NATIONAL BUREAU OF STANDARDS REPORT

4966

REPORT ON INTERNATIONAL TRAVEL
to
JAPAN, AUSTRALIA, INDIA, PAKISTAN, AND EUROPE
to
DISCUSS TEXTILE RESEARCH, EDUCATION, STANDARDS, TESTING METHODS, PROCESSING, AND SPECIALIZED EQUIPMENT

August 3, 1955 to November 6, 1955

U. S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

U. S. DEPARTMENT OF COMMERCE

Sinclair Weeks, *Secretary*

NATIONAL BUREAU OF STANDARDS

A. V. Astin, *Director*

THE NATIONAL BUREAU OF STANDARDS

The scope of activities of the National Bureau of Standards at its headquarters in Washington, D. C., and its major field laboratories in Boulder, Colorado, is suggested in the following listing of the divisions and sections engaged in technical work. In general, each section carries out specialized research, development, and engineering in the field indicated by its title. A brief description of the activities, and of the resultant reports and publications, appears on the inside back cover of this report.

WASHINGTON, D. C.

Electricity and Electronics. Resistance and Reactance. Electron Tubes. Electrical Instruments. Magnetic Measurements. Dielectrics. Engineering Electronics. Electronic Instrumentation. Electrochemistry.

Optics and Metrology. Photometry and Colorimetry. Optical Instruments. Photographic Technology. Length. Engineering Metrology.

Heat and Power. Temperature Physics. Thermodynamics. Cryogenic Physics. Rheology and Lubrication. Engine Fuels.

Atomic and Radiation Physics. Spectroscopy. Radiometry. Mass Spectrometry. Solid State Physics. Electron Physics. Atomic Physics. Nuclear Physics. Radioactivity. X-rays. Betatron. Nucleonic Instrumentation. Radiological Equipment. AEC Radiation Instruments.

Chemistry. Organic Coatings. Surface Chemistry. Organic Chemistry. Analytical Chemistry. Inorganic Chemistry. Electrodeposition. Gas Chemistry. Physical Chemistry. Thermochemistry. Spectrochemistry. Pure Substances.

Mechanics. Sound. Mechanical Instruments. Fluid Mechanics. Engineering Mechanics. Mass and Scale. Capacity, Density, and Fluid Meters. Combustion Controls.

Organic and Fibrous Materials. Rubber. Textiles. Paper. Leather. Testing and Specifications. Polymer Structure. Organic Plastics. Dental Research.

Metallurgy. Thermal Metallurgy. Chemical Metallurgy. Mechanical Metallurgy. Corrosion. Metals Physics.

Mineral Products. Engineering Ceramics. Glass. Refractories. Enameled Metals. Concreting Materials. Constitution and Microstructure.

Building Technology. Structural Engineering. Fire Protection. Heating and Air Conditioning. Floor, Roof, and Wall Coverings. Codes and Specifications.

Applied Mathematics. Numerical Analysis. Computation. Statistical Engineering. Mathematical Physics.

Data Processing Systems. SEAC Engineering Group. Components and Techniques. Digital Circuitry. Digital Systems. Analogue Systems. Application Engineering.

- Office of Basic Instrumentation
- Office of Weights and Measures

BOULDER, COLORADO

Cryogenic Engineering. Cryogenic Equipment. Cryogenic Processes. Properties of Materials. Gas Liquefaction.

Radio Propagation Physics. Upper Atmosphere Research. Ionospheric Research. Regular Propagation Services. Sun-Earth Relationships.

Radio Propagation Engineering. Data Reduction Instrumentation. Modulation Systems. Navigation Systems. Radio Noise. Tropospheric Measurements. Tropospheric Analysis. Radio Systems Application Engineering.

Radio Standards. Radio Frequencies. Microwave Frequencies. High Frequency Electrical Standards. Radio Broadcast Service. High Frequency Impedance Standards. Calibration Center. Microwave Physics. Microwave Circuit Standards.

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1. College of Science, Tokyo University, Tokyo, Japan. Sunday, August 7, 1955.

The discussions concerning the visits in Japan with the following were most helpful and beneficial:

Enji Naito, Past President, Nitto Spinning Company
H. Tsukahara, Nitto Spinning Company
Dr. Masatami Takeda, Prof. Physical Chemistry, Tokyo College of Science
Keikichi Arai, Director, The Society of Polymer Science and Lecturer at Tokyo and Keio Universities
T. Takahiko, Planning Department, The Society of Polymer Science
Yukichi Arai, Department of Literature, Sofia University, Interpreter.

Visited Tokyo University with Prof. Takeda and met his wife and two daughters. Also met the director of the laboratories of the largest Department Store of Tokyo, who is a former student of Prof. Takeda, and was given a guided tour of the store and the modern air conditioned restaurant. It was impressive to observe the quantity and quality of merchandise and the huge crowd in the store, which remained open on Sunday until midnight. Prof. Takeda is on leave for 1955-57 to the University of Illinois and Harvard University and is planning a visit to the National Bureau of Standards before his return to Japan.

2. American Embassy, Tokyo, Japan. August 8, 1955.

Mr. Connelly, General Services Officer, provided very helpful information in connection with my travels in Japan.

3. The Society of Polymer Science, Tokyo, Japan, August 8, 1955.

Prof. Keikichi Arai, Director, explained the functions of the Society and of its publications, namely, "Journal of Popular Science of High Polymer" and "Report of Research of Society of Polymer Science". The August issue of the former and the June

and July issues of the latter were obtained as being typical. (They are in Japanese language.) Prof. K. Arai and Y. Arai accompanied me in all my visits in Tokyo and their assistance and hospitality are gratefully acknowledged and deeply appreciated.

4. Government Chemical Industrial Research Institute, Tokyo, Japan. August 8, 1955.

Dr. Koshiro Ishimura, Director, who had just returned in the morning from a 110 day round-the-world trip and including a visit to the National Bureau of Standards, explained the functions of the institute and the facilities in a tour through the laboratories. The basic researches are primarily aimed toward eventual pilot plant production of industrial products from raw materials that are available in Japan. A vitamin had been isolated from rice bran and it was claimed that fowl gained 25% more weight in 90 days when fed 0.02 mg per day. The crystalline structure had been determined but the chemical structure was still unknown. A low density refractory (1.05) of low thermal conductance (0.12) and resistant to high temperatures (1700° F) was in pilot plant production. Extensive researches were in progress recovering salts from sea water and producing fertilizers from rock. A 90 page booklet, published in 1950 in English, was obtained and it describes the main researches of the past and also the then current programs and is available for reference.

5. Tokyo Institute of Technology, Tokyo, Japan. August 9, 1955.

Professors Hosaku Uchida and Kan Shirakashi and members of the research staff. This Institute is located at Oh-Okayama, Meguraku, which is some 15 miles from the center of Tokyo. The Institute was established in 1881 as the Tokyo Trade School and in less than 70 years has become an outstanding Technical Institute of University standing. In addition to the main buildings of lecture rooms and dormitories there are over 25 laboratory buildings for researches in chemistry, dye chemistry, textiles, textile engineering, ceramics, applied chemistry, electrochemistry steam and power, metal engineering, internal combustion, hydraulics, electric power and high voltage, chemical engineering, architectural engineering, building materials, precision machinery, and chemical resources. Aeronautical engineering was abolished after World War II. After a tour through the research facilities in the fields of textiles and a general discussion with members of the staff one was impressed with the great emphasis on research, especially applied, in addition to training of engineers and scientists. In the field of textiles, for example, may be mentioned research and development work on tow to yarn spinning, development of SY yarn evenness tester based upon an aerodynamic sensing element (airmicrometer) with automatic recording and

and integration, development of an abrasion machine for testing 20 specimens simultaneously, studies of roller gripping in drafting and spinning machines. In general, the research studies are carried through the pilot production stage. The SY Evenness Tester is manufactured by Shimadzu Co., Ltd.

6. Kyoto, Japan. August 9, 1955.

Upon arrival in Kyoto had conference with Dr. Kiyohisa Fujino, Professor of Engineering, Kyoto University, and Chief Editor, Journal of the Textile Machinery Society of Japan, concerning the arrangements for my visits in Japan and for my lectures. This discussion, carried on in German, resulted in a most satisfactory program for the visits in Kyoto, Osaka, and Nagoya.

7. Toyo Rayon Company, Ishiyama Otsu, Kyoto, Japan. August 10, 1955.

Iwao Iwanaga, Managing Director
Kotaro Tanemura, Auditor
Kohei Hoshino, Director of Research Laboratory
T. Ohara, Manager of Seta Plant
Prof. Kiyohesa Fujino, Kyoto University

This company is a leading producer of rayon and sole producer of nylon in Japan. Visited two of the six plants, filament and spun yarn. The spun yarn plant contained over 100,000 spindles and uses new high drafting spinning machines, draft ratio of about 160, and it contained 370 new high speed automatic looms. The company produces the following main items and has the indicated productive capacity for each. Regular tenacity rayon yarn 38,500,000 lb.; high tenacity rayon yarn 7,500,000 lb.; rayon staple 61,000,000 lb.; spun rayon and nylon blended yarn 26,100,000 lb.; nylon filament yarn 12,100,000 lb.; nylon staple 5,400,000 lb.; nylon monofilament 280,000,000 meters; rayon, nylon and mixed filament fabrics 2,400,000 sq. yd.; spun rayon and nylon blended fabrics 20,500,000 sq. yd.; rayon tire fabrics 2,700,000 lb.; dyeing and finishing of rayon, nylon, blended, and mixed fabrics 29, 400,000 sq. yd. Through extensive research and modernization of equipment the Toyo Rayon Company aims to produce the highest quality at the lowest cost. The 1955 production exceeded the highest prewar level and a large percentage of production was exported.

