of textile economics, management and markets. Currently, policy research issues focus on the impact upon the U. S. textile

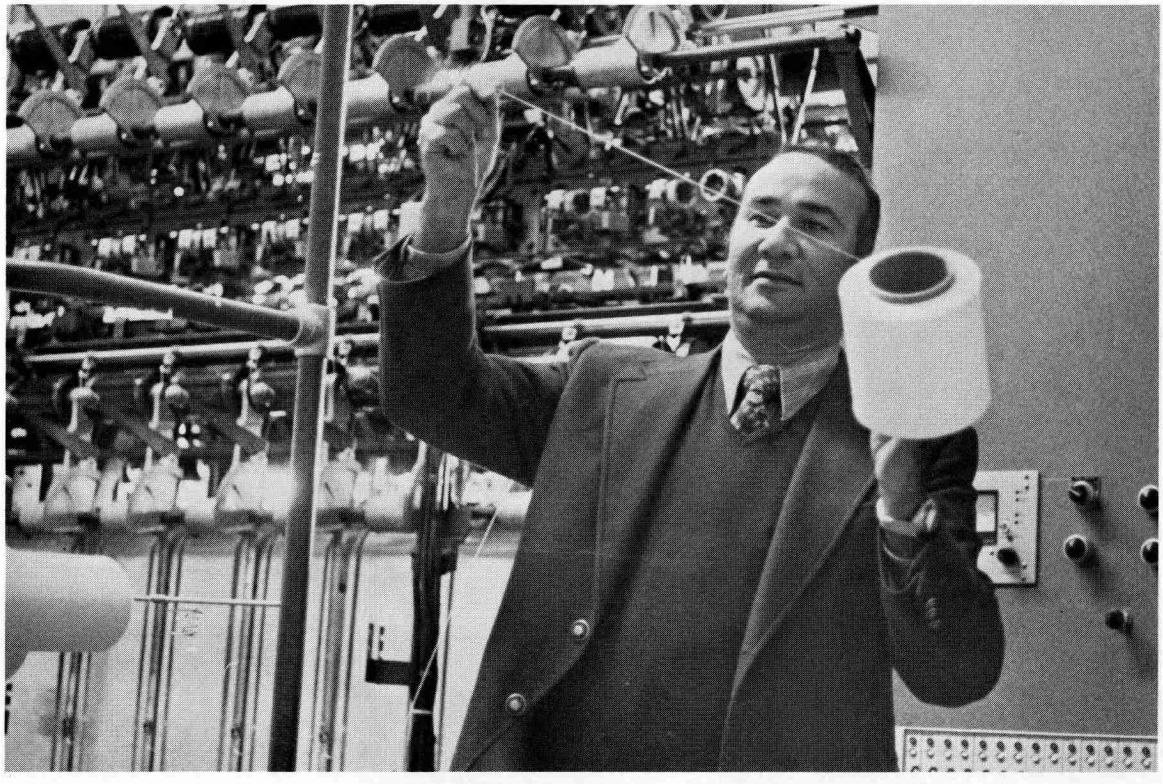
industry and economy of foreign trade in textiles, productivity, and government regulations—especially regulations enacted by O.S.H.A., E.P.A. and the Consumer Product Safety Commission.

My specific research projects in regulation are directed toward the economic, financial and employment impacts of cotton dust, noise level, environmental and consumer safety regulation on the primary textile industry, associated industries and the economy of the U.S.

Our studies in foreign trade are concerned with investigating the scope, dimensions, and causes for the unfavorable trade balance and with estimating import and export demand functions so as to be able to better quantify causal relationships and the effects of changes in important variables in these trade models with respect to both direction and magnitude.

A related study is concerned with estimation of consumer expenditure functions for apparel for several nations. We also have a project to estimate demand and consumer response functions for selected apparel products in the U.S. Additionally, work on econometric models of the U.S. textile and apparel industries is underway.

Most of my research involves statistical estimation or operations research, and I am interested in these techniques as well as quality control, production/operations management and related topics.



Aly El-Shiekh

Professor of Textile Materials and Management

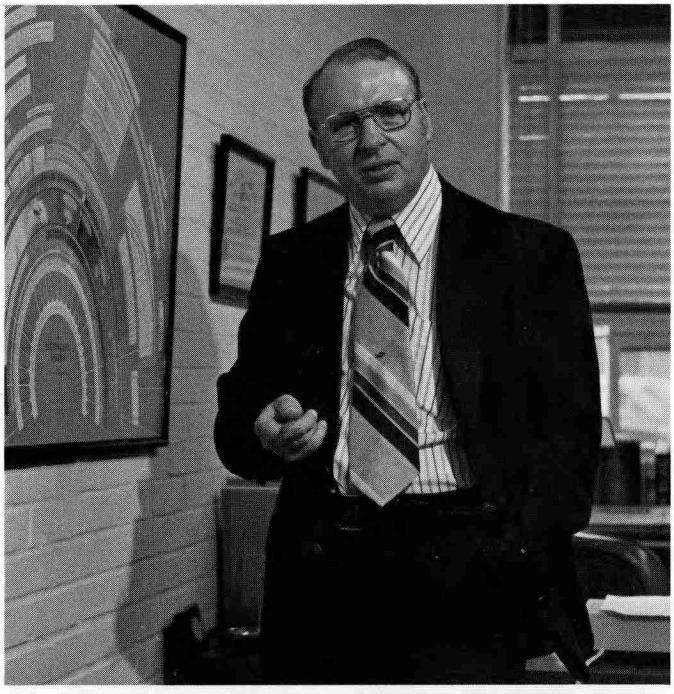
B.Sc. (Mechanical Engineering) 1956, Alexandria University, Egypt
M.S. (Textile Technology) 1961, Massachusetts Institute of Technology
M.E. (Mechanical Engineering) 1964, Massachusetts Institute of Technology
Sc.D. (Mechanical Engineering) 1965, Massachusetts Institute of Technology

The research of our group is centered in the areas related to yarn manufacturing and the mechanics of textile structures. We are interested in the following areas:

1. Machine fiber interactions.
2. Dynamics of spinning systems.
3. Evaluation of textile structures, both theoretically and experimentally.
4. Energy conservation in yarn manufacturing and texturing.

Studies currently in progress include the following:

1. High speed mercerization of cotton fibers, to evaluate the most effective technique for mercerizing and spinning cotton fibers.
2. Mechanics of blended yarns, to theoretically predict the tensile behavior of these yarns and to experimentally verify the theories obtained.
3. Energy conservation in yarn systems; analysis leading to the evaluation of these systems in terms of their energy consumption. It is hoped that through machine modification and changes in machine settings substantial saving can be accomplished.



Paul D. Emerson

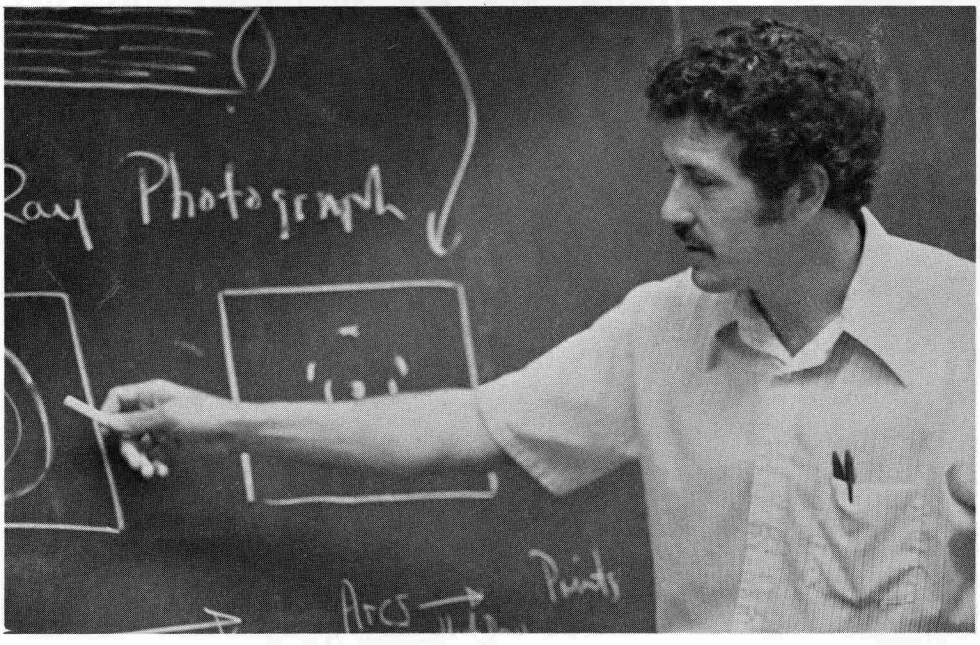
Professor and Head, Machine Design and Development

B.S. (Mechanical Engineering) 1940, Purdue University

Research interest centers on control of noise from textile machinery. Peripheral interests include environmental concerns, safety and health, and energy conservation.

