1953

The Bobbin and Beaker Vol. 11 No. 3

Clemson University

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<table>
<thead>
<tr>
<th>Category</th>
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<tr>
<td>Suits</td>
<td>Rain Coats, Blouses, Dress Shirts</td>
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<td>Wash Cloths</td>
<td>Table Cloths, Silver Cloth</td>
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INDUSTRIAL AND MISCELLANEOUS PRODUCTS

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PACIFIC MILLS
WEAVERS OF QUALITY FABRICS FOR OVER A HUNDRED YEARS

Pacific Mills Plants

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Pacific Mills Sales Offices

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VATROLITE®—Use this powerful concentrated reducing agent for brighter vat dyed colors on cotton, linen and rayon... for faster, cleaner stripping results on silk, cotton and rayon.

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The Textile Graduate Challenge

DR. HUGH M. BROWN
Dean of Textiles

Never before has the textile graduate had such a chance to find his proper place in the industry. Wherein earlier days he looked, often long and hard, for an opening with most any company that would take him even at very low pay, he is now sought out by dozens of concerns. They send their representatives to spend hours on end interviewing the seniors and follow-up with tours of their plants with all expenses paid. High ranking personnel take time out to give them a picture of their organizations.

The men they hire, instead of having to prove themselves as of old with a broom, are now given training programs with a chance to learn many phases of the total production. Where once there may have been considerable resentment toward the textile graduate, there is now the finest good will
and chances for help on every side. The present graduate will work in a cleaner, better lighted mill, even finding air-conditioning in an ever increasing number of plants.

Long before graduation the textile students has been aided by the industry. Practically every textile school has had a dominant part of its plant furnished outright by textile companies. Large grants of money have been donated for improving the teaching staffs.

It would be difficult to determine how many years a graduate must work in the plants to be worth what those plants have given him. This should be an inspiring challenge to every graduate to prove himself in his job, humbly realizing that he is in great debt and that he must advance himself as rapidly as possible, both for his own sake and for his company. He can have the proud assurance that many other graduates before him have met the challenge, knowing that only by hard work, continued study and a fine, fair attitude toward all who work under or over them could their mill earned the profits that made their opportunities possible.

Graduates will soon learn that profits and wages, though essential, are only part of the challenge. Before there can be profits in these times there must be good will, joy in work well done and a pride in the product among all the personnel from the President to the sweepers. The graduate who does his part to make this possible in his chosen company meets the industry's challenge.

Clemson Student to Represent Southern Area At Chicago

At the recent spring meeting of the Piedmont Section of the American Association of Textile Chemists and Colorists, the report of a group of Clemson textile chemistry students on their original research work, was chosen to represent the entire Southern area at the National Convention of this Association.

Members of this group were Lonnie T. Howard, Paul N. Robinette, Charles B. Simpson and Fitzhugh L. Wickham, and the subject of their research was, "The Dyeing of Union Shades on Blends of Dacron or Orlon with Wool." These students have selected Lonnie Howard to present the paper for them, and he will receive an expense paid trip, from the association, to participate in the national contest with students of other geographical divisions of the association. This contest will be held as part of the program of the National Convention in Chicago next September.

Professor W. G. Blair Passes

Gaston Gage, Head
Yarn Manufacturing Department

Professor William Gardiner Blair died at his home at Clemson on March 17, 1953. He had retired from teaching on September 1, 1952 because of heart trouble, which he had suffered from for more than a year or two.

He is survived by his widow, Mrs. Lena Lawton Blair and one son, Clyde, who has a position with one of the Deering Milliken Mills. He also leaves two brothers.

Professor Blair was born in Whitinsville, Mass. His first work was with Whitin Machine Works and this always held a high place in his affections.

He attended New Bedford Textile School and later took some graduate work at Clemson during the summers.

It was in the fall of 1914 that Mr. Blair first came to Clemson and he taught in the School of Textiles until the spring of 1920. During this tour of duty the enrollment in the Textile School was small, there being only three members of the teaching staff. He left teaching at Clemson to go with the United States Department of Agriculture in spinning research and left this position to do spinning research for Armstrong Cork Company. After this he was with the Judson Mill for about one year. About this time Mr. Blair bought a farm in Greenville county where he lived and farmed until he returned to the Clemson faculty on September 1, 1936 to stay until his retirement.

Mr. Blair was a great favorite with the students. He always knew their names and called them "Mister." In turn they all called him "Pop." This was probably due to his prematurely white hair, because otherwise he never acted or looked old.

He was a great sports fan and baseball and basketball always seemed to have a stronger attraction than did football. He would stay to the bitter end of a baseball game and in the early spring "bitter" was sometimes correct. Only the pure in heart would brave the cold wind on Riggs Field for some games. Mrs. Blair would be there too and they continued to attend sports events after his retirement.

For years Mr. Blair served as faculty advisor for Phi Psi fraternity. The outstanding success of this fraternity at Clemson is largely due to his work and interest.

We at Clemson miss "Pop" Blair.
Industry and The Student Graduate

By George Asnip,
General Manager, Laurens Mill

It is obviously impossible in so brief an article to give a complete and detailed analysis of this tremendously broad subject. However, I will list my observations of several of the most important qualities which industry must have in a student graduate. I consider these several qualities to be of top priority, and to a significant degree, they are lacking in the student graduates that industry is now receiving from universities and colleges.

It is primary that a college or university have as its aim to provide instruction, experience, and motivation to each student so that he will graduate with the knowledge and the qualities of leadership required by a leader of industry and with the basis for continued development throughout his lifetime, leading to fitness for assuming responsibilities in industry of the highest order.

Indispensable are the following objectives:

1. To give the student the motivation for a lifetime of service to industry.
2. To give the student a balanced and liberal education in the arts and sciences in order to develop his powers of reasoning and analysis; to give him a firm grasp of the role of industry in a democratic society and an awareness of the problems facing industry; to give background of general knowledge enabling him to cope with the problems of industry.
3. To develop in the student those personal physical attributes and abilities needed by a leader of industry.
4. To give the student a basic education in the fundamentals and techniques of industry and in the roles and missions of industry in a democratic state.
5. To develop in the student a sense of duty and the qualities of character, leadership, integrity and loyalty.

It is to be understood that technical knowledge is of the greatest importance, and I wish to stress the fact that this phase of the student’s education must not be minimized; however, consideration should be given to other qualities which must be developed in the student to best equip him to enter industry and become a leader.