8. Kyoto University, Faculty of Engineering, Kyoto, Japan. August 10, 1955.

Prof. Kiyohisa Fujino
Prof. Masao Horio
Prof. Takashi Kondo

Kyoto University, founded in 1897 with only 53 students, has grown rapidly to a distinguished undergraduate and graduate university with about 10,000 students in 1955. Excellent work is done in the field of textiles, textile chemistry and applied mechanics to textile machinery, as a part of the Faculty of Engineering. The outstanding work of Professors Fujino, Horio, Kondo, and associates is well known from their publications in Textile Research Journal. Nevertheless it was very enlightening to observe their research facilities and to participate in stimulating discussions concerning friction measurements of travelers in ring spinning, internal friction in tire cords, visco-elastic properties of fibers, double refraction, dynamic measurements from subsonic to supersonic frequencies in different fibers, and newly developed electron microscope. It was stated that five different electron microscopes have been developed in Japan for commercial production.

9. Toyo Spinning Company, Ltd., ("Toyobo") Osaka, Japan. August 11, 1955.

Kojiro Abe, President
Tamezo Yabuta, Vice President, Research and Manufacturing
Toru Saburi, Director of Textile Research Institute and Head of Technical Department
Toyohiko Ohta, Director and Manager of Institute for Textile Chemical Research
M. Shibata, Chief of Dyeing and Finishing Department
M. Yokoi, Manager of Moriguchi Dyeing Works
Shiro Koga, Manager of Spinning
Setsuo Nomura, Manager of Woolen

Since the end of World War II the Toyo Spinning Company, known as "Toyobo" the largest textile company in Japan, has acquired a "New Look" through extensive modernizations of manufacturing machinery, research and technical activities and developments, and thorough-going quality controls. In connection with the efforts in quality control Toyobo was presented the Deming Award in 1952 by the Japanese Union of Scientists and Engineers. In the newest cotton spinning mill unusually fine cotton yarns, count of 160 and higher, can be spun. It owns 27 mills, produces wood pulp for making filament and staple rayon; spins cotton, woolen, worsted, and rayon yarns; weaves fabrics from these yarns; dyes and finishes the woven fabrics. It operates a Textile Research Institute, a Chemical Research Institute for Textiles, and an Institute for Economic Research. Its educational facilities include a Training Center, a School for Nurses, and a Vocational High School in every mill. Mr. Koga stated that their first attempt to employ the N. C. State School of Textiles recommendations for high cotton carding production was not successful, but in view of the tremendous potential savings possible that a second application study is in progress. It was only possible to

observe the facilities of the laboratories of Textile Chemistry and of the Dyeing, Printing, and Finishing Plant at Moriguchi. The latter is equipped with new machinery for continuous bleaching, Sanforizing, dyeing, finishing, and printing and has a monthly productive capacity of 6 million yards for bleaching and 2 million yards for printing. It is interesting to note that the average age and average period of employment of 300 male workers were 30 and 7 years and for 340 female workers 19 and 3 years, respectively. After observing the quantity and quality of this plant and assuming that this plant is typical of the other plants the claim for the slogan "A New Look at Toyobo" seems appropriate.

10. All Japan Cotton Spinners' Association, Osaka, Japan. August 11, 1955.

Kuniji Ohba, Chief of Technical Division.

The primary function of the association is compilation and dissemination of statistical data concerning the cotton industry in Japan and in other countries as well. The information compiled for the May 1955 issues seem extremely comprehensive and complete and these copies are available to anyone interest in such information.

11. Japan Cotton Technical Institute, Osaka, Japan. August 11, 1955.

Fusajiro Abe, President
C. Oba, Director

This Institute was established 4 years ago for the following objectives:

1. To make technological studies and researches on cotton spinning, weaving and finishing and also on blending with other fibers.

2. To make joint studies in cooperation with, or entrust such works to Universities and other Technical Institutes.

3. To collect books and data on textile technology and to arrange meetings for technical study and research.

4. To do other business necessary to achieve the objects of the Institute. In less than two years over 30 projects were entrusted to 15 different Universities. Much progress has been made on these projects. In 1953 a branch office of the Institute was opened for promotion and educational purposes at Japan Spinners' Inspection Foundation. The purpose of this branch is to display for operation and public inspection a wide range of new textile machinery and samples of textiles

produced by cotton mills in Japan This facility is rather unusual and comprehensive and contains some 25 processing machines from about a dozen manufacturers, auxiliary machineries from over 60 makers, and textile products from over 20 textile manufacturers. The Show Room is running on a semi-permanent basis and whenever a new type of machinery is available the old one is replaced by the new one. Demonstrations of the machines exhibited are conducted for 2 days a month, although the Show Room is open daily to the public and particularly to buyers. The OM-S type Super High Draft Ring Spinning Frame is mentioned as a typical exhibit. With it yarns are spun directly from the Draw Frame Sliver and drafting up to 700 times is possible when very fine count yarns are spun, for example the drafting is 300 to 400 for 60 to 80 count and 150 to 250 for 20 to 40 count. In conventional spinning drafting of 20 to 50 times is considered "High Draft". The unusual interest in this development is immediately apparent and it is my understanding that arrangements have recently been completed for distribution of this equipment in the United States. It was stated that almost a million spindles are already in use in textile mills of Japan and other countries.

12. Japan Spinners Inspecting Foundation, JSIF, Osaka, Japan. August 11, 1955

Bungo Umemiya, Director and Chief of Yarn Inspection Department.

The new laboratories of the Japan Spinners Inspecting Foundation are equipped with new instruments and facilities for testing and new cotton processing machinery. One of the primary functions of the foundation is to inspect and test cotton products made in Japan for conformance with established quality standards for export trade and issuing certificates in accordance with the Export Commodities Control Law. In addition to the head office in Osaka, the Foundation maintains an office in Tokyo and also seven Inspection Houses serving different areas of Japan.

13. Japan Synthetic Textile Inspection Institute, Foundation, JSTIIF, Osaka, Japan, August 11, 1955

Kyuichi Ohata, President
Risaku Tsunokae, Director, Central Testing Institute

The extensive laboratory facilities and new instruments were observed and the functions were discussed. Chemically produced textile fibers and their products are subjected to an exact and strict inspection by the Japan Synthetic Textile Inspection Institute, Foundation (JSTIIF) prior to export in accordance with the Export Commodities Control Law. Seven branch inspection houses serve different areas and the.

products of the mills in these areas are examined daily and samples are submitted to the Central laboratories in Osaka for quality conformance according to Textiles Grading Standards known as Japan Industrial Standards (JIS) which are drawn up by authorities on the subject and instituted by the Minister of International Trade and Industry. All goods inspected by the Institute are stamped with the mark "JSTIIF". The total quantity inspected from April 1953 to March 1954 were as follows:

Rayon Filament Yarn	144,000,000	lb.
Rayon Staple	675,000	lb.
Spun Rayon Yarn	248,000,000	lb.
Rayon Filament Fabric (grey)	2,926,000	linear yards
Spun Rayon Fabric (grey)	152,000,000	square yards
Spun Rayon Fabric (finished)	19,000,000	square yards
Spun Vinylon Fabric (grey)	272,000	square yards
Spun Vinylon and Nylon Filament Fabrics (finished)	2,297,000	square yards

The keynote to an expanding export market and retention of this market of Japanese textiles is high quality products and maintenance of high quality. JSTIIF, as well as JSIF, are Government-approved inspection organizations. The stamp of approval by these foundations is highly regarded and appreciated in both overseas and home markets.

14. Osaka University, Faculty of Engineering Conference, Osaka, Japan. August 12, 1955.

Prof. Tokio Uematsu, Osaka University, Mechanical Engineering
Prof. Kemeo Nakajima, Naniwa University, Faculty of Engineering, Osaka, Interpreter
Prof. Kujohisa Fujino, Kyoto University, Faculty of Engineering
Prof. W. Tsuji, Kyoto University, Faculty of Engineering
Prof. M. Ogave, Kyoto Technical Art & Textile Fiber University
Prof. M. Oku, Kobe University, Faculty of Engineering
Akira Aoki, Research Processing Dept., Daiwa Spinning Co., Osaka.
Shiro Koga, Spinning Department, Toyobo, Osaka
T. Ueno, Managing Director and Secretary, Japan Textile Machinery Association, Osaka
T. Furuichi, President, Kamitsu Iron Works, Itami Hyogo-ken, Osaka
T. Kikuchi, Editor, Jour. Textile Machinery Society of Japan

In this forenoon conference questions pertaining to the testing of textiles, quality control, research, processing, and finishing were discussed. This question and answer conference was very stimulating and provided opportunity for discussion of problems of mutual interest.

15. Lecture arranged by Textile Machinery Society of Japan and Kyoto University, Mengyo - Kaikan, Bingomachi, Osaka, August 12, 1955.

Kojiro Abe, President, Toyo Spinning Co., Chairman
Prof. K. Fujino, Kyoto University, Discussion Leader
Prof. K. Nakajima, Naniwa University, Interpreter

The lecture entitled "Textile Research in the United States" was attended by over 300 scientists and textile technologists. The lecture was translated into Japanese by Prof. Nakajima, a recent graduate of the School of Textiles of N. C. State College, from memory in intermittent fashion of 1 to 2 minute speaking steps. It was illustrated with numerous slides and a special motion picture film and the total duration and discussion lasted three hours. The very attentive and appreciative audience made this lecture a new and delightful experience inspite of the intensely hot and humid afternoon.