Noise has potential adverse effects on the hearing of nearly a million exposed textile workers. Research studies conducted jointly with the Center for Acoustical Studies have led to development of effective techniques for quieting the majority of spinning rooms to acceptable levels. Much of the research is concerned with sources of noise and vibration from various machine parts and development of retrofits, enclosures and redesigns for quieter operation. Additional studies on the economic impact of enforcing noise standards in the textile industry are in progress.

Future research will be conducted based on earlier findings in computer-assisted analyses of finite elements in moving machine parts. Application of the new technique is expected to lead to optimization of noise reduction through redesign of machine components.



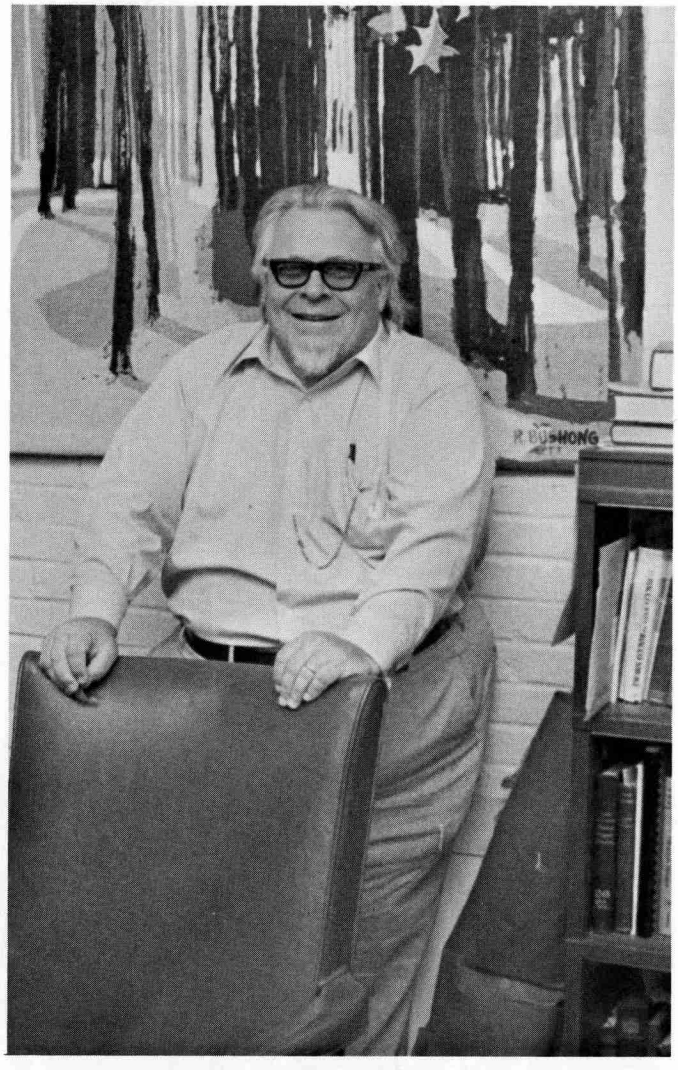
R. E. Fornes

Professor of Textile Materials and Management

B.A. (Mathematics) 1965, East Carolina University
Ph.D. (Physics) 1970, North Carolina State University

My major research interests are in the field of fiber and polymer physics. I am involved in the study of the structure and properties of fiber forming polymers, using X-ray, NMR, IR, light microscopy and electron microscopy. I am also interested in the mechanical analysis of textile assemblies, the effects of radiation on fibrous materials, and the physical and chemical characterization of cotton dusts. Current studies in progress include the following:

1. A study of the interfacial interaction of incompatible polymer blends (e.g., nylon 66 and polyethylene glycol) to determine the nature of crystallization growth at the interface.
2. The study of water bonding in epoxy/graphite fiber composites using broadline NMR and IR spectroscopy.
3. The study of the effects of gamma and electron radiation under vacuum on the mechanical properties of epoxy/-graphite fiber composites. These materials are candidates for applications in space.
4. The characterization of particle size distribution of cotton dust using scanning electron microscopy.
5. Cotton plant parts are extracted and compounds are separated and purified using chromatographic techniques. Identification is made using NMR, IR, and mass spectroscopy.



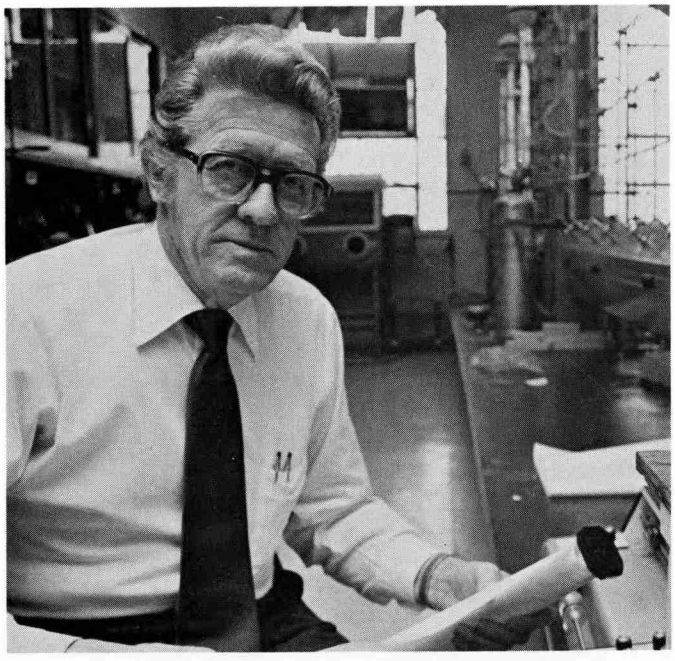
T. Waller George

Professor of Textile Materials and Management

A.B. (Physics and Mathematics) 1941, Kansas City University (U. of Missouri at Kansas City)
M.A. (Physics) 1943, University of Illinois

Work during the past five years on the physics of fiber and fibril formation has revealed the role of molecular environment (solvent) in permitting wide classes of linear fiber forming polymers to develop colinear order along the backbone. Principal efforts in the past have and continue to concentrate on contrasting effects between solutions of linear polyethylene and polyethylene terephthalate. The solidification of larger elements of polymeric materials from thermodynamically preferable configurations, such as colinear alignment, has been shown to exhibit a wide variety of morphologically different entities, as well as being significant in the development of high fiber tensile modulus. Tactoidal fibrillar structures receive current interest with emphasis on their conversion into fully ordered fibrous crystals. In the case of polyethylene, such crystals have been shown to consist of linear arrays of alternating sequences of partially oriented but otherwise glass-like regions with highly crystalline structures which have axial ratios of about 8 to 1 (length to diameter). The crystalline lattices of the more highly ordered segments have an expanded crystal structure (defect character) which probably arises from the restrictions on crystal growth imposed by the entangled regions which ultimately appear as aligned but otherwise amorphous zones. The concatenated structural sequence is nucleated on a relatively long, thin core structure which is most probably a thin fibril comprising a small number of relatively extended molecules. This associated state is not only stable at temperatures of fibrous crystal growth, but appears to have thermal stability well beyond normal (polymeric) crystal melting temperatures. The processes of the formation of these ultimate fibrils and their visualization is a continuing subject of high challenge. Initial work suggests the lateral dimension of these ultimate fibrils is not easily measured, being less than the resolving power of good electron microscopes (less than 40 Å). The ongoing work seeks to extend earlier results to new fiber forming systems, particularly those involving biopolymers such as cellulose and amalose.

In the technology of durable nonwoven fabric formation, particular interest is centered in processes of fiber-to-fiber bonding which are brought about through the use of solvents. When two closely contacting fibers in the nonwoven structure are appropriately treated near their mutual interface with certain regularizing-plasticizing solvents, it is conceptually possible to introduce local bonding regions between the fibers. If the solvents are extracted, one starts and finishes with the same amount of material, leaving the solvent for reuse. If, in the bond so generated, one can induce crystallization, substantially strong bonds can be achieved which, in principle, should be of great significance in determining final tensile and flexural properties of the fabric. Such bonds within a nonwoven can be treated as heterophase elements within a matrix of unbonded fiber using reasonable extensions of composite materials theory. Current interests in this technological area rely upon the application of research interests outlined above.