Industry’s first objective is to place the graduate in a position of basic responsibility—that of a supervisor. A supervisor is one who is responsible for the activities of a group of workers performing a job. The student graduate immediately as he enters industry will of course be indoctrinated into the industrial organization and will become familiar with company policies, practices, and basic operational processes. However, all this is only incidental to his ability to assume the position of supervisor in the least amount of time consistent with his individual ability to absorb those fundamentals of organizational policy, practice and procedure.

The student must develop a fine sense of responsibility with regard to his fellow man. This entails the ability to get along with people. A leader of industry is fully aware of the fact that he gets results through people, and if a student is to become a leader, he must be trained and motivated in his actions so that he is thoroughly appreciative of the fact that he gets results through people, and if a student is to become a leader, he must be trained and motivated in his actions so that he is thoroughly appreciative of the fact that his success will be built upon the results he will obtain through people. The student graduate must be fully trained in the foundations for good job relations. Industry is acquainted with its grave responsibilities to its workers and is even more deeply conscious of the fact that each person making up the work force must be treated as an individual. It is very apparent that many of the student graduates today are not cognizant of the fact that their success in becoming leaders in industry is dependent upon their full realization of the individuality of each person in the working force and that they must understand people—what motivates them, and how best to accomplish a successful industrial operation through the use of people. It is extremely important that each student have a basic understanding of human psychology; that he be well versed educationally and experience-wise in the foundations for good relations with workers; that he be taught and given experience in handling job relations’ problems. In this connection of job relations, it is important to each educator to study what is being done with regard to this phase of a student’s education. It is altogether possible that this essential quality of leadership is not being stressed to the extent it should be in the education of the student.

Another very pertinent quality which industry must have in the student graduate is the ability to instruct. A fine technical education is tremendously

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World Economics and The British Textile Industry

(Editor's Note)

Dr. John W. S. Hearle was born in Gloucester, England in 1926. He received a B.A. degree in 1947 and a M.A. degree in 1950 from St. John's College, Cambridge University, and a Ph.D. degree in 1952 from Manchester University. Dr. Hearle is at Clemson under an award by the State Department under the Smith-Mundt Act which is to enable foreign post-graduate students and faculty to study in the United States. He is engaged in research on the project for the use of electrostatic forces in the opening and cleaning of cotton.

I crossed the Atlantic at the same time as the Prime Minister, Winston Churchill, and as my taxi drove away from Pier 50, the driver asked “What is it going to cost America?” Although Europeans are grateful for the tremendous help which America has given them in rebuilding countries and economies shattered by war, they do not like the idea of becoming poor relations continually begging for help to get out of their difficulties. This type of relationship is not one which will make for strength in the free world—that will come when each nation can give freely of its best, and not feel that it is dependent on the bounty of some more prosperous ally.

With the present international economic position, there would seem to be three main possibilities:

(a) A continuation of American aid, which neither the giver nor the receiver find very pleasant.

(b) A reduction in dollar expenditure by soft currency nations. This would result in a lowering of their standard of living; a weakening of their defence effort; a tendency to separate from America and form a third world camp (and possibly some countries passing under Russian influence); and a loss of American overseas markets—for example, the British would probably economize first on imports of raw cotton, tobacco, and films.

(c) Increased sales by foreign countries in the United States, enabling them to earn enough to satisfy their vital dollar needs. For this to happen some modification of American import and tariff policy seems necessary. At present the tendency is for protection of the American manufacturer whenever a foreign country starts to succeed in the American market. Fewer import restrictions and lower tariffs would cause some loss to American manufacturers in the home market; but would result in lower prices to the American public (since the foreigner could not compete unless he was cheaper), and a continuation or increase of overseas sales, without the dollars to pay for these coming from the pocket of the taxpayer. It would also result in a much more healthy relation between the nations of the free world. In the words of the British Chancellor of the Exchequer, we want “Trade, not aid.” To do this we, in the countries which need dollars, must make a great effort ourselves to send more of our production into dollar markets.

How does Britain and the British textile industry fit into this picture? Following the war, Britain has been faced with the need to make a great economic effort. There are various reasons for this. During the 18 months of war, before Lend-Lease, Britain

* Import restrictions serve essentially different purposes in debtor and creditor countries. In debtor countries they prevent the import of goods which the country has not got the foreign currency to pay for. In a creditor country they protect the home producer, but restrict the ability of debtor countries to earn anything with which to buy from the creditor country.

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Warp Sizing

By Dr. Paul Seydel

(Advertiser's Note)

The contents of the following article are the major points of interest of a speech given by Dr. Paul Seydel to the National Textile Manufacturing Society at Clemson, February 17, 1953. Dr. Seydel is associated with the Seydel-Woolley and Company, Atlanta, Georgia.

In any discussion of sizing, we must keep foremost in our minds what the purpose is of warp sizing. It is not to produce a certain feel or a certain stiffness. It is not to add weight or strength to the yarn or even to lay the fibers. It is purely and simply to obtain the best possible weaving. These other considerations contribute to good weaving, but will not produce it.

No one or two properties can be chosen as a basis for judging a yarn. Attempts have been made by practically everyone who has investigated the subject to relate yarn or size film tests to weaving efficiency. Certain work of the Textile Research Institute promises to give some indications of how the warp will behave in a weave room by correlating a number of different properties of the yarn and size films which may be tested in the laboratory. Yet even this work with its complicated relationships of many properties will not always give an accurate picture of weave room performance. The Shirley Textile Institute of Britian also has not been able to accurately predict weaving quality from laboratory tests. Recently the American Dyestuff Reporter contained a paper by the Rhode Island Section stating that laboratory tests could not be relied on to predict mill efficiency. So sizing is still more of an art than a science, although the scientific angle is being developed day by day, both here and in England.

A good warp size, well-handled on the slasher (and that is very important) should give increased tensile strength, flexibility, elasticity, good fiber-lay, smooth size film, and hygroscopicity. The last is a technical term meaning ability to attract moisture and hold it—therefore allowing weaving to be carried out at lower humidities, with attendant increased comfort to the weavers and less tendency to rust machinery parts.

Tensile strength has been used much in the past as a basis for judging a sized yarn, principally because it is easy to measure. Increase in tensile strength of sized yarns is due to a glueing together of the fibers of the yarn, so that they do not slip past each other. We can see this in breaking an unsized yarn — the break is uneven with unbroken fibers which have merely slipped and stuck out. This is even more obvious if the yarn is first untwisted. A heavily sized warp will break almost square.