16. Teikoku Rayon Company, Nagoya, Japan, August 13, 1955.

Isamu Washida, Plant Superintendent
Hodaka Toshio, Chief, Business Section

The Teikoku Rayon Company is the oldest and largest producer of rayon in Japan and has plants in 7 cities. The new mill at Nagoya was established in 1951 to produce spun yarn and woven fabrics. It is an extremely modern mill, equipped with high speed automatic looms and over 60,000 spindles of the super high draft system previously discussed. The yarns spun were of 20 to 60 count and the draft ratio from sliver to yarn was 200. The annual production of spun rayon yarn is about 27 million pounds of 27 average count. The mill is air conditioned throughout and the air is cleaned by means of two large capacity electrostatic air filtering units. The mill was exceptionally clean and the yarns and fabrics produced were spotless. About 30% of production is for export. About 80% of the 1020 employees are young women, who are housed in new company dormitories and receive special training at company expense. It was extremely gratifying to be able to observe the excellent facilities of this most modern mill. The company conducts researches in all fields of raw materials, chemicals, machines, finishing of rayon fabrics, and new synthetic fibers in its modern Research Institute and the results are put immediately to test at the Komatsu Mill.

17. Government Industrial Research Institute, Nagoya, Japan, August 13, 1955.

Dr. Taro Hisada, Director

This Institute is a branch of the main Institute in Tokyo and is operated as a part of the Ministry of International Trade and Industry. It has over 300 employees, has an annual budget of about $500,000 and conducts research in six Divisions that is primarily aimed at industrial applications. The Mechanical Division is concerned with textile machinery, bicycles, gears, cutting tools, machine shop machines, bearings, forming and extruding techniques for metals and plastics, solar furnaces, automatic controls, electronic computers, electric spark and ultrasonic forming, radioactive isotopes, and quality control of manufactured products. Polymer chemistry, organic synthesis of dyes and dyestuffs, synthetic resins form a part of the Chemical Division which includes a very wide range of general and specialized research in chemistry. The other Divisions are Metallurgy, Ceramic, and Porcelain and Pottery. The Institute has a three stage electron microscope with resolution of 2mμ and reflection and transmission photographs can be taken even at high temperatures, max. 900° C. Dr. Hisada visited NBS after attending the International Conferences on Solar Energy in Arizona in the Fall of 1955.

18. Lecture arranged by Nagoya University and the Institute, Nagoya, Japan, August 13, 1955.

Prof. Kenji Tanaka, Textile Department, Nagoya Institute of Technology, Chairman
Prof. Koji Nakanishi, Chemistry Department, Nagoya University, Interpreter.

The lecture given in Osaka was repeated upon request and was translated in the same manner by Prof. Nakanishi, who received his D. Sci. Degree from Yale University.

19. Informal Discussion arranged by Nagoya Branch of Textile Machinery Society, Gifu, Japan, Evening, August 13, 1955.

K. Kato, Textile Machinery Society
Suehoru Yasuda, Manager, Kurashiki Cotton Spinning Company, Anjo Mill.
S. Kitami, TOA Wool Spinning and Weaving Company, Kusu Mill
Professors Hisada, Tanaka, Nakanishi, and others

Opportunity was had to discuss the facilities of mills which time did not permit to visit. One was Kurashiki Cotton Spinning Company that operates 12 modernized mills for cotton spinning, weaving, and finishing. Their Anjo Mill was constructed in 1951 and is considered one of the most modernized

mills in Japan. There are two spinning units and one weaving unit in this mill. The spinning units are equipped with 96,000 ring spindles of the most improved super high draft system. The weaving unit consists of 962 automatic looms. The Company also provides many recreational, welfare and educational facilities for its employees. Photographs provided of the interior of this mill indicate the entensive and extremely modern aspects of the mill. Their Kusu Mill has 80,000 spindles for worsted spinning, French system, ring and mule spinning. The discussions ended about midnight in a small boat on Nagara River during which a delightful meal was had and opportunity was provided to observe Cormorant fishing by Masters according to the manner and customs of 1500 years ago.

20. Seminar arranged by the Society of Polymer Science, Tokyo, Japan, August 14, 1955.

Prof. K. Arai, Keio University, Chairman
Prof. Eiichi Kiyooka, Director, International Department, Keio University, Interpreter
Takeo Takagi, Director Vice-President, Toho Rayon Company
Yoshio Tsunoda, Director, Asahi-Dow Limited
Prof. Hidehiko Higashi, Agency of Industrial Science and Technology
Prof. Eiichi Fukada, Kobayasi Institute of Physical Research, Tokyo
Prof. M. Suzuki, Shinshu University, Faculty of Textile and Sericulture, Ueda
Prof. Tadasi Zusi, Textile College, Tokyo University of Agricultural and Textile Technologies, Tokyo

Mamoru Nakamoto, M. Yamabe, and some 30 scientists and technologists of Tokyo. An illustrated seminar lecture was given concerning recent textile researches in the United States and this was followed by a discussion for 1-1/2 hours with the main interests in standards, establishment of standards, and methods for quality control. Work on piezo-electricity of wood, statics of the balanced twist, simple method of measuring the moisture content in fibrous materials and impact actions in carding long staple fibers were mentioned in connection with research at local universities. The Toho Rayon Company was established in 1950 when Teikoku Sen-i K. K. was divided into three companies to conform with the Authorized Reorganization Plan required by the Reconstruction and Reorganization Law for Elimination of Excessive Concentration of Economic Power. The main products are "spiral" crimped rayon staple, spun rayon yarns and fabrics , direct spun (tow to yarn) rayon yarns and fabrics, spun-dyed crimped rayon staple, rayon yarn spun on the wool-spinning systems, and acetylated crimped rayon fiber. Considerable information concerning the manufacture of these products was made available.

21. Keio University, Mita, Minatoku, Tokyo, Japan, August 15, 1955.

Prof. Dr. M. Masima, Dean, Faculty of Engineering, Applied Physics
Prof. Dr. M. Fujii, Dept. of Applied Chemistry
Prof. Dr. I. Watanabe, Mechanical Engineering
Prof. Mikio Hiramatsu
Prof. Eiichi Kiyooka, Director, Internaional Department, Interpreter
Prof. K. Arai, Polymer Science Lecturer
Prof. M. Suzuki (Formerly of Keio University)
Prof. S. Akimoto

The visit to Keio University was in the nature of a series of round-table conferences with different Professors discussing typical researches in the various departments of the University. Keio University was founded less than a century ago as a private school by Fukuzawa Yukichi, who is regarded as the progressive leader to introduce western culture to Japan and urge its general adoption. In this essentially single-handed movement he had to overcome powerful opposition and even risk his life frequently to attain his aims and convictions. He taught himself the Dutch language and later English and his zest, zeal, and passion for the establishment of this great progressive Keio University were firmly rooted at this time, just about a century ago. It seems almost incredible that as recent as a century ago there was essentially no knowledge of western culture and progress in Japan in contrast to the position and leadership currently found in the modern Japanese industries, culture, and education. In the ceaseless efforts to promote western culture in education, Fukuzawa Yukichi became a prolific writer and derived considerable income with which to support the phenomenal growth of Keio University. This unselfish dedication to the high aims and ideals of Keio University has been perpetuated to the present by the Faculty and Students in rebuilding Keio University, which was so severely destroyed by bombs at the close of World War II, and is an indelible impression of the visit. The theoretical and experimental researches in applied science are not only extensive but thorough. The study on "Pneumofil" in the field of textile machinery is a typical example. The simple method for the measurement of the concentration of pulp solutions appears very practicable. A definite quantity of the solution is poured into a beaker, the solution is rotated by a propeller, and the time is noted from the instant the propellor is suddenly withdrawn until the liquid has come to rest. In the whole range of concentration the following formula holds: $C = Kt^n$, where C is the pulp concentration, t is time to the halt of the solution and K and n are constants depending on the forms of the beaker and the propeller as well as on the propeller speed.

22. Japanese Standards Association, JSA, Tokyo, Japan, August 15, 1955.

Tadashi Kasaishi, Managing Director
Daisaku Miwa, Chief, Standards Division, Agency Industrial Science and Technology
Ministry of International Trade and Industry

The Japanese Standards Association was established in 1946 for the purpose of improving productivity in industries and of benefitting general consumers through standardization. To meet this purpose, JSA is performing lots of research projects and promoting industrial standardization. JSA, being provided with no subsidy, has to finance all its activities partly with revenues raised from publishing JIS, Japanese Industrial Standards, and industrial books and partly with dues collected from sustaining members. JSA prepares drafts for JIS, maintains close liaison with standardization bodies in overseas countries, and maintains library of overseas standards, promotes quality control through seminars, sponsors lectures, promotes the standardization of industrial terminologies in cooperation with the "Terminology Studying Committee" of Educational Ministry, and assists in the promotion of products of factories licensed to place JIS-Mark on manufactured items. "The factories licensed to place JIS-Mark" stand for the factories which are qualified by Government, according to the Industrial Standardization Law, or having competency to produce invariably the designated products of quality good enough to meet the relevant JIS and enjoys the license of affixing the JIS-Mark on the products.

23. Japan Chemical Fibers Association, Tokyo, Japan, August 15, 1955.

S. Moto, Manager

The Japan Chemical Fibers Association was established in 1948 by the manufacturers of rayon, acetate, and synthetic fibers and their spinners. The objects are furthering of amity among the members, research of problems both economical and technical, dissemination of information, promotion of end uses, publication, and accumulation of statistics of Japan's Chemical Fiber Industry and also of the World Chemical Fiber Industry. According to statistics provided by the association, Japan ranked first in world production in 1938 with a total of 540 million pounds of rayon and staple fiber. This value dropped to 27 million pounds in 1945, rose to 253 million pounds in 1950, 369 in 1951, 404 in 1952, 521 in 1953, 633 in 1954 and was estimated to reach 688 million pounds in 1955. Since 1952, Japan has been the second largest producer (USA being first with about 1,100 million pounds). Since 1952, Japan has been the largest producer of rayon and acetate staple fiber: 358 million pounds in 1953 against 310 for USA and 448 million pounds in 1954 against 379 for USA. The estimate for 1955 was 496 million pounds.