Richard D. Gilbert

Professor of Textile Chemistry

B.S. (Chemistry and Physics) 1942, University of Manitoba
M.S. (Organic and Physical Chemistry) 1950, University of Manitoba
Ph.D. (Organic and Inorganic Chemistry) 1950, University of Notre Dame

My graduate students and I have three main research interests: Synthesis of block copolymers, NMR and ESR spectroscopic techniques as applied to macromolecules, and application of analytical techniques including high performance liquid chromatography and spectroscopic techniques for the separation and identification of reaction products of high polymers and of components of natural products. Examples of these include: Synthesis and characterization of block copolymers containing cellulose and amylose oligomeric blocks (biodegradable polymers), synthesis and characterization of ethylene/propylene block copolymers (elastomeric fibers), sequence distribution in acrylonitrile/vinyl pyridine copolymers using ^{13}C NMR spectroscopy, ^{13}C NMR investigations of the mesomorphic state of aromatic polyamides, use of spin labels to study dye diffusion (ESR spectroscopy), separation and identification of biologically active components in cotton dust using HPLC, NMR and GC/MS spectroscopy.

Perry L. Grady

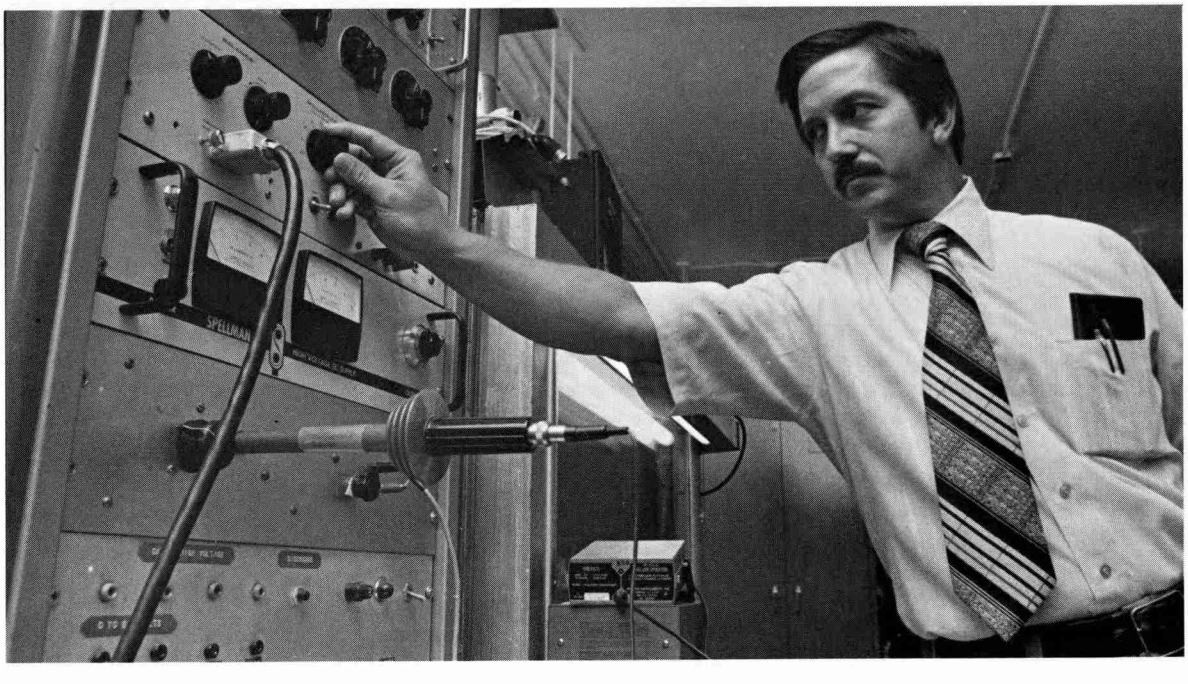
Associate Professor of Textile Materials and Management

B.S. (Electrical Engineering) 1962, North Carolina State University
M.S. (Electrical Engineering) 1967, North Carolina State University
Ph.D. (Fiber and Polymer Science) 1973, North Carolina State University

My research activities are diverse with a general emphasis on the development and use of instrumentation to study the properties of the textile materials and solve problems in textile processes. General areas of interest are instrument design and development, physical properties of textile materials, electrostatic and charge-transport properties of fibers, open-end spinning, computer applications in textiles, and energy conservation in the textile industry.

Studies currently in progress include the following:

1. Development of instrumentation to measure the thermal insulation properties of fabrics and develop materials to be used in retrofitting buildings to conserve energy.



2. Studies of the thermal shrinkage properties of textured yarns by developing instrumentation to measure length changes and shrinkage forces of yarns as a function of temperature.

3. Determining the electrical resistance of a wide range of polypropylene fibers and films to facilitate understanding of their electrostatic properties.

4. The evaluation of textile materials under high-speed impact, e.g., the effect of the shape of an impinging bullet on ballistic impact properties of high modulus aramid fibers. The ultimate goal of this work is to understand and improve the performance of bullet-proof vests.

5. The use of computers in the collection and analysis of textile laboratory test data, e.g., the development of systems and algorithms for determining yarn and fabric stress-strain properties.

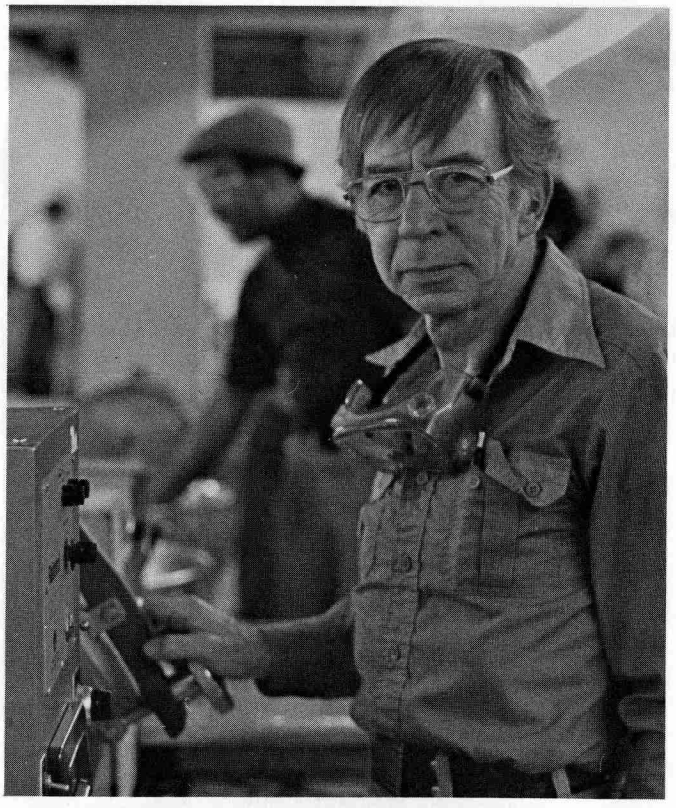
6. The measurement and control of energy used in weaving.

7. The development of a computer based model of energy consumption in the production of textile products.

Thomas H. Guion

Associate Professor of Textile Chemistry

B.S. (Chemistry) 1940, Davidson College
Ph.D. (Organic Chemistry) 1949, University of North Carolina at Chapel Hill

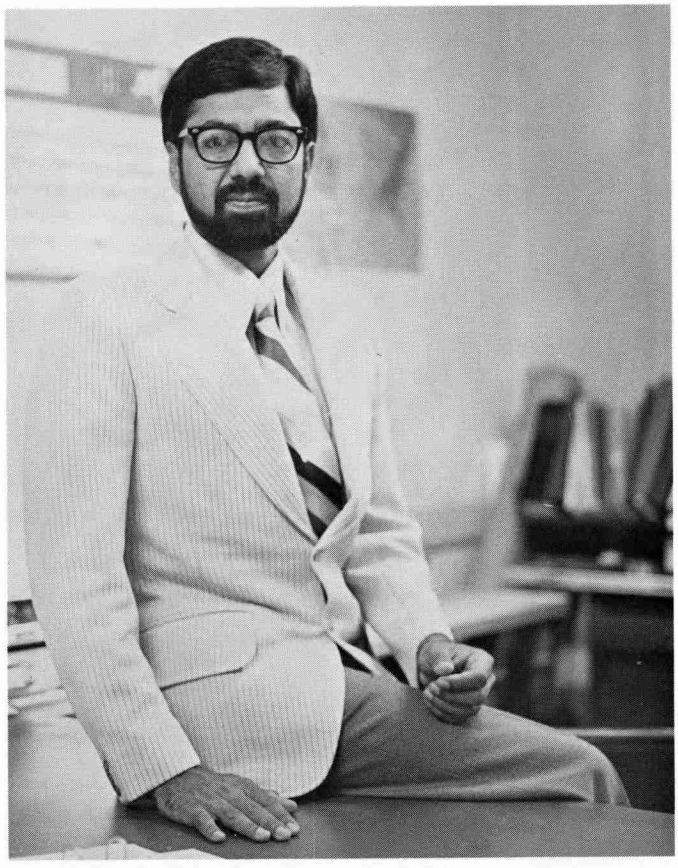


A. Sorption and diffusion of dyes into fibers and films

The process of coloration of fibers and films is generally considered to take place in 3 stages; a) transport of colorant molecules through a liquid to a fiber-liquid interface; b) sorption onto the fiber surface and c) diffusional mass transfer into the bulk of the fiber or film. The third stage of diffusion, being the slowest, is the rate-determining step, and of the greatest technological interest. Mathematical models describing the interplay of the variables controlling this process are dealt with by modern computational techniques to obtain the constants characterizing the systems.