The effect of the film itself on increasing the strength is small, as the film strength is much less than the fiber strength—the individual cotton fibers are as strong as steel of the same size.

Then why not try to get as high a tensile strength as possible by getting good penetration and glueing together the fibers all the way to the center of the yarn? Well, this has been tried as fallacy number one. In the first place, the fibers go in and out from the center, so that most of them are glued at some place along their length even with a surface size. In the second place, if we get the size all the way in the center of the yarn we get a stiff rod-like quality, due to loss of flexibility. With all the binding that warp yarn must undergo—the changing of the shed and the binding around the filling yarns—the yarn must have flexibility.

With the solidly sized yarn, the effect would be much as the action of a solid rubber tire. It is obvious that a tube filled with elastic substance—in the case of the tire, air; and in the case of yarn, the cotton fibers—is much more resistant to shock as a result of its cushioning effect than a solid tube would be.

Besides the loss of cushioning effect, an excess of penetration will decrease the elasticity of the yarn, since size films generally are not elastic as the fibers. Elasticity is an absolutely necessary property in good weaving. No matter if the tensile strength is doubled, if the loom wants to stretch the yarn farther than its elastic limit, the yarn breaks — the loom is more powerful than the yarn.

Then we see that although increase in tensile strength is usually helpful, it should not be obtained at the expense of other important properties. The size film should penetrate just deep enough to give a good anchorage to the outside of the yarn, so that there will be little tendency to shed.

A flexible film is produced only by the proper combination of good sizing materials and good slashing. The size film must not be over-dried on the slasher.

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The Saco-Lowell Gwaltney Spinning Frame Story

The Saco-Lowell Gwaltney Spinning Frame was given its first publication in 1952. Since that date almost 400 of these Gwaltney frames have been shipped to over 30 mills. The largest installation in operation at the present time consists of 65 frames at Ninety-Six Mills.

In offering this frame to the yarn manufacturing industry, the Saco-Lowell Shops were very careful to make no specific claims as to production, quality or economy of operation. They were specific in their statement that this was a brand new tool, original in design and conception, placed at the disposal of yarn manufacturers, and it was their responsibility to work out operating procedures which would assure the use of this new tool to their best advantage. This policy has worked out to the advantage of all concerned because it has placed the initiative in the hands of mill management who, in every instance, have obtained results in excess of their forecast and expectations.

In this frame are incorporated the most advanced sub-assemblies to produce the results demanded in the highly competitive textile market today. For example, there is a drafting element capable of handling staples ranging in length from 3/4" to 2-1/2" with drafts from 9.4 to 50.5. The New Era Spindle and vitritex rings will produce yarn packages weighing as much as 1 lb. The ring sizes vary from 2-1/2" to 3". All of these sub-assemblies are brought together on a brand new chassis which makes full use of the anti-node principle of spinning, illustrated in Figure 1. The distance from the tip of the front roll to the lowest position of the ring rail is 27-1/2", a construction made possible and practical by the use of the node rings 1, 2 and 3 in Figure 1.

On account of the distance which the yarn travels in going from the front roll to the bobbin, there develops a condition which brings about an equalization of the twist, a condition which is somewhat similar to that existing in a mule during the run-off and "backing" off cycle.

It is the ability of the Gwaltney frame to produce low twist yarns with low variation that makes it most useful to manufacturers of quality fabrics. Large creel packages in an accessible umbrella creel, the Pneumafil waste collecting system, an unusually broad use of anti-friction bearings in the head end in the top and bottom roll system and other strategies, and simple gearing of completely new design all contribute to operating efficiency. Streamlined contours, lint-shedding finishes and overhead cleaners allow the spinner to devote her energy to more useful activities.

TEN
WARP SIZING
(continued from page eight)
We must remember that these starch films behave the same toward heat as they do in bread — bread once toasted will never again be flexible and elastic, no matter how much it is soaked. The films will soften true enough but their toughness and flexibility are lost forever.

The gums added to a size can greatly affect its elasticity and flexibility. By means of chemicals, using proper amounts under proper conditions, gums may be made from starches to duplicate the properties of practically all natural gums, with the additional advantages of uniformity, not to mention lower expense. These gums may be incorporated in the sizing compounds, and if desired, chemicals may be added to the compounds to alter the properties of the starch.

Air-dried films of pearl corn starch are smooth and fairly strong but have no flexibility and if bent, will break. A film of a corn starch which has been treated with certain chlorides has greater flexibility—the film may be folded as much as desired without damage. Such a film with this amount of chlorides would be too soft for use in sizing yarn. Many other chemicals, both organic and inorganic, may be made by adding more tallow to the corn starch than should have been used for good sizing. The effect of the tallow is that a discontinuous film is produced, obviously of no value for sizing. Tallow used alone in size always produces this effect, which is very familiar to anyone who likes shortening bread. Crumbly biscuits and pie crusts are made in the same way — by using more shortening than usual, decreasing the continuity of the cooked starch mix. The same chemical—starch—is the basis for both bread and size.

The reason that we do not use materials that make the size film as flexible as possible is that generally flexibility is produced at the expense of hardness. Although hardness as such is not a particular desirable characteristic, the film must be hard enough to produce a smooth surface—even more important, it must be a film that is not easily pushed about on the surface of the yarns to produce a soft warp or balling up in the harnesses and drop wires. The same consideration may be applied to any attempt to get the elasticity as high as possible.

The smoothness of the film may be obtained by use of lubricants or by making a hard film, with not too much softener. There are some materials that must be particularly avoided. During the last war, we ran across numerous “starch substitutes,” and “starch extenders,” some of which contained low-grade clays. In a short length of time, some of these materials wore into the reeds, and in many cases, harness eyes

(continued on page twenty-one)
Research Opportunities for Textile Students

Dr. Edward A. Murray

Biographical Sketch
Edward A. Murray is a native of Tacoma, Washington and graduated from the University of Washington in 1938 in chemical engineering. After three years at Oregon State College as an instructor in chemical engineering, he went to The University of Texas for further graduate studies and received the Ph.D. in chemical engineering in 1946. During the war years, he was group leader in the Research Division of the National Cotton Council, in charge of a project on the application of high polymers to cotton prior to spinning. From April 1946 until October 1952, he was connected with the Deering Milliken Research Trust, and during the last four years of this period, served as Director for Chemical Research. He is now engaged in consulting in textile research and development, and is associated with the Clemson Textile Department on a part-time basis conducting research on small-scale finishing tests for cotton.