24. Nitto Boseki Spinning Company, Tokyo, Japan, August 15, 1955.

Enji Naito, Past President
Dr. Naito, Director
T. Fujita, Chief, Reinforced Plastic Research

A discussion conference was had with a group of some 20 staff members of the Nitto Spinning Company. The discussions were primarily concerned with measurements of the mechanical properties of fibers, yarns, and fabrics, their interrelationship and correlation with performance in use. Dr. Naito acted as interpreter in addition to discussion leader. Time did not permit to visit plant and research facilities.

25. Kokoku Rayon and Pulp Co., Tokyo, Japan, August 16, 1955.

Taichiro Shiraiwa, Managing Director
Yukio Arisawa, Director & Chief of Technical Research Section
Hajime Suzuki, Fabrics Section Rayon Sales Dept.

Since time did not permit to visit plant and research facilities a general discussion conference was had concerning their production and research program.

26. American Embassy, Tokyo, Japan, August 16, 1955.

A verbal discussion was had with Mr. Connelly, General Services Officer concerning my visits and observations in Japan.

27. Farewell Lecture Arranged by Society of Polymer Science and Chamber of Commerce, Associated Press Auditorium, Tokyo, Japan, August 16, 1955.

The lecture was attended by some 300 persons and the following topics were discussed: Broad NBS textile research activities and cooperation with other agencies; current research programs; processing research and quality control in textiles; comments concerning living standards in US (by request); impressions concerning my visit in Japan (by request); and an appraisal of accomplishments of the visit. The interest, enthusiasm, and generous hospitality, which remained unabated until it was time to rush to the airport, remain a greatly cherished memory of a very profitable visit with fellow scientists and technologists of Japan.

28. American Consulate, Sidney, Australia, August 18, 1955.

Had informal discussion concerning the attendance to the International Wool Textile Research Conference in Australia and received a communication from the Agriculture Attache in New Zealand outlining an extensive itinerary for a proposed visit to New Zealand, which could not be made for lack of time.

29. Wool Textile Research Laboratory, Physics and Engineering Unit, C.S.I.R.O., Sidney, Australia, August 19, 1955.

V. D. Burgmann, Director
Senior Research Staff of 15 members

The facilities were discussed for measurements of the physical properties of fibers, including viscoelasticity, interaction with water; physical properties of fiber assemblies, including mechanical properties, yarn structure, heat and water vapor transfer; physical and engineering problems of textile processing, including fiber loads, extensions, movements, and configurations, mass flow. It is of interest to note that the configurations assumed by a single wool fiber in worsted processing and estimates of strain analyses on the fiber were obtained by making the fiber radioactive, immersion in a suitable solution, and then making radiographs of the fiber in many stages during the worsted processing. The strains were derived from the various configurations. This laboratory, established in 1952, is already well equipped, and excellent work is being done by an alert research staff of young scientists.

30. National Standards Laboratory, Sidney, Australia, August 19, 1955.

A. J. Higgs, Technical Secretary

The facilities and research programs in the Divisions of Electrotechnology, Metrology, Physics, and Radiophysics were explained, and several laboratories were visited. The National Standards Laboratory, located on the grounds of Sidney University, is essentially equivalent to the NBS.

31. Radio Astronomy Observatory, Potts Hill, Australia, August 19, 1955.

J. B. Hindman, Radio Astronomer

The radio-telescopes of the Observatory at Potts Hill are located in the vicinity of the city reservoir some 20 miles from Sidney. In one installation two sets of 32 radio receivers are arranged along the two perpendicular sides of the reservoir

and are so connected to form a 32 element interferometer. The instruments for recording the 21 cm radio waves emitted by interstellar hydrogen were explained and the most recent maps showing the galactic distribution of hydrogen were examined and compared with those based upon information obtainable with optical telescopes. The radio telescopes are much more powerful than the optical telescopes. The plans for even more powerful radio telescopic observations were indicated. The outstanding observational results of this Observatory are well known and it was a privilege to visit and observe their facilities.

32. International Wool Textile Research Conference, Sidney, Australia, August 20 - 25, 1955.

At 15 technical sessions of the Sidney meetings over 50 technical papers were presented and discussed. The general subjects were: Studies of Soluble Proteins; Elastic Properties of Wool; The Problems of the Producer and Biologist in Meeting the Needs of the Textile Industry; Discussion on Biological Aspects; Studies Relating to Wool Manufacture; Histology of the Sheep Follicle; Physical Properties of Wool Fibers, Yarns, and Fabrics; Reactivity of the Disulphide Bond in Proteins and Peptides; and Dyeing and Finishing. At one session the writer presented the paper "Stress-Strain Relationships in Yarns Tested at Rates of Straining up to a Million Percent, Per Minute." In addition to the technical papers the following lectures were given.

Prof. W. T. Astbury, Leeds University, In Praise of Wool
Dr. H. P. Lundgren, U.S.D.A., Advancing Frontiers in Wool Chemistry
Prof. H. Eyring, University of Utah, A Statistical-Mechanical Theory of Visco-Elastic Behaviour
Prof. J. B. Speakman, Leeds University, The Future of Wool
Dr. R. L. M. Synge (Nobel Laureate) Rowett Research Institute, The Principles of Chromatography

The Conference was attended by 53 overseas scientific delegates and some 200 Australian scientists and textile technologists. In addition to the technical sessions and lectures there were a number of social sessions with opportunities for informal conferences and discussions among the delegates.

33. Australian National University, Canberra, Australia, August 26, 1955.

The Australian National University was established by Act of the Commonwealth Parliament in 1946 to encourage and provide facilities for post graduate research and study. The

four Research Schools mentioned in the Act are the following:

The John Curtin School of Medical Research
The Research School of Physical Sciences
The Research School of Social Sciences
The Research School of Pacific Studies

The facilities of these schools were in various stages of completion on a tract of 200 acres. The Research School of Physical Sciences is comprised of six departments - Astronomy, Geophysics, Radiochemistry, Nuclear Physics, Particle Physics, and Theoretical Physics. The facilities of the Nuclear and Particle Physics Departments were explained and inspected. Under the direction of Professor E. W. Titterton, Head of the Nuclear Physics Department, research work is in progress using two cascade generators of the Cockcroft-Walton type for 0.6 and 1.2 million volts. An electron synchrotron of 33 MeV. has been installed, and in the near future an 8 MeV. cyclotron producing very intense beams will be available. This cyclotron will serve eventually as the injection source for the large proton-synchrotron now under construction. The design and construction of this novel type of proton-synchrotron is under the direction of Professor M. L. E. Oliphant, Head of the Particle Physics Department and Director of the Research School of Physical Sciences. It is provided with a 148-inch pole-diameter electromagnet, and the particles produced will have energies above 10 billion electron-volts, making it one of the most powerful in existence.

34. C.S.I.R.O. Divisions of Entomology and Plant Industry, Canberra, Australia, August 26, 1955.

Dr. A. J. Nicholson, Chief of Division of Entomology
Dr. O. H. Frankel, Chief of Division of Plant Industry

The broad programs of research carried out by these Divisions were explained in relation to their importance to the wool industry. Typical examples are physiology of digestion of wool by clothes moth larvae and other keratin digesting insects, biochemistry of digestive tract, insect muscle enzymes, chemistry of cuticle and its components, development of resistance to insecticides, insecticidal formulations, transmission of virus diseases by insects, myxomatosis, and sheep blowfly disease. The exhibition of butterflies was most impressive and probably was one of the most complete and beautiful in existence. Typical broad areas of research in Plant Industry are genetics and cytogenetics, plant introduction in different climatic zones, microbiology, plant chemistry and biochemistry, plant nutrition, plant physiology, weed control and plant toxicology, plant ecology, pasture problems, irrigation studies, and special crops.

These studies have led to major economic developments in the wool industry, for example, the introduction of the virus disease myxomatosis has been very effective for controlling the rabbit menace, (7 rabbits consume as much feed as one sheep), the studies relating to pastures of subterranean clover and Phalaris tuberosa grass, and of zinc, copper, and cobalt deficiencies in soil has led to the recovery of vast areas for pastures and also improved pastures so that the number of sheep supported per acre has more than doubled.

35. Tour of Sheep Raising Areas of South Australia, August 27-30, 1955.

The four-day 500 mile tour was made by bus starting at Mt. Gambier near the southern coast of Australia, northwesterly to Naracoorte and Keith, easterly to Bordertown and Dimboola, southerly to Horsham and Hamilton, southeasterly to Camperdown and Colac, and easterly to Geelong. During this tour it was possible to observe (a) the outstanding improvements in pastures to support a much larger population of sheep; (b) the vast tracts of waste lands that had been transformed, through research on mineral deficient soils, into fertile pasture land; (c) the South Australian Soldier Settlement Farms, which is a Land Development Scheme of desert area carried out by a life insurance company, The Australian Mutual Provident Society; (d) large scale sheep shearing and wool classing; (e) a number of flocks of Merino and Polwarth sheep; and (f) the effective control of the rabbit menace through the mosquito-borne virus disease, myxomatosis. It was also pointed out that the toxicity of Phaloris Tuberosa which causes a fatal malady of "Staggers" can be effectively controlled by a supplementary diet of 0.1 mg. cobalt per day. It is of interest to note that Australia with a population of less than 10 million people has a sheep population greater than 120 million and raises over 1/4 of the World production of wool. The annual wool clip exceeds a billion pounds which has a value of about a billion dollars and this is an important economic factor to Australia. Wool exports from Australia earn between 40 to 50 percent of total exports, and in several years have exceeded 50 percent of total export earnings.