B. Measurement of the color and appearance of textiles and its relation to fabric geometry.

The visual appearance of polymeric products, such as fibers, paint films, paper and molded plastics, is the resultant of light partly absorbed and partly scattered by diffraction. Selection of dyes and pigments to color these polymeric materials uses data only for the absorption behavior of selected colorants. The light-scattering properties of the object which permit it to be seen as opaque or translucent rather than transparent, and which are governed by the geometric construction of the material, are either ignored or allowed for by introducing empirical "correction factors." To place the technology of "instrumental match prediction" on a sound theoretical basis and to make it more widely applicable to a variety of objects differing in surface texture, the light-scattering and the absorption coefficients, both of which govern reflectance, need to be measured independently as a function of geometric construction. Thereby, the contribution of each to overall appearance could be predicted and controlled.



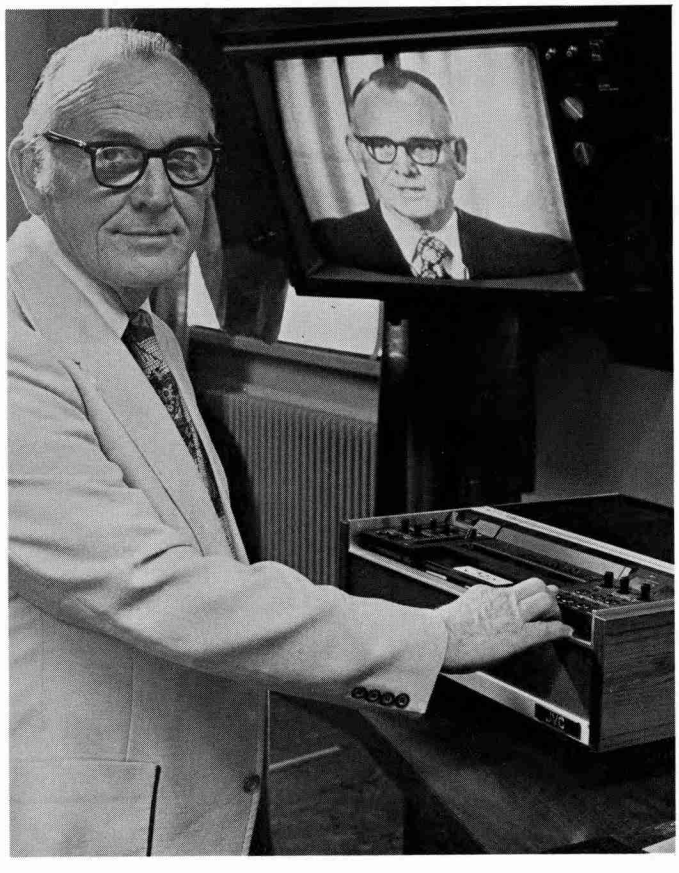
B. S. (Bob) Gupta

Professor of Textile Materials and Management

B.S. (Textile Technology) 1958, University of Punjab, India
Ph.D. (Textile Physics) 1963, University of Manchester, England

Current research interests lie broadly in fiber and textile science with emphasis on physical properties, mechanics, modification, and biomedical applications. Emphasis of earlier research has been in structural mechanics of twisted assemblies, and self crimping fibers. Brief details of some of the present areas of investigation are as follows:

1. Fabrication and physical properties of absorbent nonwovens for uses in hygiene products such as napkins and tampons.
2. Synthesis and evaluation of super absorbent cellulose fibers. Chemical and radiation initiated grafting systems are being examined for increased absorbency of rayon, cotton and pulp, and the accompanying changes in the structural and the mechanical properties.
3. Solventless urethane coating of fabrics by radiation curing. Resin coats are applied using monomer-oligomer mixtures and cured by electron beam for products with improved aesthetic and physical properties.
4. Measurement and characterization of degree of openness of fibers in staple yarn processing.
5. Mechanical analysis of knot security in surgical sutures.
6. Inter-fiber friction of human hair. This property, related directly to problems such as hair entanglements, is measured by differential sliding of hair fibers and studied as a function of surface conditions and treatment.
7. Melt instability and crystallization studies in polyolefins.

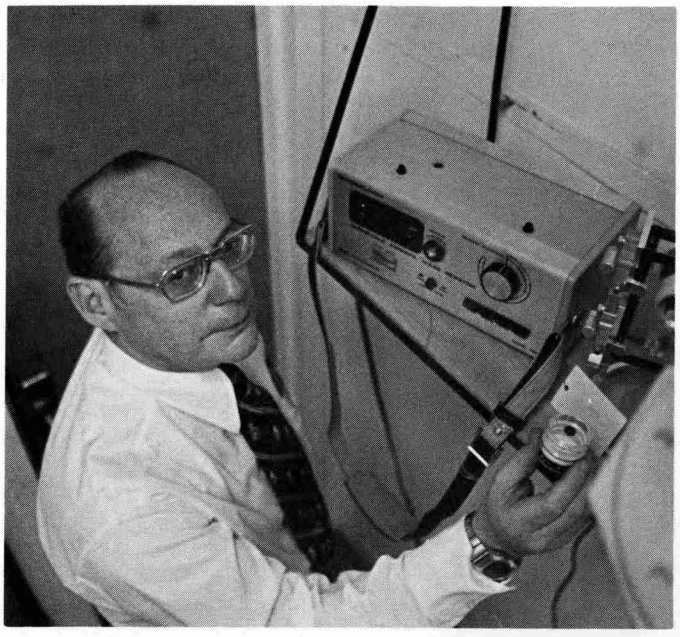


D. S. Hamby

Burlington Professor of Textiles

B.S. (Textile Engineering) 1946, Auburn University

My primary professional activities have been in the areas of in-process quality control and product performance and evaluation. The relationship of quality levels at specific steps in manufacturing as related to finished product quality is of particular interest. Also, the relationship of yarn and fabric quality as related to apparel quality and performance and evaluation of methods of measurement of quality attributes and the relation of laboratory measurements to product performance are areas of interest.



Solomon P. Hersh

Charles A. Cannon Professor of Textiles
Department of Textile Materials and Management

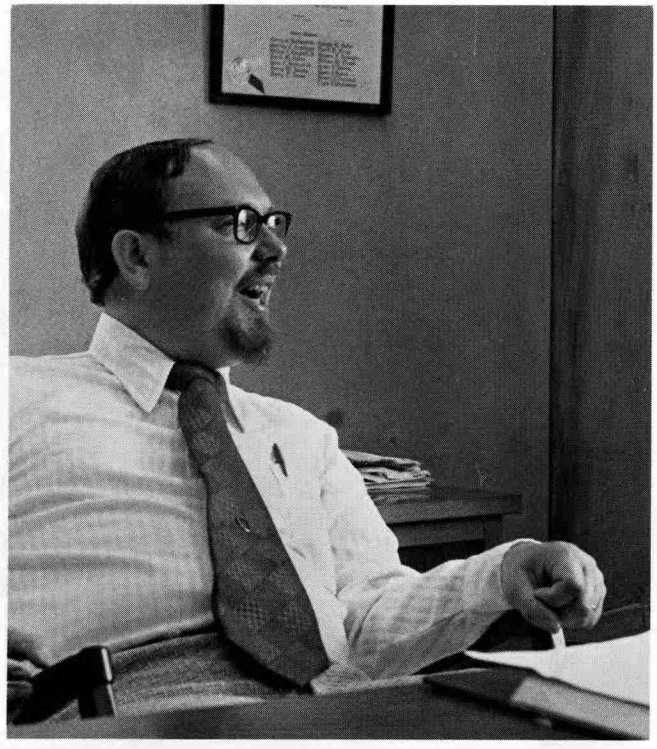
B.S. (Textile Chemistry and Dyeing) 1949, North Carolina State University
M.S. (Textile Technology) 1951, Institute of Textile Technology
M.A. (Physical Chemistry) 1953, Princeton University
PhD. (Physical Chemistry) 1954, Princeton University

Current research focuses on four major areas: (1) the characterization and control of cotton dust and their influence on associated health problems; (2) the preservation of historic and artistic textiles; (3) the electrical characteristics of fibers and fiber assemblies; and (4) the mechanical and viscoelastic properties of fibers and textile structures.