Although college courses in textile are not usually considered as the ideal training for would-be research men, there is today a new opportunity in the field for men of creative minds with practical training in textile operations. All industries today are expanding their research efforts, and in these days of technical manpower shortage, the competition for personnel has driven the salary scale for research workers very sharply upward. The textile business, hardly a research-created industry, is beginning to adopt some of the methods which have placed this country foremost in chemical, metallurgical, petroleum and other fields, and the demand for researchers in textiles is probably at least as great today as it is in other industries.

In order to discuss textile research with some degree of intelligence—no one, least of all the research man, seems to understand the textile business completely—it is perhaps best to start with a definition or two. Research may be defined as the application of the scientific method in an investigation having as its objective the revision of accepted conclusions in the light of newly discovered facts. The scientific method, according to the late Thomas Midgley, is characterized by the reproducible experiment, all of the variables such as temperature, time, concentration, and the like, being controlled so as to yield a result which can be exactly repeated tomorrow, next month, or five hundred years hence. Research is of many types, and it is difficult to classify them. For our purpose, the difference between fundamental and applied (or industrial) research can best be understood if we make use of an executive’s opening statement in proposing a new project. In the first case, it would probably be, “Let’s find some new data,” and in the second, “Let’s find some new dollars.”

Practically all of the fundamental research on fiber, yarn and fabric is, at present, conducted in laboratories of research foundations such as the Institute of Textile Technology at Charlottesville, Virginia, the Textile Research Institute at Princeton, New Jersey, the various government laboratories, or in the fundamental research divisions of major suppliers of synthetic fibers. Textile mills, in general, have found that fundamental research, with its long waiting period for results which can be converted into dollars, is not well fitted to an operation where dame fashion rules the roost, and with few exceptions, research in the textile industry itself has been of a strictly applied character. Because the industry is highly competitive, and production schedules can change overnight, much of the research in textile product development goes on in an atmosphere similar to that in the emergency room of a hospital. The patient needs quick treatment if he is going to live. It is unfortunate, but true, that the buying public does not always demand the best values in textile products—this leads to wasted, or at least non-constructive, efforts in development laboratories where activities are largely governed by market demands. A manufacturer who fails to satisfy the customer will not remain long in business, so researchers should not blame the production man for his attitude, and must adapt their own thinking to fit the needs of the whimsical consumer (mostly female, of course.) There is a degree of frustration in trying to make a fabric out of that new miracle fiber from coal, air and water, when the lab reports show that one or another of the old fibers is really better, and this has become an almost everyday headache in textile development laboratories. But mills are always faced with adapting operations to the handling of materials that will bring in the greatest profit per loom week, and the new fibers are usually most profitable. Whether the demand will be there next season is of secondary importance. The clash of one synthetic on another is heard in every remote corner of the textile manufacturing empire with strong hints, as we find new announcements in the trade literature of additions to an already confusing array, that the battle is only getting under way. The chance that an orderly situation will be established by the

TWELVE

(continued on page fourteen)
Placement Work of The Textile School

Dr. Hugh M. Brown
Dean, School of Textiles

This is to outline the placement work being carried on by the Textile School. Since the war the following services have been provided:

1. Before each graduate period a folder is made up for each graduate containing all his grades by subjects, his grade point ratio, a summary of his confidential personality record, his picture and a form filled in by the student giving his outside activities and job preferences. This folder may be studied by any prospective employer coming to Clemson to either interview or inquire about students.

2. The school, through the Dean’s office, arranges with company personnel for interviews with all interested seniors. Notices are posted concerning every request for men and interview schedules are set up for all the prospective graduates interested in each company. Group interviews are arranged when requested if the number of interested seniors justify them.

3. For companies not wishing to send personnel representatives for interviewing, notices of the openings are posted and lists of interested seniors are sent by mail along with summaries of the personnel records and grade point ratios. Additional information including transcripts of credits on any student may be had on request.

4. When requested, arrangements are made for personnel representatives to talk with the student’s professors concerning his ability and personality.

5. When requested by companies, trips are arranged for students to visit plants and meet company personnel.

6. A file of names of former graduates wishing information on openings is kept in the Dean’s office and a list of recent openings is sent to each former student wishing to make a change. Such students should write giving a statement on the types of openings he would consider. He may review the total list of openings by coming to the office.

7. All company requests for men with experience are promptly answered with a list of the names of all such men who have recently requested

(continued on next page)
PLACEMENT WORK OF THE SCHOOL OF TEXTILES

(work similar to the position to be filled. Companies having such openings may list them with the school briefly outlining the positions.

It should be realized that ever since the war there has not been nearly sufficient graduates to fill all requests for men. This has been especially true during the period of the Korean conflict when so many graduates have to enter Military service. There now, however, are an increasing number of graduates completing their period of service and looking for openings in the industry.

In addition to placing graduates the school seeks to place as many undergraduates as possible in summer work during their sophomore and junior years. This sort of work is very helpful in the students training, fitting them for more rapid advance in the industry after graduation.

RESEARCH OPPORTUNITIES FOR TEXTILE STUDENTS

(continued from page twelve)

scientific method is remote; like most developments in the industry, each fiber will find its own place, but only through the slow evolutionary process which is characteristic of the business. With consumers becoming increasingly critical, there is reason to suppose that competition in the immediate future will be stiffer than ever, and in an industry which can overproduce very quickly with existing plant capacity, it seems reasonable to assume some mills will be forced out of business. In such a competitive situation as this one, research at the mill level may very well spell the difference between business success and failure.

Does all of this indicate that the opportunities in applied textile research may be limited? Quite to the contrary; if mills are to run the fabrics in current demand, or to produce the old ones at competitive prices, a fresh approach to manufacturing problems and a scientific one, is an absolute necessity. The opportunity in the textile manufacturing industry for applied research men was never greater than it is today.

Still another great potential for productive applied research along textile lines exists in the laboratories of the chemical companies and machinery suppliers. Many chemical companies, not yet manufacturing textile chemicals, are eyeing this market with more than casual interest. It is difficult for them to break into this business quickly, because the industry is so highly specialized and textile mill requirements in raw materials and machinery are, in many cases, quite different from those of customers in other industries. The needs of a textile mill are best understood by those who have had first-hand experience; a degree in textiles is good, and manufacturing experience even better. With additional graduate training in research methods, the graduate in textile chemistry should be able to provide the key to this problem for a considerable segment of the chemical industry. Equipment manufacturers, particularly those who are now in the textile machinery game, are finding it profitable to use textile engineers in development work.