36. Wool Textile Research Laboratory, Processing Unit, C.S.I.R.O., Geelong, Australia, August 31, 1955.

Dr. M. Lipson, Director
Senior Research Staff of 16 members

The nucleus of the present research staff was initially accomodated in the laboratories of the Textile College of the Gordon Institute of Technology in Geelong. Since 1950, new facilities were erected on 15 acres of grazing land at Belmont,

which now include extensive laboratories, pilot plant, textile machinery equipment for almost every operation concerned with wool processing. In addition the facilities of wool industry are used in a cooperative arrangement to explore the applications of research in full scale plant operations. The program of research includes: scourable sheep branding fluids; wool scouring processes, especially a continuous solvent degreasing process; lanolin recovery by the flotation process; dyeing of wool; chemical modification of wool, especially mothproofing and resin-treatment for shrinkproofing; the drafting process, in relation to such factors as yarn evenness and improved processing; combing and batching oils in wool processing; the frictional properties of yarn against metal; mechanical properties of fibers; crimp removal; and weaving problems.

37. International Wool Textile Research Conference, Geelong, Australia, August 31 - September 3, 1955.

At 8 technical sessions of the Geelong meetings almost 50 technical papers were presented and discussed. The general subjects were: Carding, Drafting, and Spinning; Fine Histology of Wool and Hair; Interaction of Wool and Water; Wet Processing of Wool; The Behaviour of Wool Fibers During Mechanical Processing; and Amino Acid and Functional Group Analysis of Proteins.

38. Textile College, Gordon Institute of Technology, Geelong, Australia, September 1, 1955.

W. R. Lang, Head of Textile College
G. Jones, Head Textile Chemistry Department

Theoretical and practical training courses are given in Textile Chemistry and Textile Industries, including woollen and worsted spinning, cotton yarn manufacturing, weaving, dyeing and finishing. Unusual opportunities and facilities are afforded the faculty and students in view of the fact that Government Woolclassing, Publ ic Textile Testing, and Textile Research Departments are integral units of the Textile College. The Textile Testing Laboratory is well equipped and has the National Association of Testing Authorities recognition for specified physical and chemical tests. Research concerning wool fiber characteristics of interest to woolgrower, broker, and manufacturer, with emphasis on the nature and significance of crimp in manufacturing, fineness-crimp-quality number relationships, and studies on cystine linkage and wool damage, has led to over 20 publications in the last 10 years by members of the Textile College Staff.

39. Symposium with Textile Manufacturers, Arranged by The Woolen and Worsted Manufacturers' Association of Victoria at Gordon Institute of Technology, Geelong, Australia, September 1, 1955.

Dr. M. Lipson, Chairman

The following three summary papers were presented:

Worsted Processing by Dr. A. B. D. Cassie, Wool Industries Textile Association, Leeds.
Wet Processing by Professor C. S. Whewell, Leeds University, Leeds.
Woolen Processing by Dr. I. G. Martindale, Scottish Woolen Technical College, Galashiels.

In these papers each speaker covered the latest development and their probable impact on the industry. At the conclusion of the papers a lively discussion followed in which the audience, estimated as over 500, participated. A summary of the symposium was given at the conclusion by the chairman.

40. Valley Mills, Geelong, Australia, September 2, 1955.

L. W. Wright, Manager

Drs. Happey and Hannah of England, Dr. Kritzinger of South Africa, and Drs. Lundgren and Schiefer of the United States visited the Valley Mills which was followed by a general discussion. This mill scours wool and processes it into high quality fabrics following typical British procedures. It is a relatively small mill and the demand is not felt sufficient to justify a high speed modern production organization.

41. Wool Textile Research Laboratory, Biochemistry Unit, C.S.I.R.O., Melbourne, Australia, September 5, 1955.

Dr. F. G. Lennox, Director
Senior Research Staff of 24 members

The research facilities and programs were explained and the accomplishments by an able and energetic staff of young scientists (14 Ph. D., 6 MSc., and 3 BSc. staff members) were indeed impressive. The researches in 16 laboratories included the following: Collagen and acid damage of wool; amino acid analysis of wool; electrophoresis; diffusion; cystine and lanthionine; fungal degradation of cellulose; infra-red spectroscopy; microscopy and X-ray diffraction; polargraphy and kinetics of peptide hydrolysis; microbiology; organic chemistry; sheepskin digestion, carbonizing, wool protein denaturation, and trypsin digestion; surface chemistry of proteins; viscosity, asmotic pressure, refractometry, ulracentrifuge, light scattering; chromatography; peptide synthesis.

42. Forest Products Laboratory, C.S.I.R.O., Melbourne, Australia, September 7, 1955.

Dr. R. S. T. Kingston

The testing facilities of the Forest Products Laboratory were observed and the research programs were discussed. The research programs are concerned with experimental and theoretical studies of the chemical and mechanical properties of wood, pulp, and paper, including creep, relaxation, and rheology as affected by moisture, temperature, and time and magnitude of stress application. Approximately 200 papers have been published by the staff during the last 10 years. Over 40 recent reprints and a list of Forest Products Laboratory publications were obtained for reference purposes. The following reprints are typical:

A critical temperature range in the plastic deformation of plywood.
The nature of plastic deformation in wood at elevated temperature.
Rheological changes during gel formation in adhesive systems.
Creep in initially green wooden beams.
Stress-strain relationship: a mathematical model.
The recovery of plywood after compression at elevated temperatures.
Factors influencing the plastic deformation of timber and plywood in compression.
Creep and stress relaxation in wood during bending.
Mechanical and physical properties of coconut palm.
The effect of temperature on the strength of wood, plywood, and glued joints.
The fiber-bonding materials and their importance in pulping.
The influence of electrolytes on pulp and paper properties: Cation and anion effects.
Pulping studies of five species of mangrove association.
The structure and properties of paper: the D.F.P. rheometer and significance of swellingand hydrogen bonding on interfiber adhesion.
Measurement of the viscosity of alkali-cooked pulp with cupriethylenediamine.
The application of viscosity increments to the study of two problems in the behaviour of casein.
Chain-length distribution studies on nitrated wood and cotton celluloses.
Mechanical conditioning of high polymers
Kinetic treatment appropriate to rapid reactions involving two consecutive second order steps
The sampling of timber for standard mechanical tests.
Interpolation in a series of correlated observations.

Equipment for simultaneous determination of thermal conductivity and diffusivity of insulating materials
Diffusion in wood: Theory, temperature coefficient, ion selection and its effect on the diffusion of electrolytes.
A method of measuring the thermal conductivity of poor conductors.

43. Holeproof Hosiery Company, Melbourne, Australia, September 7, 1955.

Mr. D. C. Arnold and Mr. Wilkinson, Research and Testing

A general discussion was had concerning performance tests for textiles and for quality control. This was followed by a tour through the mill which contained equipment for throwing silk (6-thread silk for women's hosiery) twisting and setting of nylon for all-stretch hosiery which have become very popular, and knitting of full fashioned nylon hosiery using very high speed 60 gauge machines manufactured in Reading, Pa. Full inspection and quality control assure high quality sheer women's nylon hosiery of high gauge and low denier.

44. International Wool Textile Research Conference, Melbourne, Australia, September 5-9, 1955.

At 10 technical sessions of the Melbourne meetings, nearly 40 technical papers were presented and discussed. The general subjects were: Bilateral Structure of Wool; Amino Acids and Peptides; X-ray and Infra-Red investigations of Protein Structure; Enzyme and Protein Chemistry; Chemical Modification of Wool; Shrinkproofing and Mothproofing of Wool. In addition to the technical papers the following lectures were given:

Dr. E. G. Carter, Technical Director, International Wool Secretariat, Wool Science and Wool Supremacy.
Prof. R. B. Corey and Linus Pauling (Nobel Lureate) California Institute of Technology, Configurations of Polypeptide Chains in Proteins.
Prof. F. Sanger, Cambridge University, The Structure of Insulin.
Prof. Emil L. Smith, University of Utah, Leucine Aminopeptidase; Specificity, Mechanism of Action and Use in Study of Peptide and Protein Structure.
Prof. H. Zahn, University of Heidelberg, Experience with Cross-Linking Reactions in Wool.

In summary it is appropriate to note some general observations concerning the International Wool Textile Research Conference, Australia, 1955.

There is no question but that this conference was extremely well organized by the arrangements committees. The conferences were attended by representatives from most research and educational institutions concerned with wool and protein materials and the technical papers and lectures covered the most recent progress of all research phases very thoroughly. The five volumes of the proceedings will provide a most valuable and complete record of up-to-date information and also indicate very forcefully the many areas where additional research and development is urgently needed to resolve many questions concerning which there is conflicting or inadequate information.

In a symposium near the end of the conferences an attempt was made to enumerate the fiber characteristics of wool that are most desirable and it was not possible to reach full agreement. Nor was it possible to reconcile some divergent views expressed concerning the number of different types or classes of wool fiber that are necessary for producing the wool fabrics for consumer uses, even though there was general agreement that it was the finishing of the fabric which contributed most importantly to the ultimate and desirable attributes of the fabrics.

It was rather apparent that present knowledge concerning the structure of wool and its chemical behaviour is incomplete and also in part contradictory. To avoid some of the latter it was strongly felt that provisions should be made to establish a fairly large quantity of "Standard" wool for experimental purposes and steps were initiated for C.S.I.R.O. to provide such a standard wool of known origin to any worker desiring it for research purposes.