Cotton dust is of great concern to the textile industry because of its association with byssinosis, a pulmonary disability. Research underway involves the characterization of cotton dust by techniques such as scanning electron microscopy, energy dispersive spectroscopy, microprobe analysis, and light scattering. Other activities involve the development of instrumentation for dust sampling and of techniques for controlling and removing cotton dust during processing.

Studies of how archaeological as well as contemporary textile material can be preserved for future generations is another major activity. These studies are concerned with (1) understanding mechanisms of ageing, (2) developing polymer resin systems to consolidate or reinforce highly degraded textiles and (3) developing deacidification techniques to diminish the long-term auto-catalytic deterioration of stored textiles.

The electrical properties of fibers and polymers are of great importance, not only for their utility as semiconductors, photo-conductors, and resistive heating elements, but also because of safety and health problems associated with them. Current research concentrates on determining the generation and dissipation of electricity in polymers and fibers.



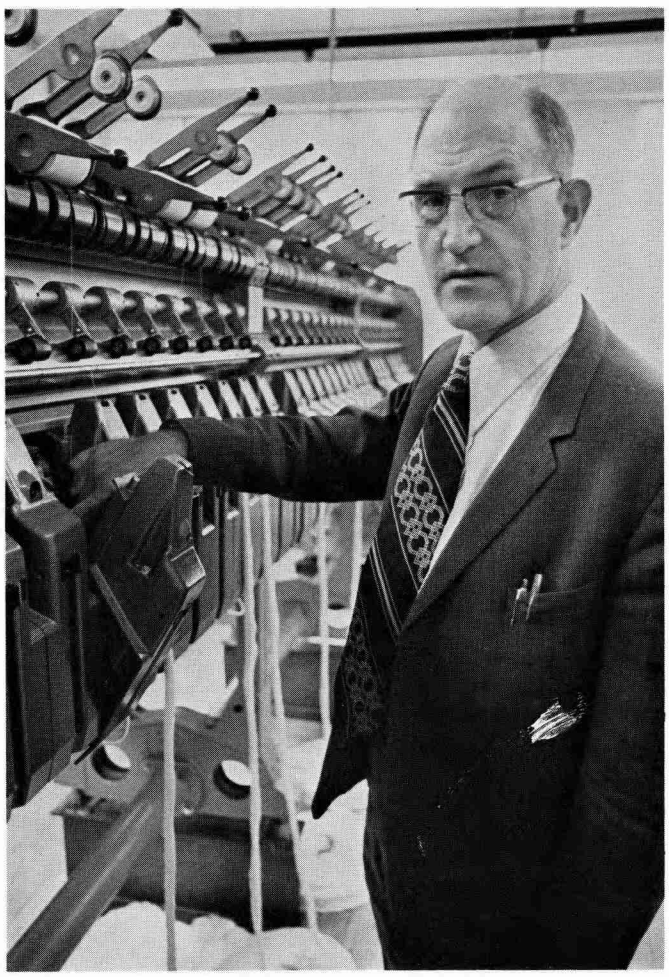
Charles D. Livengood

Associate Professor of Textile Chemistry

B.S. (Textile Chemistry) 1958, North Carolina State University
M.S. (Textile Chemistry) 1967, North Carolina State University
Ed.D. (Education) 1972, North Carolina State University

The dyeing and finishing segment of the textile industry is a major consumer of energy. Most of the processes respond positively to increased energy input; that is, the more energy utilized, the greater the output. As a result, new processes, equipment, and chemicals have been developed that yield greater production output with a corresponding increased energy requirement. Innovations largely have assumed no limitations on availability of energy. Thus, with the current costs and potential shortages, there is a strong need for research on methods to reduce consumption.

My current research interests are directed toward the development and evaluation of processes and chemicals that require less energy. Specifically, efforts are directed toward the development of energy efficient techniques for the removal of sizing chemicals from fabrics. Procedures for the recovery of such chemicals for reuse are also being developed. It is anticipated that this research will provide alternatives to the energy consuming and environment polluting systems currently being used.

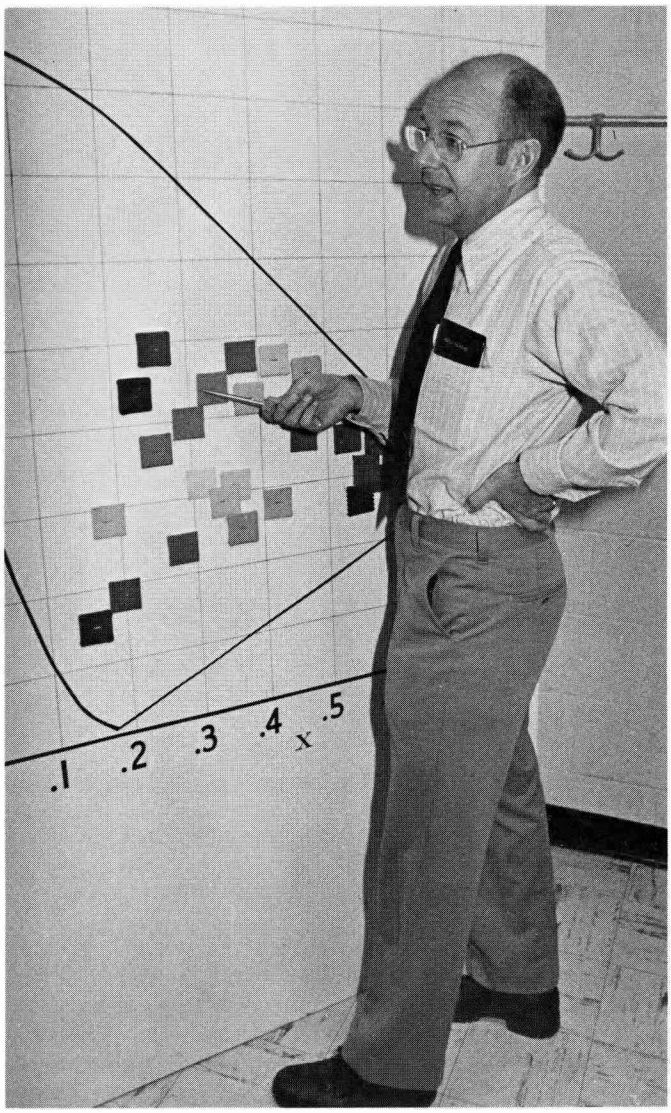


Peter R. Lord

Abel C. Lineberger Professor of Textile Materials and Management

B.Sc. (Engineering) 1950, University of London
Ph.D. (Engineering) 1966, University of London
D.Sc. (Engineering) 1976, University of London

The focus of the research carried out in this sector is on the engineering design of textile machinery and the performance of the machines. This also implies an interest in the materials produced. Recent specific interests include: 1) The mechanics of yarn formation in rotor-type open-end spinning machines, 2) the manufacture of twistless yarns, 3) the manufacture of electrostatic yarns and 4) the interaction of the process and the characteristics of the materials produced in both yarn and fabric forms.

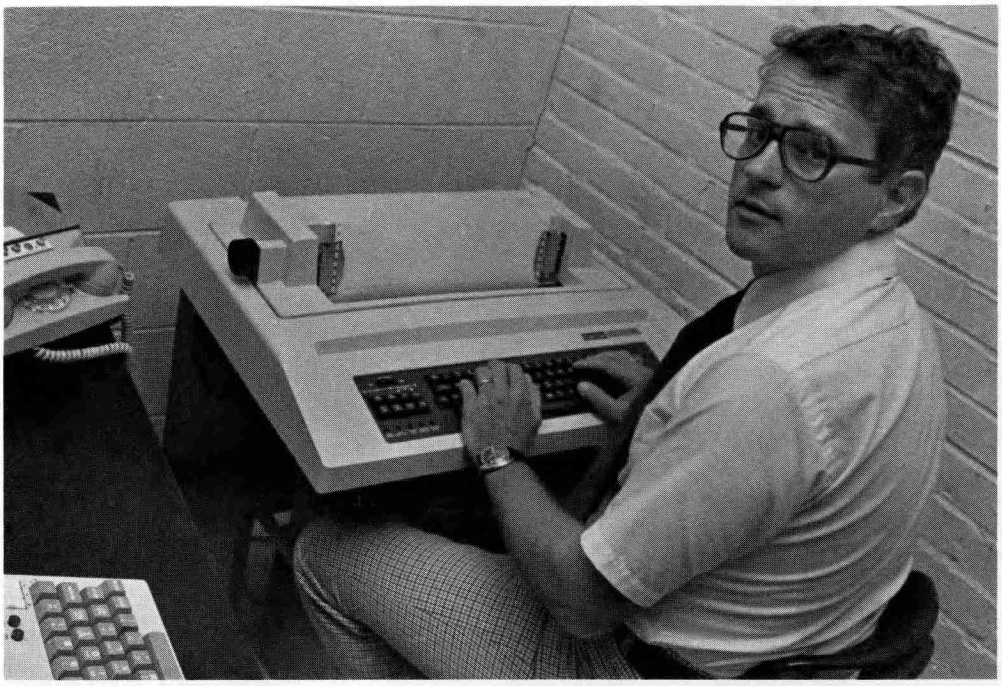


Ralph McGregor

Cone Mills Professor of Textile Chemistry

B.Sc. (1st Class Honors) (Color Chemistry) 1953, Leeds University, England
Ph.D. (Color Chemistry) 1957, Leeds University, England
D.Sc. (Color Chemistry) 1979, Leeds University, England

Major research interests include diffusion and sorption in polymer films and fibers, with particular reference to dyes; color science, color perception and appearance; computer simulation of heat and mass transfer in heat transfer printing; the application of ESR spin labeling and spin-probe techniques to problems in fiber manufacture, fiber processing and fiber end-use.