The current shortage of technical manpower for research has created today a seller's market among practically all of the graduating seniors in the class of 1953. The picture seems to be darker (or brighter, depending upon whether one views the situation from the standpoint of the personnel department or the applicant); research workers have never been more in demand and shorter in supply and all indications are that the shortage will not be over for some years to come. The textile graduate today may capitalize on research opportunities which did not exist a few years ago.

Through specialized training for research does not insure a successful career, it does come in handy from time to time, and it usually enhances the chances for a rise to the top of the ladder. A few years ago, it would have been impossible for a textile graduate to equip himself for a research career without an additional two or three years of undergraduate training in one of the sciences as well. Today, a number of textile schools offer graduate training and the Institute of Textile Technology also grants advanced degrees after two years of successfully-completed graduate training to outstanding textile students who are interested in laying the foundation for a research career. In such institutions, research methods are competently taught by men who have had long experience in the field, and the graduate training more than pays for itself through more rapid professional progress on the job.

Opportunity is usually greatest where security is least. The final decision on research in the textile industry will probably never be reached. Management will certainly minimize the expense of development or even discontinue development work if it cannot produce a profit. The challenge is an immediate one; if we don't get results today, we won't be here tomorrow. The potential rewards, however, are all that could be desired, and then some. If one has a leaning toward tackling insoluble problems, producing positive results in an impossibly short space of time, and a philosophical acceptance of ninety-five per cent failure, research in textiles is indeed the greatest opportunity of our generation.

FOURTEEN

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Iota Chapter wishes to welcome three new members to the ever-growing ranks of the fraternity. These are: Heyward C. Hurt, a TC major from Greenwood, S. C.; Joe F. Mattison, a TC major from Belton, S. C.; and Max U. Gainor, a TE major from Lancaster, S. C. These candidates met all the chapter requirements and completed the third degree on April 13.

In keeping with the objective of maintaining high standards and scholarship throughout the fraternity, it is Iota’s policy to pledge the sophomore with the highest scholastic average for each semester, and to pledge juniors and seniors with a grade point ratio of at least 2.6 and 2.3 respectively. This is based upon a “4” grade point system. We feel that this policy encourages scholarship among Clemson textile students and insures a good, all-round reputation for the chapter. These facts are mentioned because we wish other chapters and interested persons to know how Clemson Phi Psi men are chosen.

The “Orchids of the Month,” along with this chapter and the whole textile school’s congratulations, goes to Marvin C. Robinson of Asheville, N. C., who has accepted a scholarship to the Institute of Textile Technology at Charlottesville, Virginia. This is quite an accomplishment since the enrollment of the Institute is made up of a very limited number of outstanding textile students. Marvin has three letters in basketball to his credit, is a member of the Block “C” Club, and is active in the Clemson Blue Key Organization. You will also find his name listed in “Who’s Who In American Colleges.” He plans to enter the Institute soon after graduation in June.

The Annual Banquet for Iota Chapter will be held May 1 in the “Cotton Room” of the Greenville Hotel in Greenville, S. C.
An original, fundamental research on “Vat Dyeing on Orlon, Dacron-Orlon-Wool, and Dacron-Wool Blends” of considerable value and success was recently completed by one of our brothers, Fitzhugh L. Wickham, and a fellow student, Paul R. Robinette. These two textile chemistry majors presented their paper before the Piedmont Section of the AATCC and won first place. The research paper will also be entered in the contest at the National Convention of the AATCC at Chicago in September.

Along with this subject of textile chemistry we would like to mention that two of our members, Fitzhugh Wickham and William P. Creighton, are active members of the Alpha Chi Sigma Fraternity. This is an honorary chemists’ fraternity with nation wide recognition. Around our campus these two “Brothers of the Test Tube” have made themselves well known among the students.

Clemson’s representative to the National Convention in Philadelphia in May will be Bennette E. Wilson, a textile engineering major from Spartanburg, S. C. Ben is President of Iota Chapter and Editor of the “Bobbin and Beaker.” We, of the Clemson Chapter, are sure that you who attend the convention will find Ben a fine and interesting person, and hope that you will enjoy working with him as much as we have.

We were all saddened at the recent death of our faculty advisor, Prof. W. G. Blair. “Pop”, as he was affectionately known to all students, gave abundantly of his time for many years for Phi Psi generally, and Iota Chapter in particular. He was well known throughout the whole textile industry and his untimely passing leaves a gap that will be hard to fill.

INDUSTRY AND THE STUDENT GRADUATE
(continued from page six)

important; however, let me emphasize the fact that unless the student has the ability to impart instruction to people he cannot succeed as a leader in industry. As previously mentioned, the first objective of the student graduate is to become a supervisor, and as such, he will have the responsibility of obtaining results through people, and they, in turn, must be instructed to obtain results. They must know how to do the job; this entails instruction. Instructing is not a haphazard practice. It requires detailed planning, understanding of the person to be instruct-

ed, knowledge of the subject, and proven procedures to be followed in order that the instructing job may be done most efficiently in a minimum of time. It may be quite definitely stated that if a worker hasn’t learned, the instructor hasn’t taught. And this rather important statement expresses the importance of the definite need of the student to be fully qualified to instruct those workers whom he has been entrusted to supervise.

The student graduate, to whom we are looking to become a leader in industry, will always be faced with the prime responsibility of obtaining the maximum production possible of the highest quality at the lowest cost. This, of course, requires the greatest technical skill, but even more important it requires the basic ability to get results through people and to be able to instruct them.

How many of our educators really know intimately the problems of a supervisor in industry? It is of the greatest importance that they do know. The supervisor’s task is one of tremendous complexity. His responsibilities are many. They include the responsibilities for production, quality, costs, safety, good job relations, instructing new employees, labor turnover, health, and a whole host of other very important duties. In order to carry out these obligations, the supervisor must have a vast knowledge and certainly a foundation of experience. It is vital that knowledge and experience be imparted to the student to equip him to enter industry and adequately cope with these responsibilities. Regardless of the industry which the student enters, the basic responsibility will be the same. Although individual industries and companies may have different policies, practices, and procedures, the problem of understanding people, treating them as individuals, obtaining good job relations, and the ability to instruct workers is the same.