The view was also expressed that it seems senseless to breed and produce superior wool and then to damage it severely in processing, such as necessarily follows current scouring procedures. A satisfactory continuous solvent degreasing process without subsequent wetting would largely solve this problem. A delegate from Sweden stated that such a process had been achieved and is being used in a large Swedish Mill, but he failed to provide convincing evidence to dispel the doubts of some delegates. The continuous solvent degreasing process developed by C.S.I.R.O. at Geelong seemed expremely promising.

The excellent staff of young scientists of the three Wool Research Laboratories of Australia and their contributions of outstanding technical papers at the conferences indicated clearly that major scientific advances in wool research will result from their efforts.

At the conclusion of the conferences the views of the delegates were essentially unanimous that this conference was extremely successful and worthwhile and that a similar conference should be planned for 1960. The majority of the delegates suggested that it again be held in Australia. The benefits and stimulations a delegate receives by attending such a conference and from the personal contacts with the delegates are numerous and need not be mentioned individually. It is recommended that a delegate attend the conferences planned for 1960.

45. American Consulate, Sidney, Australia, September 9, 1955.

A brief visit was made to the American Consulate in Sidney to obtain communications concerning the visit to India.

Report on the Visit to India, September 10 - October 7, 1955

By Dr. Herbert F. Schiefer, National Bureau of Standards
Under the U.S.A. Technical Cooperation Mission to India
International Cooperation Administration, State Department

46. American Consulate, Calcutta, India, September 12, 1955.

Arrangements were made for the visit in Calcutta and for Air Flights in India.

47. Technological Research Laboratories, Indian Central Jute Committee, Regent Park, Tollygunge, Calcutta, India, September 12, 1955.

Dr. P. B. Sarkar, Director, and staff

The facilities for jute processing and for research were explained and this was followed by a discussion with members of the research and testing staff. The main discussion was concerned with methods for testing the mechanical properties of jute fibers and of jute yarns and fabrics, especially strength, resistance to abrasion, and surface friction.

48. U.S.A. Technical Cooperation Mission to India, New Delhi, India, September 13, 1955.

Mr. Clifford H. Willson
Mr. Hyde Buller
Mr. Harold Flaata
Mr. Jack Kent
Mr. Gordon Wagenet
Mr. Edward Largent
Mr. Robert Rick
Mr. Roberts

The purposes and objectives of the visit to India were discussed as well as the arrangements for specific visits and lectures in the areas of New Delhi, Bombay, and Ahmedabad. The arrangements for the visits were made mostly by Mr. Kent and Mr. Roberts.

49. Council for Scientific and Industrial Research, CSIR, New Delhi, India, September 14, 1955.

Prof. M. S. Thackar, Director

Prof. Thackar outlined the procedures for coordinating the research activities in India through CSIR. All research programs and requests for research grants are reviewed by CSIR and must receive approval before the work is undertaken.

There is special interest in radio and micro wave research and in Solar Energy. He indicated that a delegate from India would attend the Solar Energy Conferences in the United States in the Fall of 1955 provided necessary arrangements can be made. Mr. Flaata offered assistance through TCM and Dr. Mathur, Deputy Director, National Physical Laboratory attended and also visited the National Bureau of Standards.

50. Textile Department, Delhi Polytechnic Institute,,New Delhi, India, September 14 and 21, 1955.

Prof. R. N. Srivastava, Acting Department Head

Professor Srivastava attended the School of Textiles, N. C. State College, 1951-53, and during part of this period he was a student of the writer. Since his return he has been acting head of the Textile Department of Delhi Polytechnic Institute and has initiated steps to modernize the textile testing and processing facilities, and to strengthen the staff and courses of instructions. He also reviewed future plans and improvements based upon his experience and knowledge at N.C. State College to attain a higher standard of training to meet the needs of the textile industry in India. He mentioned a number of factors which are hindering progress, such as insufficient funds for purchase of processing and testing equipment, difficulty in obtaining modern equipment, inadequate space, very meager library (especially technical journals and books from overseas), and mental anguish and uncertainty associated with the long delay of pending action concerning his status as Head of the Textile Department. The facilities of the Department were observed and it was gratifying to see the progress that had already been made since 1953. The available space had increased 3 - fold and considerable equipment had been installed and much more was still in crates to be installed. Much remained to be accomplished, however, to attain another contemplated 5 - fold increase in space and facilities. Prof. Srivastava sought advice concerning many problems and appreciated the assistance provided. He deserves every consideration and assistance possible to aid him in attaining the goal of a much higher standard in the Textile Department. The respect and enthusiasm shown by his staff and students was outstanding and the establishment of the "Society of Textile Technologists, Delhi Polytechnic" by students and staff members is a progressive step. The inaugral meeting of the Society was held on September 21 with an attendance of over 200 and it was my privilege to attend this meeting and to give the inaugral guest lecture. The primary objective of the Society was stated to be the promotion of the educational activities among the students and staff members, including

a series of lectures by experts from the industry, educational and research institutions, and weekly study discussions on current technical problems and developments of the industry. It is worth noting that in this connection the Society expressed the hope to receive the cooperation of the United States Information Service in provided motion picture films that illustrate current textile processing and other technical progress in the United States and other countries. This provides an opportunity for education and promotion among the youth of India's future technical experts which should be supported and fully utilized.

An interesting reprint "Effect of Twisting on the Optical Diffraction Patterns of Single Fibers" was received from P. K. Katti and M. T. Chiplonkar, Department of Applied Science, Delhi Polytechnic. In this work the optical diffraction patterns of single fibers are studied using experimental arrangements similar to those used for the X-ray diffraction camera, and using visible light instead of X-rays. It appears that this technique may be useful in studies of changes produced in fibers by mechanical and chemical modifications as well as differences between fiber types. The paper is published in the Journal of Scientific Industrial Research, 1955, Vol. 14-B, No. 6, pp. 253-257.

51. National Physical Laboratory, Delhi, India, September 15 and 20, 1955.

Dr. K. N. Mathur, Deputy Director
Dr. Amarjit Singh, Electronics Division
Dr. R. K. Kaul, Applied Mechanics Division

The National Physical Laboratories are housed in an excellent new structure since about 1949. The various facilities were explained and the research programs were discussed. The work parallels that of the National Bureau of Standards and excellent accomplishments have resulted since its establishment, including magnetron tube, theoretical studies of vibration phenomena, and on solar energy. Interest was expressed for closer contact and association with the work at the National Bureau of Standards and at this writing an extensive visit to the Bureau has been made by Dr. Mathur after his attendance at the Solar Energy Conference in the Fall of 1955 and the mailing of reprints pertaining to research in Engineering Mechanics to Dr. Kaul and Dr. Cadambe. The writer gladly accepted the invitation to give an illustrated lecture to the staff of over 100 on "Stress-Strain Relationships in Yarns Subjected to Rapid Impact Loading." The lecture was followed by an extensive discussion.

52. India Standards Institution, New Delhi, India, September 16, 1955.

Dr. H. Verman, Director
Mr. M. Kishen, Deputy Director

The procedures for the development and promulgation of standards were reviewed and discussed, particularly with reference to textiles. Many standards for textiles have been issued which often follow the requirements of overseas standards. In later visits to industry a criticsm of the India Standards Institution was the fact that many textile standards are issued with insufficient guidance from industry with the result that some of the standards contain requirements that can not be met in India and so do not reflect national conditions and interests. New facilities are under construction for the India Standards Institution, which is currently housed in the Shri Ram Institute for Industrial Research.

53. Shri Ram Institute for Industrial Research, Delhi, India, September 16 and 19, 1955.

Dr. D. N. Daruvalla, Director
Dr. V. B. Chipalkatti, Deputy Director

The research facilities were observed and explained and the research aims and programs were discussed in considerable detail. The Institute established by the "Lala Shri Ram Charitable Trust" and is located in new buildings completed in 1950 on 10 acres of land in the Delhi University area. It conducts research for sponsors, such as industrial concerns in India, groups of companies, individuals or Government agencies, as well as research financed from the Institute's endowment funds. The Institute's broad fields of research include the following: Industrial Chemistry; Fuels and Combustion; Mineral Processing; Chemical Engineering; Electrochemistry; Plastics and Paints; Textile Chemistry; and Sugar Technology. The Institute takes complete technical responsibility for the development of a project from its evaluation as a new idea to its final successful culmination as a commercial manufacturing enterprise. The work progresses through a laboratory test tube stage into a pilot plant stage into a semi-commercial scale stage into a final scale commercial manufacturing enterprise. The Director of the Institute had recently returned from an extended visit to research centers in the United States, including the Division of Organic Fibrous Materials and other areas of the National Bureau of Standards. The Institute, which has grown rapidly and has already made outstanding progress since its establishment, is destined to play an important part in the Industrial Economy of India.

54. Luncheon, Delhi Gymkhana Club, Delhi, India, September 16, 1955.

At a luncheon arranged by Mr. Hyde G. Buller, TCM, as host, opportunity was provided to meet key people of India, TCM, and the U.S. Embassy and to discuss technical problems. In addition to 10 persons from TCM and the U.S. Embassy the following were present from India.