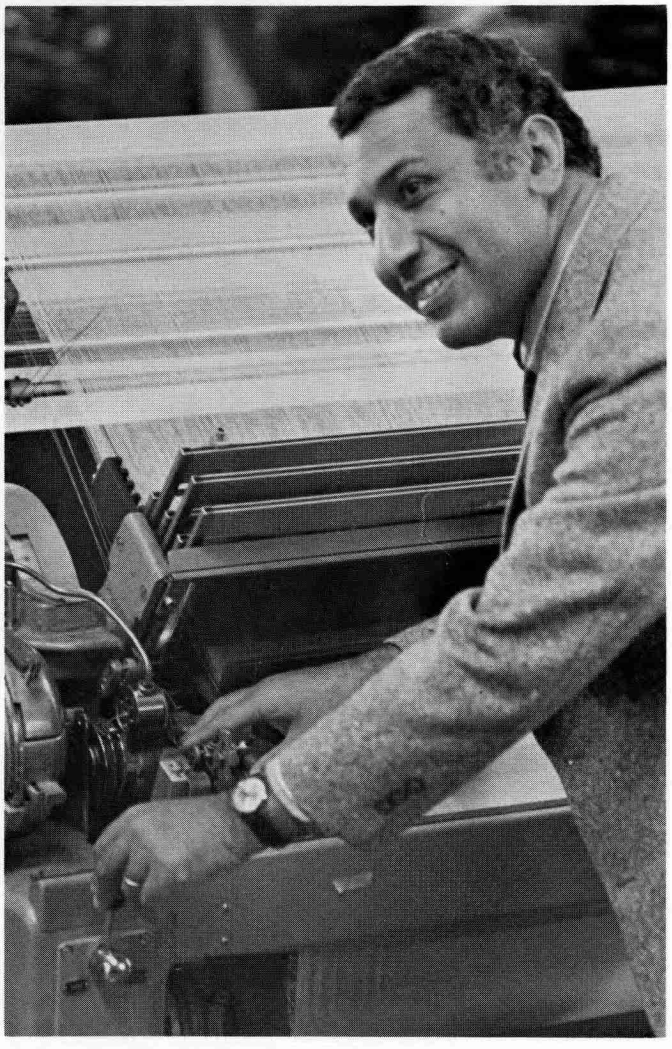


Gary N. Mock

Assistant Professor of Textile Chemistry

B.S. (Chemical Engineering) 1967, Virginia Polytechnic Institute
M.S. (Chemical Engineering) 1968, Clemson University
Ph.D. (Chemical Engineering) 1976, Clemson University

Recent advances in computer control of textile processes have been spurred by the availability of lower cost computer components. Projects underway include mathematical modeling of heat-transfer printing and direct microcomputer control and monitoring of dyeing machines.



Mansour H. Mohamed

Professor of Textile Materials and Management

B.S. (Mechanical Engineering) 1959, Alexandria University, Egypt
Diploma (Textile Technology) 1962, Manchester University, England
Ph.D. (Textile Technology) 1965, Manchester University, England

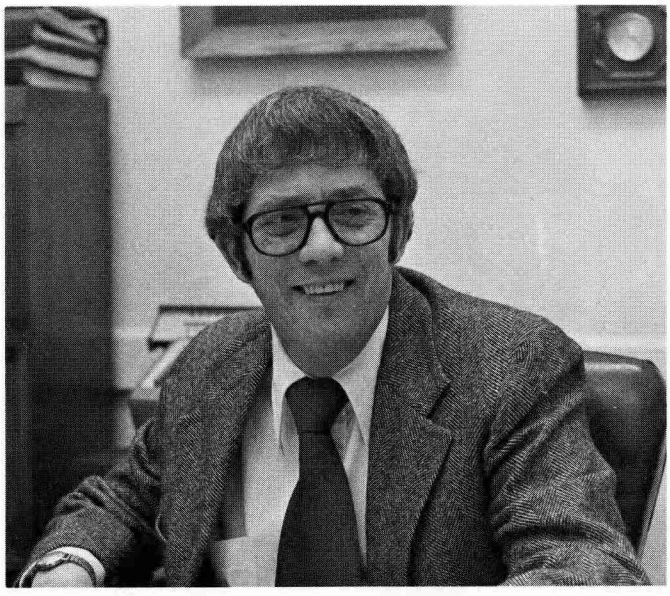
Research interests include: Dynamics of weaving machines with emphasis on the design of loom mechanisms for higher speeds and for energy conservation and the effect of these on weaving performance.

Structure and properties of textile fabrics to provide better understanding of the correlation between fabric parameters and fabric properties. This is very useful in the engineering of fabrics to meet end use requirements. This work has been extended to consider the performance of new types of yarn structures in woven and knitted fabrics.

Nonwoven fabric forming systems and the influence of process parameters and fabric parameters on the properties of the nonwoven fabrics produced.

Mendel L. Robinson, Jr.
Associate Professor of Textile Materials and Management

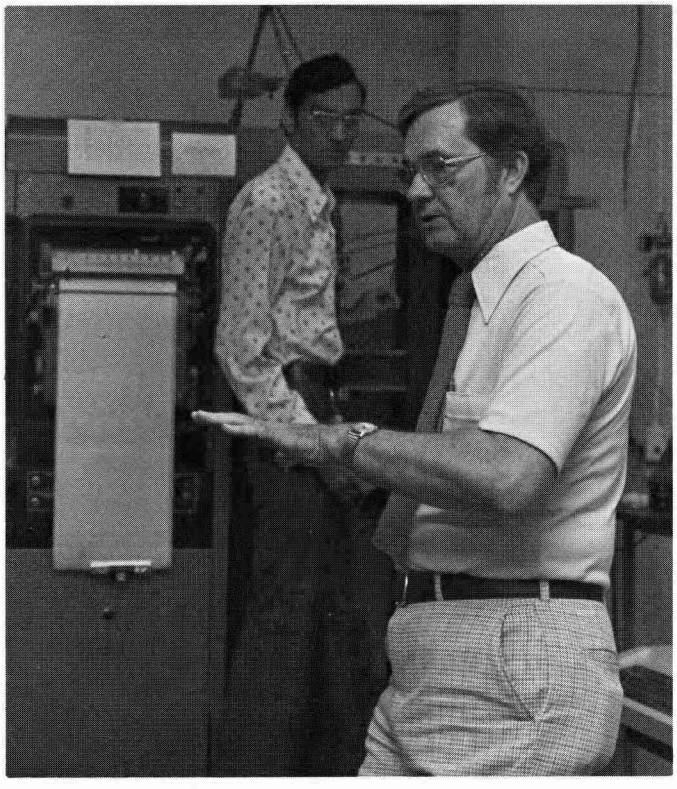
B.S. (Textile Management) 1955, North Carolina State University
M.S. (Textile Technology) 1965, North Carolina State University
Ed.D. (Occupational Education) 1970, North Carolina State University



The broadly defined textile industry is embarked upon a course of continuing change in an effort to alter its traditionally labor intensive nature to a much more capital intensive posture. Such change requires an ongoing effort to develop and most economically utilize new, more sophisticated and usually more expensive technology.

The socio-economic problems that attend the changing nature of the textile industry are primary areas of research interest. Foremost among these problem areas are the human issues involved by changes in the nature of the labor force required, the economic impact of governmental regulations, the attraction of the requisite risk capital to finance necessary changes, and the growing inequities in competition for certain segments of the world textile market.

Identification of the competencies expected of current and future management and supervisory personnel by the different and distinctly dissimilar segments of the textile industry is also a major area of research interest. Demographic studies regarding employment, remuneration, and location of the different segments of the broadly defined textile industry are also interesting areas for research. These studies are normally undertaken to identify patterns of change as they develop and to seek to identify the underlying causes for such change.