The educators of our students have a tremendous responsibility—first, to understand fully and completely the problems of industry; secondly, to make mandatory the inclusion in the curriculum of the student courses of study and discussion which will equip the student with knowledge and experience in working with people. The students of today will be the leaders of industry tomorrow, and as such, they will be far better prepared to meet their responsibilities if they understand human relations and methods of instruction. Industry stands ready today to supply the facts and the day-to-day problems which the student will encounter when he enters industry. The educator’s duty is to get these facts, know and understand the problems, and produce a student graduate fully equipped to cope with these responsibilities.
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WORLD ECONOMICS AND THE BRITISH TEXTILE INDUSTRY
(continued from page seven)

used up almost all her gold and dollar reserves buying the weapons with which to fight: These were the savings accumulated during the prosperity of the 19th century; and their loss has two effects—there is no interest coming in, and, more seriously, whenever there is any economic set-back our reserves are perilously low. And British must import to live—we have a population of 50,000,000 (24 times that of South Carolina) in an era only three times that of South Carolina; and, although British agriculture produces a high yield, we cannot produce enough in that area to satisfy our needs. Another factor involved is the increased competition in many of our traditional export industries. For example, at one time, our biggest export was textile goods, mainly in cheap cloth for Africa and the East; but we now have to compete with production in Eastern countries having cheap labor, with U.S. mass-production for a huge home-market, and with increased production in countries anxious to supply their own home-markets.

Since Britain has only a moderate home-market, only a limited supply of raw materials, and has not got the advantage of cheap labor or cheap power, and must transport her imports and exports over long distances, her best hope for the future lies not in mass-production but in quality production. British will have to concentrate on products needing the maximum of skill and the minimum of raw materials and power. A good example is the Comet jet airliner—the fastest and finest air-liner today—designed and made by the De Havilland Company in England.

The British textile industry suffers particularly from the difficulties facing the British economy. Built up during the nineteenth century to supply a cheap mass foreign market, it is now left with old machinery and crowded mills, facing increased competition without the flexibility of a new and expanding industry. But, although some mills still have a backward attitude (in good times saying “we do not need to re-equip” and in bad times saying “we cannot afford to”) the majority are facing these problems, introducing new methods, and adapting their production to present-day needs.

Some facts and figures may be of interest. The British cotton industry employs a labor force of 320,000, of whom about 60% are women; and produces about 25,000,000 lbs. of yarn, and 60,000,000 yards of cloth per week. The woolen and worsted industries employ about 200,000; producing 45,000,000 lbs. of yarn and 35,000,000 sq. yards of cloth per week. The rayon industry produces about 10,000,000 lbs. of yarn per week. The industry is almost entirely horizontally organized, and is concentrated in a small area: almost the whole cotton industry lies within an area 30 miles long and 20 miles wide in Lancashire, and within this area the various towns specialize in particular types of work—e.g., fine spinnings, coarse spinning, weaving, etc., with Manchester as the commercial center of the industry. The wool and worsted industry is similarly concentrated in Yorkshire, centered on Leeds and Bradford.

Except in the field of synthetic fiber production, the British textile industry is made up of a large number of small firms: 20% of employees are in units employing less than 100, 55% in units of 100-500, and 25% in units bigger than 500. There has been no tendency to amalgamate into industrial mammoths. But realizing that competition against external forces is more important than internal competition between different firms, the industry has done much in cooperative research and education to improve its efficiency. This effort takes various forms. First there are Government bodies such as the Cotton Board, which concerns itself with industrial efficiency and the economic position of the industry, more than with technical detail.

Secondly, there are nine Research Associations— for wool, cotton, linen, jut, rayon, hosiery and knitting, felt and hat-making, lace, and laundry. Financed partly by the industry and partly by the Government, they are controlled by Boards elected by the member firms. The research which they do varies from pure science, such as the work on partition chromatography, carried out at the Wool I.R.A.,

(continued on next page)

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May 1953

* British gold reserves were reduced from 2,696 million dollars in 1938 to 1 million dollars in 1940. Our remaining dollar reserves were mainly in U.S. investments owned by British citizens; these were not all readily marketable, though about $400,000,000 worth (including such holdings as the British ownership of American Viscose Corporation) were requisitioned and sold.
for which A. J. P. Martin and R. L. Synge were awarded the Nobel prize in chemistry last year; to an immediately practical problem such as the adaptation of an instrument to measure the moisture in cakes of viscose rayon. The largest of these is the British Cotton Industry Research Association (The Shirley Institute) which has a total staff of nearly 500, about 1/4 graduates, and an annual income of $700,000*. The only field which the Research Associations avoid is that of political and industrial controversy; but even there they try to provide the facts on which such matters as wage rates can be fixed. In addition to doing the research they have to see that the results reach their members in a form which they can use. This is done partly by publication and partly by the personal activities of the liaison staff.

Thirdly there are the Textile Departments of the Universities (financed jointly by Government, local authority, industry, endowed grants, and fees, but largely independent in administration and policy) and Technical Colleges (controlled by the local authorities.) These produce fewer graduates than American Textile Schools (which is characteristic of the British educational system), but they are supplemented by a large number of those working in the industry who take part-time Courses, mainly in the evenings. The Universities of Manchester and Leeds, the former biased towards cotton, the latter towards wool, offer courses in Textile Technology for the degrees of B.Sc. Tech., M.Sc. Tech., and Ph.D.; and several of the Technical Colleges also offer full-time courses — in particular, Nottingham and Leicester serve the needs of the hosiery and knitting industry. In addition to teaching, the Universities do research (mainly financed out of their general income, but in some cases by grants for special purposes.) For example, at Manchester, we have W. E. Morton’s work on yarn structure, on spinning quality of cotton, and on other subjects; P. H. Walker’s development of a yarn irregularity tester; my own work on the electrical resistance of fibers; work on braided structures; on the measurement of forces in spinning by means of piezo-electric crystals; comparative studies on the arealometer; and on methods of strength testing of cloth.

Fourthly there are Societies designed to further the needs of the industry, and to spread knowledge among its members. Foremost among these are the Textile Institute and the Society of Dyers and Colourists.

There is thus a considerable background of research and information available for the British textile in-

* At the official rate of exchange. In terms of wages and prices it is probably worth about $1,400,000.

TWENTY
were cut clear through in a week or so of using these abrasive materials.

The quality of hygroscopicity is desirable only to a certain limit. The ability of a size film to hold moisture will go a long way to prevent troubles from over-drying or toasting the films. It will allow use of lower humidities in the weave room, giving increased strength and flexibility due to the extra moisture in the yarn. It may also be carried too far, however, as too much of a hygroscopic agent will hold so much water that a soft film will be obtained, resulting in the dreaded "soft warps." A film of this nature is liable to be gummy and sticky as well.