Dr. Meghnad Saha, Member of Parliament and well known Nuclear and Astrophysicist
Dr. Nanjappa, Textile Commissioner of India
Dr. K. N. Mathur, Deputy Director, National Physical Laboratory
Dr. Maharaj Kishan, Deputy Director Textile, Indian Standards Institute
Mr. Rameshwar Dayal, Under Secretary, Dept. of Economic Affairs, Ministry of Finance
Mr. A. Nagaraja Rao, Industrial Advisor, Ministry of Commerce and Industry and a member of the Governing Board of Shri Ram Institute for Industrial Research
Prof. Humayun Kabir, Secretary, Ministry of Education
Mr. K. G. Saiyidain, Joint Secretary, Ministry of Education
Prof. R. N. Srivastava, Head Textile Department, Delhi Polytechnic
Mr. D. Padmanbhan, Deputy Director, Council of Scientific and Industrial Research

55. Government of India, Ministry of Works, Housing & Supply, Directorate General of Supplies & Disposals, Delhi, India, September 16, 1955.

Mr. F. Ashmore, Deputy Director General Inspection (Textiles)

Technical points relating to testing of textiles and general procedures for inspection were discussed.

56. Delhi Cloth Mills, Delhi, India, September 19, 1955.

Mr. Arulker, Manager
Mr. G. C. Pande, Director of Laboratories

The facilities for spinning cotton yarns and weaving fabrics were observed and the problems for modernization were discussed. Since this is an older mill the processing machines were to a considerable extent obsolescent with many workers per processing unit and provided a great contrast compared to modern units. It was explained that the Government policy prohibited the installation of automatic looms and there were severe restrictions concerning new high speed and high production machines for cotton yarn spinning. These restrictive policies appeared to be contrary to the progressive views of the technical personnel of the mill. The laboratory facilities,

development research, and quality control methods reflected the progressive ideas, however. It is interesting to note that an experimental cotton card had been provided with two coilers and two sliver cans. There was great interest in the fact that a similar modification was used in the United States to double the card production, without any changes in card settings and speed, by feeding into the card two laps and by splitting the web to form slivers.

57. Swatantra Bharat Mills, Delhi, India, September 19, 1955.

B. D. Pathak, General Manager

This new mill is associated with the Delhi Cloth Mills and was established under the direction of Mr. Pathak and he incorporated many mill features which he observed during his extended visit to the United States in 1947. In contrast to the Delhi Cloth Mills it is very modern indeed and is a tribute to Mr. Pathak's progressive philosophy, which nearly cost his life when he was murderously attacked by the subversive element of mill operatives. Since his return to active duty he is esteemed and respected very highly by mill personnel, including his former adversaries. This very friendly relationship was everywhere apparent during the visit with him through the processing departments of the mill. Adjoining the mill are new dormitories and apartment buildings for the mill operatives, including excellent welfare, recreational, social, educational, and cooperative facilities.

58. TCM Staff, Delhi, India, September 21, 1955.

The accomplishments of the visits in the Delhi area were reviewed with members of the TCM staff as well as the plans for the visits in the Bombay and Ahmedabad areas.

59. Taj Mahal Hotel, Bombay, India, September 22, 1955.

Mr. P. N. Amersey, Director, Cotton Brokerage Firm and Owner Men's Shirt Factory

Mr. Amersey is a graduate of the School of Textiles, N.C. State College and of North Carolina University. Since his return from the United States Mr. Amersey has done very well and he provided much information and assistance for the visits in the Bombay area. This help is gratefully acknowledged and appreciated.

60. American Consulate, Bombay, India, September 23, 1955.

Harrison Echols
P. K. N. Swamy

The program for the visits and lectures in the Bombay area were reviewed and the necessary arrangements were made for effectively carrying out the program.

61. Luncheon, Taj Mahal Hotel, Bombay, India, September 23, 1955.

At a luncheon arranged by Dr. C. Nanjundayya, Director, Indian Central Cotton Committee Technological Laboratory, opportunity was provided to meet key personnel of the Textile Industry in the Bombay Area and to discuss details for pending visits in this area. Professor H. J. Woods, Leeds University and Dr. K. J. Lindberg, Swedish Institute for Textile Research, who stopped in Bombay on their return from the Wool Textile Research Conference in Australia, also attended the luncheon.

62. Department of Chemical Technology, The University of Bombay, Bombay, India, September 23, 1955.

Dr. G. M. Nabar, Professor Textile Chemistry, Dyeing, and Finishing

The facilities of the Department of Textile Chemistry, Dyeing, and Finishing were observed and the research and educational programs were discussed. A lecture on "Recent Textile Research" was given to over 300 under the Joint Sponsorship of the Technical Association of the Department of Chemical Technology and the newly organized Bombay Textile Research Institute. At the writer's suggestion Dr. Lindberg from Sweden and Prof. Wood from England were also given an opportunity to speak.

63. The National Rayon Corporation, Limited, Bombay and Kalyan, India, September 24, 1955.

Mr. S. L. Hemmady, Secretary
Dr. M. D. Parekh, Technical Manager
Mr. Jayant J. Mehta, Production Manager

The Viscose Plant of The National Rayon Corporation is located at Kalyan, about 50 miles from Bombay. After a conducted tour through the entire plant and laboratories the visit ended with an informal discussion of technical textile problems. When the plant was established in 1951, the annual production was 5 million pounds. The production for 1955 was 12 million pounds and it will be 20 million by 1957 and 30 million by 1961. Within a few miles of the plant another Rayon

Plant, The Century Rayon Corporation, is being constructed under the supervision of the Kohorn Company of New York City. The production of rayon in India is rapidly becoming of increasing economic importance.

64. Lecture, Silk and Art Silk Mills' Research Association, Bombay, India, September 26, 1955.

Sankalchand G. Shah, Chairman
D. N. Shroff, President
J. G. Parikh, Secretary
S. M. Mehta, Proprietor, Paragon Textile Mills, Discussion Leader
Harrison Echols, U. S. Consulate General Office

The lecture was attended by over 200 members of the Association and their technical staff. Upon arrival at the new Lecture Hall of the Association it was found that the projection facilities provided by US Information Service Agency were inadequate for the intended illustrated lecture. An extemporaneous talk was given stressing textile research activities in the United States: B, to produce Better textiles, through quality control and new testing methods for performance evaluation; C, to produce higher quality textiles Cheaper, through higher production and automation, new processing methods and machinery, and reduction of waste; and N, to produce high quality textiles with New attributes, through use of new fibers, blends of fibers, new finishes and chemical treatments, new varieties of fabric designs and weaves. In the talk specific references were made to the May 1955 issue of Textile Research Journal wherein examples are recorded that are typical of these research activities. The talk was concluded with a brief account of the current textile research activities at the National Bureau of Standards. In view of the great interest and response to this talk and the discussion which followed, it was obvious to stress this subject in other lectures scheduled to be given in India.

65. Lecture, Bombay Mill Owners Association, Bombay, India, September 27, 1955.

B. G. Kakatkar, Secretary

An illustrated lecture was given to a capacity audience of over 200 members of the Association and their technical staff on "Trends in Current Textile Research" with emphasis on quality control, higher production of cotton processing, and reduction of cotton waste in processing. Attention was directed to the recent cotton processing research at the School of Textiles of North Carolina State College whereby the production of cotton cards was doubled, card waste was reduced to one

half, more uniform and stronger yarn was produced, and the nebs were materially reduced. The chairman, who is a cotton mill executive and a member of the Indian Parliament, led an extensive discussion after the lecture and, as in the lecture of the preceeding day, there was intense interest in the results of processing research which has led to more efficient production and of higher quality. There was great surprise that the results were applied in industry almost concurrently with the research work and even greater surprise was shown to the fact that the results obtained in industry were being published as for example in the May 1955 issue of Textile Research Journal. A conservative estimate of the actual cost of the research reported in this issue is in excess of $250,000 whereas the annual benefits to industry exceed many millions of dollars.

66. The Tata Mills Limited, Bombay, India, September 28, 1955.

B. Rajaram, General Manager
Fali A. Pestonjee and Technical Staff

The discussions of the lecture of the preceding day were continued and questions concerning more details were answered. This discussion aroused more interest, surprise, and even considerable doubt with the eventual request for permission to borrow the copy of the May 1955 issue of Textile Research Journals and other available reprints for a period of 24 hours for more detailed study by the technical staff. This request was gladly granted. There was a conducted tour of the extensive cotton mill facilities, 45,000 spindles, 1800 looms, and employing over 5000 operatives. Quality control methods have been initiated and there was interest in effecting modernization of processing machinery. One interesting study has been the application of the control chart method on mill accidents; their number, causes, and effects of remedial actions. At the beginning of this study there were 3600 accidents per year. This number was reduced to about 800 in 3 years of application of the the control chart method and this number has remained between 800 and 900 per year for about 3 years. During the tour one gained the impression, however, that inspite of the excellent reduction in number of accidents there still existed hazards which could not be tolerated in a modern cotton mill. It is worth noting that in addition to textile mills, the Tata Corporation operates large steel industries in India and a Nuclear Research Institute in Bombay.

67. Calico Printing and Dyeing Company, Bombay, India, Sept. 29, 1955

Prabhu V. Mehta, Technical Director
H. N. Kothari, Production Manager

This company was established by the father of H. N. Kothari

and is now directed by the father and his two sons. Mr. H. N. Kothari is a recent graduate of Michigan State College and N.C. State College. The company employs 300 and does printing and dyeing on job lots of 50,000 yards. Screen printing has been practically discontinued and the space is being converted to modern continuous printing. There is considerable difficulty with buying the desired equipment, especially for modern resin treatments which require a wide range of temperature adjustment. Currently, acetate fabrics can not be resin finished. A new German Embossing and Printing machine was being installed. This combination permits obtaining a very wide range of pattern effects using one basic design. A large amount of the production is for export to the United States.