William C. Stuckey, Jr.
Associate Professor of Textile Materials and Management

B.S. (Textile Technology) 1950, North Carolina State University
M.S. (Textile Technology) 1955, North Carolina State University

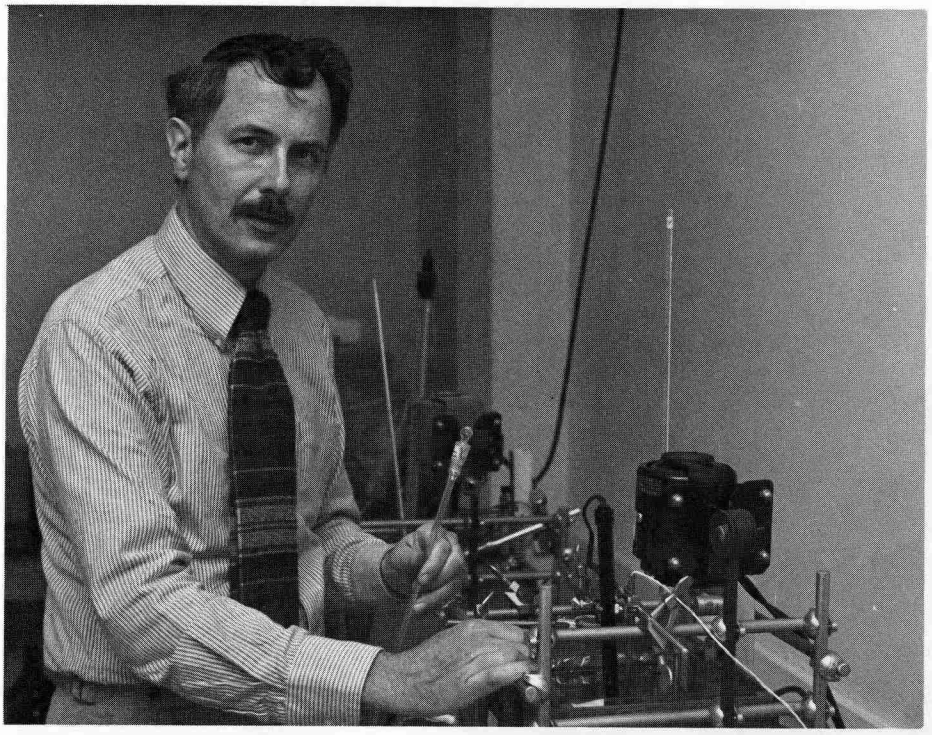
Research interests have historically been in testing and in quality control variables, especially in the variation qualities of strengths and dimensions of yarns. Considerable work has been done to classify these in ring spun yarns. Present investigations include study of yarns from newer and different spinning systems. Side effects are studies of fiber and yarn processing parameters which have influence on variation quality of these textile materials.

Other areas of current interest and work include:

1. Fiber cohesion—the investigations of fiber parameters, both physical and chemical, having influence on the "clinging" attraction of fibers and subsequently affecting the strength and texture of strands and fabrics.

2. Aesthetics of fabrics such as hand, pilling and snagging. Hand is the concept of how a fabric feels to the user. Attempts are being made to better define by instrumentation the subjective assessment of good, poor, soft, harsh, warm, cool, etc. Pilling and snagging relate to appearance or visual aesthetic appeal. Studies of mechanics of pill and snag formation lead to proper selection of materials and designs of fabrics to reduce or minimize these undesirables.

3. Instrumentation and test methodology—how to correctly measure a material parameter and what type of instrumentation is available to do so is of utmost importance. Attempts are continuously being made to improve in both areas, resulting in new methods for measuring, for example, snag resistance of fabrics and the development of a new instrumentation concept, the Bean Bag Snag Tester. This is the area of the most recent publications and papers.



Michael H. Theil

Associate Professor of Textile Chemistry

A.B. (Chemistry) 1954, Cornell University

Ph.D. (Polymer Chemistry) 1963, Polytechnic Institute of New York

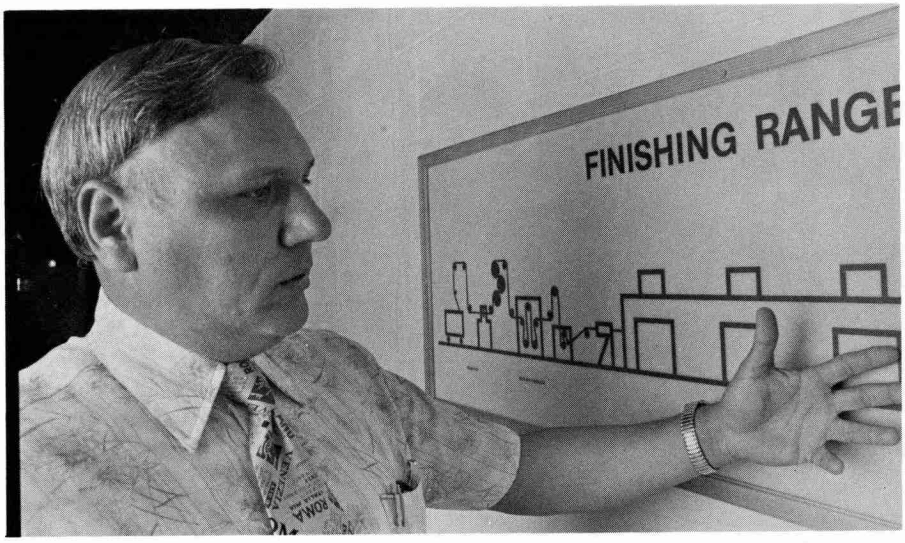
Polymers differ from lower molecular weight substances by their high molecular weight and often chain-like nature. They have properties that allow them to contribute greatly to the comfort and welfare of mankind and to be essential substances for life itself. We have the broad objective of gaining insight into how the large size and specific chemical constitution of macromolecules affect their unique properties. Accordingly we are studying polymers from several special standpoints.

Much of polymer behavior and even structural features are governed by the laws of chance. Some polymers, called copolymers, consist of more than one kind of chemical unit arranged in varying degrees of randomness. We are concerned with characterizing this randomness so that the mode and mechanism of the synthesis of copolymers may be correlated with their thermodynamic and physical properties.

If molecular regularity or symmetry allows, many polymers can display increased strength or toughness through crystallization. The crystal shapes that most polymers display differ from those of typical low molecular weight substances and often keep polymers from developing optimum properties. Modification of these crystal shapes could improve properties. We are studying fundamentals of polymer crystallization behavior in order to provide a basis for greater control over the crystallization process. Our investigations have include crystallization rate studies and the thermodynamics of the crystal-melt equilibrium.

Cellulose, synthesized by solar energy conversion in plants, is probably the world's most abundant polymer. A small fraction of this cellulose is directly usable as a fiber. Much of the rest of it can be converted to useful textile fibers, but existing processes for so doing are highly polluting and uneconomical. We are studying the fundamentals of precipitation of cellulose from solution and cellulose-solvent phase equilibria. These efforts may contribute toward the development of improved processes and fibers for utilizing cellulose in fibers.

The preparation of polymer blends is a potentially attractive way of obtaining classes of materials having continuous ranges of desirable properties. However, due to low entropy of mixing, relatively few pairs of polymers form compatible blends. We are investigating the bulk state properties of blends which may show polymer compatibility. We are studying how subtle characteristics of polymer structure affect both the ability to form compatible blends and the properties of such blends.



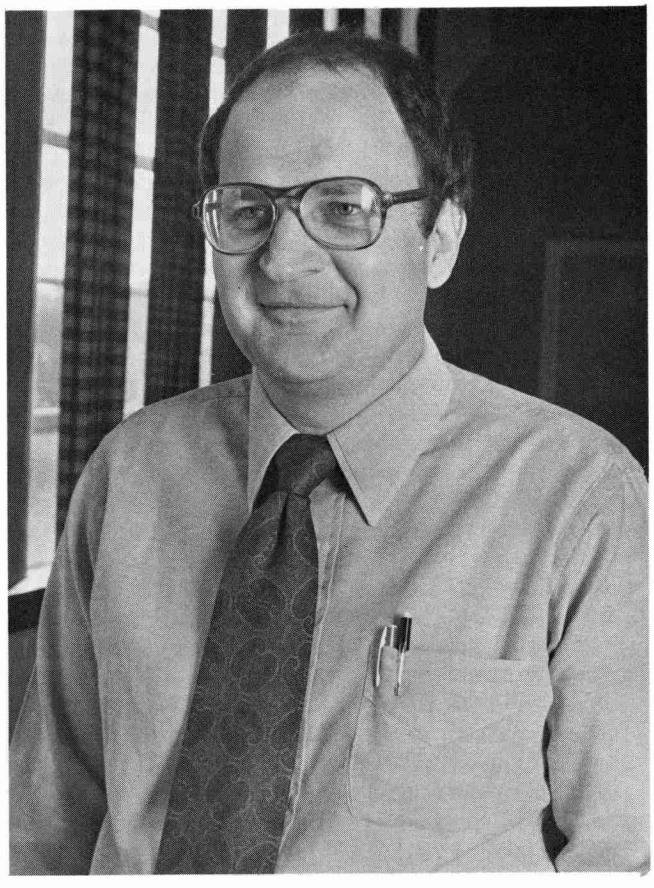
Charles Tomasino

Associate Professor of Textile Chemistry

B.S. (Chemistry and Industrial Engineering) 1952, University of Florida
M.S. (Chemistry) 1957, University of Florida
Ph.D. (Organic Chemistry) 1959, University of Florida

Research programs are underway investigating "Formaldehyde-Free" chemical aftertreatments of textile fabrics for easy-care properties. Some new cross-linking systems for cellulose are being researched. Studies of the reaction of dibasic acids with cellulose have uncovered some practical catalyst systems for promoting the reaction. These systems do confer easy-care properties to cellulose fabrics.