Hardness of the film can be tested on laboratory prepared film by a gadget known as the Sward Hardness Rocker. The rocker is set on a film so that it will begin to rock, much like a rocking chair. The number of swings it makes before it stops is a measure of the hardness of the film—It rocks more easily on a smooth hard surface than on a soft, yielding surface. The Textile Research Institute has shown by such tests that films that are either too hard or too soft will not weave well. The former are probably too brittle and the latter not strong enough.

No one particular property can be used as a basis for determining the weavability of a warp. For best results, each property must be balanced with the others.

Since literally millions of yards of cloth sized with chlorides (which are used by most of the larger size compound manufacturers) are finished each month without complaints, it hardly seems necessary to defend these useful materials. There still exists, however, some feeling against their use. Research conducted by the author at the Georgia Institute of Technology under the supervision of Dr. Harold Bunger and Professor C. A. Jones showed no damage to yarn sized with zinc and calcium chloride. On drying these yarns with even more heat and for a longer time than is normally done in finishing, it was found that the strength of yarns sized with chlorides to be actually greater than those which did not contain these compounds. It is believed that this increase is due to the water-attracting powers of the chlorides, which hold more moisture to the yarn, thus giving it a higher breaking strength. At least no tendering effect was indicated.

Probably the origin of the prejudice against chlorides came from some troubles that arose many years ago when hot-calendaring cloth containing high percentages of magnesium chloride which is much less stable than the chlorides in use today. Calcium and zinc chlorides are stable much above a temperature that would be sufficient to char the cloth.

The necessity for fiber-laying is obvious to anyone who has seen break-outs due to tangled ends in a loom. Efficient fiber-laying is accomplished by use of the proper materials to give good adhesive qualities to the size film.

The merits of a size compound cannot be judged by a chemical analysis. Analysis is a valuable check on uniformity, but beyond that the ordinary analysis does not go.

A good size compound should contain gums, lubricants, and softeners. The properties of these materials should be properly balanced to give the desired effect in sizing.

The reason most sizing compounds contain more or less water is that the gums they contain must be maintained in a more or less soluble state. Once the gums have dried out, they are very difficult to get back into solution, unless spread in the very thin films in which they occur on the sized yarns. Even then, gums derived from starch products may need enzymes or chemicals for their solution. Also the preparation of many of these materials requires water for the chemical reaction—the reaction will proceed only in solution. It would cost more to remove the water than would be saved in freight charges.

A 4% solution of locust bean gum is so stiff that it will not flow. It has little adhesive qualities. Its principal use is as a thickener, where viscosity is required, particularly in printing pastes. Sometimes too, greater viscosity is desirable in sizing, in order to pick up more size at the same concentration of solids in the size.

Gums are produced from chemically treated starch. One of the greatest advantages of starch gums is that they may be prepared to give a certain viscosity at any concentration desired. Many of the natural gums cannot be put into as concentrated solutions as are normally desired for sizing purposes. An important factor is the ability to vary the adhesive properties of the gum. Certain viscosity starch gums give films that are too sticky for sizing use, and would probably ball-up behind the reed and gum the harnesses.

The man that prepares the size should know something about the over-all effect that a gum produces on his mix—whether it gives the proper viscosity, the proper amount of adhesiveness to lay fibers without gumming; the proper flexibility of finished size film, etc. Experience is the most valuable factor in determining this, and a good man in the slasher room can still do as well, sometimes better than the chemist in the laboratory. The chemist has principally the advantage that when he finds out what is wrong, he knows in what direction to move to vary the properties the way he wants them. The weave
Clemson men play a big part in the proper operation of our plant.
WARP SIZING
(continued from page twenty-one)
room is still the ultimate test.
Another group of materials that is checked in every analysis is the so-called “fats.” This term has come to include in the minds of people using textile chemicals, not only the pure fats but also the many varieties of oils, waxes, and synthetic materials having lubricating or softening properties.
Lubricating and softening are not all the same thing, but may often be confused because most fats serve both purposes. However, it must be remembered that the properties vary considerably from one fat to another. Sulfonated fats are good softeners but poor lubricants; mineral fats are much better lubricants, but not nearly as good for softeners. Pure beef tallow has some of both qualities, but is not ideal from either standpoint. Blends of other fats often surpass tallow in both properties, sometimes at a cheaper cost. Tallow owes its position to the fact that it was one of the most readily available fats in the days when sizing began.
In analysis, fats are generally divided in to saponifiable and unsaponifiable fats. Although many persons judge the effectiveness of a size by the amount of saponifiable fats it contains, both kinds vary immensely in properties and cost. We have tallow which can be either high grade edible or low grade inedible—a normal analysis will not indicate the difference. We have stearic acid and oleic acid, one a solid, the other liquid. We have fish oil, which is a very sticky oil, of no use at all for lubrication, and we have a synthetic fatty ester, which is claimed to have four times the lubricating value of tallow. We have a sulfonated product which has excellent softening properties. Japan wax is familiar to all. Textile soap and ordinary soap—all these materials show up in a chemical analysis as “saponifiable fats,” yet their properties differ greatly.
In addition, there are partially saponifiable fats such as Carnauba, Candelilla, bees’ waxes, and cotton wax. Part of each of these show up in an analysis as saponifiable fats, part as unsaponifiable fats. Linseed oil too, is a saponifiable fat, but one which will dry out on exposure to air to form an insoluble film—definitely not desirable on sized yarns.
Among the “unsaponifiable fats,” we have in addition to the unsaponifiable portions of Carnauba, Candelilla, cotton wax, and others, the mineral products; paraffin oil, kerosene, petrolatum, various paraffin waxes each having different lubricating properties and softening effects. Cetyl alcohol, although unsaponifiable, is used to make high-grade emulsions, showing that lack of saponifying ability is no basis for judging emulsifying properties. Mineral products, properly blended with emulsifying agents, can be as emulsifiable as any saponifiable material. Generally spots from mineral oils come from non-emulsified oils dropping from machinery bearings containing dirt and fine metal particles. Although the oils themselves may be easily scrubbed out, the dirt and metal particles are not. Properly handled, mineral oils have never given trouble.