A novel in-situ polymer-forming "no cross-link" system is also being investigated. This system is a departure from the conventional cross-linking methods and is a relatively unexplored alternative. Partially blocked, fully extended urethanes are being studied to determine the mechanism by which these materials are attached to the fiber, to compare polymer properties with fabric performance and to design more effective polymers.



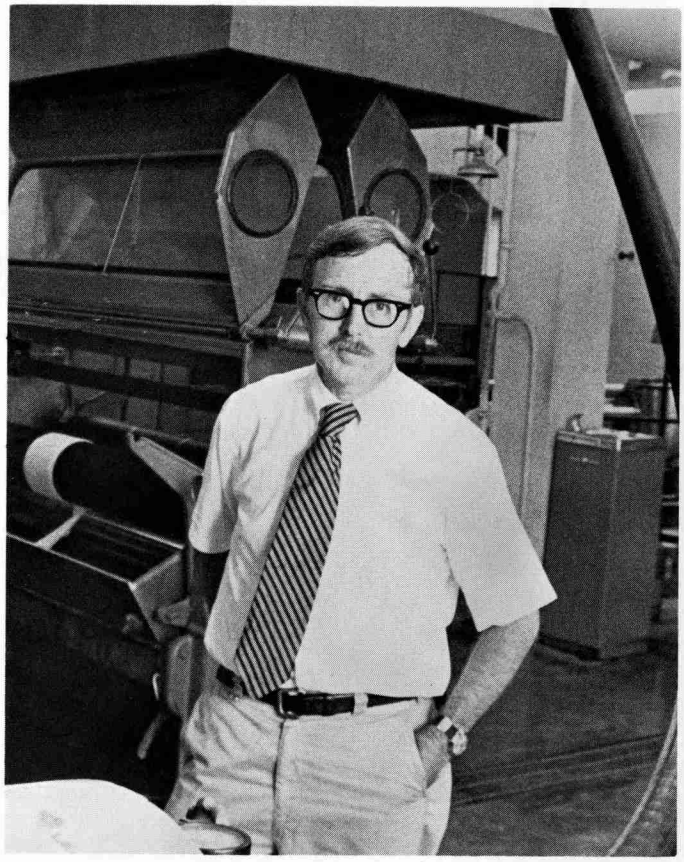
Paul A. Tucker

Associate Professor of Textile Materials and Management

B.S. (Textile Technology) 1963, North Carolina State University
M.S. (Textile Technology) 1966, North Carolina State University
Ph.D. (Fiber and Polymer Science) 1973, North Carolina State University
NSF-NATO Fellowship, 1974, The University of Leeds, England

My research is concentrated in two areas: (1) general microscopical studies and (2) basic materials science as it applies to fiber technology. Studies currently in progress include the following:

1. Setting thermoplastic filaments with chemical plasticizers.
2. Structural studies of polyethylene terephthalate produced by high pressure extrusion.
3. Microscopical assessment of print quality.
4. Characterization of sub-micron cotton dust by transmission electron microscopy.
5. Basic and applied research on the conservation of historic and artistic textiles.
6. Changes in the chemical constitution of lungs upon prolonged inhalation of cotton dust.
7. Structure and morphology of amine-treated polyethylene terephthalate filaments.



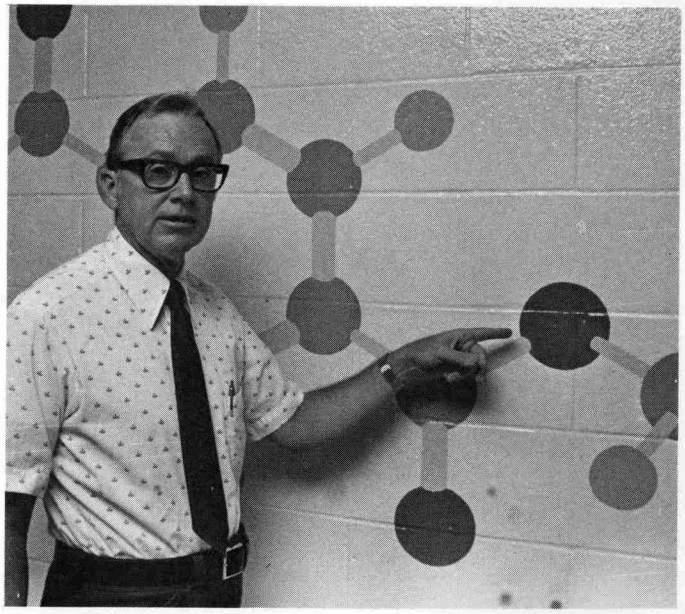
William K. Walsh

Professor of Textile Chemistry

B.S. (Chemical Engineering) 1954, University of South Carolina
Ph.D. (Chemical Engineering) 1967, North Carolina State University

My research and teaching interests are in the physical chemistry of textiles and polymers and in energy-saving techniques for textile wet processing. Radiation curing of resins and binders, surfactant foam, and emulsion applications in textiles, mechanical properties of polymers, transport of liquids in textile assemblies, and the effect of fiber surface properties and moisture transport on clothing comfort are of special current consideration.

The main advantage of radiation curing comes from the fact that most resins, finishes, coatings and adhesives are applied with large volumes of water, which must be evaporated at the cost of energy (2000-3000 BTU/lb of fabric) and air pollution (in the case of solvents). Application of unsaturated liquids and high speed polymerization, or curing, with radiation) ultraviolet or electron beam) results in large energy savings and is applicable to a number of textile processes. Most of the energy savings results from eliminating the solvent and the heat needed to remove it. This also, however, causes a reduction in the volume of liquid applied, which gives rise to interesting application problems.



Wilson M. Whaley

Professor of Textile Chemistry

B.S. (Pharmacy) 1942, University of Maryland
M.S. (Organic Chemistry) 1944, University of Maryland
Ph.D. (Organic Chemistry) 1947, University of Maryland
Postdoctoral Fellow, 1947-1949, University of Illinois

Dyes are the principal decorative elements of textiles and also the most complex chemical entities used in the industry. The chemistry of dyes is a surprisingly vigorous and exciting field of research today, considering that the subject is 120 years old and has had an impressive history of intensive research and development during the intervening years. New dyes have been developed whenever needed for newly developed synthetic fibers or when radically different dyeing processes have been invented.

Despite all of that effort there is a continuing need for improved dyes. Those available are often deficient in lightfastness, resistance to chlorine bleach, washfastness, dyeing efficiency, color value and other important properties. There is now an accelerating threat to the acceptability of all dyes as a result of increasingly stringent toxicity criteria, applicable to all industrial and consumer chemicals. A number of dyes have already been prohibited as potential carcinogens, and others are considered suspect. It appears likely that a significant number of them will have to be replaced by less dangerous dyes. Research on many of these problems is underway in our laboratories.

Please send me an application form for graduate study in Textiles at North Carolina State University.

My undergraduate degree is in _____ from
(Major)

_____ .
(Institution)

I am interested in pursuing _____ degree studies.

Semester and Year I plan to start: _____

Please print:

Name _____
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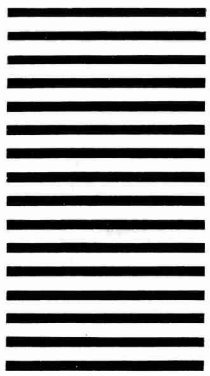

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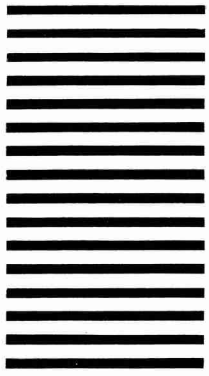

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