TEXTILE MEN RECEIVE AWARDS ON SCHOLARSHIP RECOGNITION DAY
The following men were honored on scholarship recognition day, May 6, 1953. Allston T. Mitchell of Greenville, S. C., was awarded the Fiberglas Junior Scholarship, in the amount of $600. Mr. Mitchell is a double major in Textile Engineering and Manufacturing. Marvin C. Robinson, Textile Engineer from Asheville, N. C., received a $1125 fellowship to the Institute of Textile Technology. The American Association of Textile Chemists and Colorists Award went to William P. Creighton, Textile Chemistry and Dyeing major from McCormick, S. C. Mr. Robert M. Cook, Textile Engineering major from Aiken, S. C., received the June National Association of Cotton Manufacturers Medal. Mr. Leonard G. Boyd, Textile Manufacturing major from Manson, Iowa, received the February National Association of Cotton Manufacturers Medal, The American Association of Textile Technologist Award and the Phi Psi Award.

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<td>Carolina Supply</td>
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<td>Carter Traveler</td>
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<td>Chicopee Mfg. Corp.</td>
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<td>Chiquola Mfg. Co.</td>
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<td>Ciba Co., Inc.</td>
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<td>Cidega Machine Mfg. Co., Inc.</td>
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<td>Clinton Industries Inc.</td>
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<td>Deering Milliken Co. Inc.</td>
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<td>Duncan Mills</td>
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<td>Dupont</td>
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<td>Gaston County Dyeing Machine Co.</td>
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<td>Geigy Co. Inc.</td>
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<td>Gower Mfg. Co.</td>
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<td>Greenville Steel &amp; Found. Co.</td>
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<td>Ideal Textile Supply Co.</td>
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<td>Joanna Cotton Mills Co.</td>
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<td>Kearny Mfg. Co.</td>
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<td>Keever Starch Co.</td>
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<td>Ralph E. Loper Co.</td>
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<td>L. C. Martin Drug Co.</td>
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<td>Mountain City Foundry and Machine Co.</td>
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<td>New England Bobbin &amp; Shuttle</td>
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<td>North American Rayon Corp.</td>
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<td>Nova Chemical Corp.</td>
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<td>Riggs Lombard, Inc.</td>
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<td>Smith, Drum &amp; Co.</td>
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<td>J. P. Stevens, Inc.</td>
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<td>Taylor-Colquitt Co.</td>
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<td>The Terrill Machine Co., Inc.</td>
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<td>Texize Chemical Inc.</td>
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<td>U. S. Bobbin &amp; Shuttle Co.</td>
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<td>Victor Monaghan Co.</td>
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<td>Virginia Carolina Chemical Co.</td>
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<td>Jacques Wolf &amp; Co.</td>
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<td>Woodside Mills</td>
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* See Previous Issues

Where are they now . . . ?

B. E. Wilson, T.E. '54

Clemson graduates finishing in June will find that they are not alone. Everywhere they go they will find some Clemson men. If you are joining the Dan River Mills Inc., you will find Robert C. Smith, Trainee Mfg.; David Campbell, Trainee Riverside Mfg.; David Crawford, Trainee Riverside Mfg.

Also, Edward Baker, Secondhand Trainee, Carding; John Brooks, Overseer, Dyeing; William Brown, Overseer, Designing; Joe Davis, Overseer, Weaving; Glenn Gambrell, Overseer, Carding; Andrew Gregory, Utility Superintendent; Donald Hill, Overseer, Carding; and Frank Jones, Overseer, Carding and Spinning.


THE BOBBIN AND BEAKER
You heard us! Sure-as-spinning, Vicara is wild about wool, nuts about nylon, coos over cotton, raves about rayon, "oohs" and "ahs" over Orlon and Acrilan; thinks Dacron and Dynel are simply divine!

Vicara loves every fiber—because Vicara blends with any fiber to make a better fabric. Vicara is the fiber that improves the blend—any blend and every blend.

Maybe you've got a blend on your brain—a blend that's got possibilities, but's missing something. Something like luxurious softness or moisture absorption. Or maybe the wrinkles won't hang out.

If this is sad but true, then Vicara is the baby for your blend! In addition to soft luxury and glorious comfort, Vicara is completely washable, resists moths and mildew—and possesses the rare ability among man-made fibers to dissipate static.

Vicara has an impressive collection of Success Stories—in shirts, dresses and suits, blankets, socks and sportswear. It's too bad that there's not more Vicara—because Vicara loves everybody and has so much to contribute to every blend!

1. DuPont's trademark for its acrylic fiber.
2. Chemstrand's trademark for its acrylic fiber.
3. DuPont's trademark for its polyester fiber.

Vicara

THE FIBER THAT IMPROVES THE BLEND

Unifority • Beauty • Versatility • Economy • Ease in Use • Spinnability Dyeability • Warmth • Handle, Feel and Drape • Elasticity • Resiliency Absorbency • Heat Resistance • Washability • Non-felting • Non-itching No Odor • No Known Allergies • Moth Resistance • Mildew Resistance

Fiber Division • Virginia-Carolina Chemical Corporation • 500 Fifth Avenue, New York 36, N.Y.
For: Dyeing, Printing, Reducing, Stripping

REDUCING AGENT FOR VAT DYEING:
A pure, full strength Sodium Hydrosulfite (Na₂S₂O₃).
A reducing agent for dyeing vat colors on cotton, rayon and other fabrics. Also HYDROSULFITE OF SODA Q.D.
for immediate solubility in continuous vat dyeing machines.

APPLICATION & DISCHARGE PRINTING:
The highest strength of Sodium Formaldehyde Sulphoxylate (NaHSO₃·CH₂O·2H₂O). For application printing of vat colors and for discharge printing on all textiles. Also used for stripping.

DISCHARGE PRINTING OF ACETATE:
A clear-dissolving, soluble Zinc Formaldehyde Sulphoxylate (Zn(HSO₃·CH₂O)). For discharge printing on acetate dyed grounds. Also for stripping certain colors on wool, acetate and nylon.

STRIPPING WOOL STOCK:
This is a Basic Zinc Formaldehyde Sulphoxylate (Zn(OH)HSO₃·HCHO) used for stripping wool stock, Shoddy and rags.

DISCHARGE FOR INDIGO:
Mixture of Leucotrope W and Hydrosulfite AWC in the proper proportions to give a white discharge on Indigo-dyed grounds.

DISCHARGE FOR INDIGO:
Sulphonated quaternary base. For pure white discharges on Indigo-dyed grounds when mixed with Hydrosulfite AWC.

Write today for complete information as to how a Jacques Wolf Hydrosulfite can help you do your job better. Samples for testing sent without obligation.

Plants in: Clifton, N.J., Carlstadt, N.J., Los Angeles, Calif.