68. Indian Central Cotton Committee Technological Laboratory at Matunga, Bombay, India, September 29, 1955.

Dr. C. Nanjundayya, Director

In a conducted tour through the research, testing, and processing laboratories it was apparent that the outstanding work initiated by the former directors, Dr. Turner of England and Dr. Mazir Ahmad of Pakistan, is being continued under the able direction of Dr. Nanjundayya. The following recent reprints are typical of work done:

Technological Reports on Trade Varieties of Indian Cottons 1954. February 1955.
Technological Reports on Standard Indian Cottons 1954. January 1955.
A Balance For Rapid Determination of the Ginning Percentage of Seed Cotton. January 1955.
Pre-Cleaning and Ginning Tests on Indian Cottons, Tests on Laxmi Cotton 1950-51 Season. July 1954.
The Geometrical Features of the Three Maturity Groups of Cotton Fibers in the Raw and Swollen States. July 1954.
Pre-Cleaning and Ginning Tests on Indian Cottons, Tests on Karunganni Cotton 1950-51 Season. July 1954.
Pre-Cleaning and Ginning Tests on Indian Cottons, Tests on Cambodia Co. 2 Cotton 1949-50 Season. May 1954.
A Resume of the Investigations Carried Out on the Ginning of Indian Cottons. April 1954.
Ahmad-Nanjundayya Apparatus and Its Attachment for Determining Mean Fiber-Length, Fiber-Length Distribution, and Fineness of Cotton on Similar Textile Fibers.

Annual Report of the Director, Technological Laboratory for the Year Ending May 31, 1954.

69. Bombay Textile Industry Research Association, Bombay, India, September 29, 1955.

Prof. K. Venkataraman, Director, Department of Chemical Technology, Bombay University
Mr. V. B. Kulkarni, Planning Officer, Bombay Textile Research Institute
Dr. C. Nanjundayya, Director, Indian Central Cotton Committee Technological Laboratory
Prof. G. M. Nabar, Textile Chemistry, Dyeing, and Finishing.

Professor and Mrs. Venkataraman entertained at tea in their home at the University to provide opportunity to discuss the formation of the new Bombay Textile Industry Research Association, BTIRA, policy concerning research programs and publication of results, research facilities and equipment, and the selection of a Director of Research. The writer appreciated the offer to become Director and expressed his profound regrets in not being in a position to accept the offer. The plans for BTIRA are similar to the already well established Ahmedabad Textile Industry Research Association, ATIRA, which serves the textile industry in the Ahmedabad area.

70. Taj Mahal Hotel, Bombay, India, September 30, 1955.

J. G. Parikh, Secretary, Silk & Art Silk Mills Research Association

The Silk & Art Silk Mills Research Association was organized in 1950 under the auspices of the Council of Scientific and Industrial Research and has over 300 mill members. The member mills have contributed about 500,000 rupees and another 500,000 rupees has been appropriated by the Council of Scientific and Industrial Research. The Government of India is going to contribute 1/3 of the contribution made by the industry towards its Capital expenditure and 50% of the annual recurring expenditures. An imposing administration building Resham Bhavan, has been completed and is occupied. The Research Institute's buildings are under construction on a 3-acre site at Worli. The North-Light Shed, or Pilot Plant, houses the heavy mill machinery. The main building of the Research Institute will be divided into two wings. The North Wing will accommodate the Research and Testing Laboratory, Silk Conditioning House, Library, and other departments of the Institute, while the South Wing will accommodate the Technical College to train young men for the silk and rayon industries. There are, at present, no facilities in India for training students in this rapidly expanding branch of textile technology. Mr. Parikh reviewed a long list of testing instruments and research equipment to be purchased for the Institute and requested assistance in the selection of the most suitable

items from this list, as well as recommendation for the purchase of other instruments and equipment, also technical books and journals for the library, and suggestions for a Director of Research. Recommendations and suggestions were made to assist the Institute in its establishment for research, testing, and education.

71. American Consulate, Bombay, India, September 30, 1955.

Harrison Echols
P. K. N. Swamy

The accomplishments of the visits in the Bombay Area were reviewed and it was felt that they were very beneficial. It was unfortunate that visits to the National Chemical Laboratory at Poona and to the Raman Research Institute at Bangalore could not be made for lack of time. Over 100 senior scientists are employed at the former and the focal point for research is the Radioactive Tracer Unit which is under the direction of Dr. C. K. N. Nair, a graduate of Cornell University and with extensive training at the Oak Ridge Institute of Nuclear Studies. One fruitful application of radioactive isotopes has been in testing the resistance of paints and varnish compositions to sea water. It is claimed that a simple, but quick and efficient, technique has been evolved for this purpose. Another significant application has been a study on ion exchange resins. Radioactive tracers have given rapid and accurate results in evaluating efficiencies, regeneration costs and other factors so important in industrial use of resins. Other studies pertain to photosynthesis in the field of biochemistry, diffusion in the solid state, lubrication and surface corrosion, and efficiency evaluation of experimentally prepared fertilizers for phosphorous deficient soils of India. The Spectroscopic Laboratory of the Raman Research Institute is well known. Current studies are concerned with the nature of thermal agitation in crystals and the thermal energy of crystals, which are fundamental problems in the physics of the solid state.

During the visits opportunities arose for informal and frank discussions of problems concerning group sponsored research, research organizations and coordination of research efforts, publication of research results and industry application, standards for textiles and textile products, research personnel, planning and direction of research programs, effective use of available technical personnel, worker incentives, and finally the critical problem of absenteeism, which sometimes requires employing an excess of 20 percent of workers in order to assure sufficient operatives for continuous operation of a plant. The picture of existing conditions seemed rather

pessimistic and probably will continue so for sometime until economic conditions change, other traditional feelings are ameliorated, and the spirit of cooperation is enhanced through an extensive educational program.

72. Ahmedabad Textile Industry Research Association, Ahmedabad, India, October 3-7, 1955.

Mr. R. M. Shah, Secretary
Dr. B. K. Vaidya; Deputy Director and Head, Physics and Physical Chemistry Division
Dr. P. C. Mehta, Head, Chemistry Division
Dr. V. N. Patankar, Head, Statistics Division
Dr. Kamla Chowdhry, Psychology Division
Mr. S. N. Bhaduri, Liaison Officer of Spinning and Weaving
Dr. P. N. Bhatt, Liaison Officer of Wet Processing
Mr. S. A. Alim, Head, Textile Technology
Dr. T. Radhakrishnan, Head, Electronics and Instrumentation
Mr. N. Subramaniam, Senior Scientific Officer
Mr. A. G. Chitale, Basic Research in Polymers
Mr. D. Sarma, Chemical Research (Former Student at N.C. State College)
Mr. S. P. Phadnis, Librarian

The Ahmedabad Textile Industry Research Association, ATIRA, is a cooperative research association of textile mills, and allied manufacturers of India and is supported by Industry and the Government. It seeks better textiles, lower costs, increased production, and the well-being of those who work in the textile industry. It applies the scientific method to the problems of industry and conducts (1) operational research to rationalise processes and methods, (2) applied research of direct use to the industry, and (3) fundamental research to improve understanding of men, materials and processes in industry. It implements results of scientific research and technological developments with mill operation applications and training of mill personnel in the application. ATIRA'S research program is based on (a) problems referred by industry, (b) scientific developments, the details of the application of which require to be worked out to suit local conditions, and (c) ideas originating from research workers at ATIRA. The current staff of ATIRA is well over 100, including some 10 with Doctorate, 20 with Master's, and 30 with Bachelor's degrees and over 30 laboratory technicians and some 40 to 50 laborers. ATIRA was founded in 1947 by 71 members of the Ahmedabad Millowners' Association, who made an initial contribution of 5,000,000 rupees. The Government of India contributed 1,900,000 rupees during the first five years for capital investment and also half of the annual recurring expenses of the Association up to a maximum of 150,000 rupees in any one

year. ATIRA is situated on 50 acres of land acquired on the Gujarat University Campus and the buildings started in 1950 were completed in 1952. They consist of three sections having a total floor area of over 100,000 square feet. The laboratories, administration, services, and library are accommodated in a very modern 5-story central structure. This is connected on one side to a canteen to serve 75 persons at a time and a very excellent and modern auditorium seating over 400 with provisions to curtain off a part for smaller gatherings. On the other side is attached a one story research mill structure containing 30,000 square feet of floor area. The buildings are fully air conditioned and provided with excellent utility services. The mill and laboratories have excellent equipment and instruments for processing and research purposes, thus making ATIRA an ideal textile research facility. Adjoining these buildings are modern residences for the director of research (vacant), secretary, and department heads. The senior staff members are housed in modern 4-unit appartment buildings. Two additional housing colonies are for the junior research staff and laboratory technicians respectively. A large well supplies water for the laboratories and for the homes.

During the 5-day visit in Ahmedabad there was opportunity to discuss the research program and problems with each department head and with senior staff members of ATIRA. In all of these conferences instead of describing the outstanding accomplishments, and they are indeed outstanding, with well deserved pride, there was an eagerness and desire to learn how the work can be improved, how accomplishments can be increased, and how the results can be applied in industry more effectively, immediately, and extensively. The unsuccessful attempts to obtain a Director of Research for ATIRA has given some concern to members of the staff and there was great hope that one would be obtained soon and provide strong leadership, guidance, understanding, encouragement, and stimulation. Appeals were even made to the writer to reconsider this matter.

The work in all Departments of ATIRA seemed very impressive. Although several hundred reports have been issued, primarily for the benefit of the members of ATIRA, a much wider dissemination is not only justified but very highly desirable and it is hoped that a more liberal publication policy will become effective. The following are typical of ATIRA's work:

Nature and Incidence of End Breaks and Their Effect on Production in Winding, Warping, and Weaving
Elimination of Third Passage of Drawing
Mill Spinning with Small Samples of Cotton
Some Advantages of Introducing Statistical Investigation in Textile Mills

Quality Control in Blowing Room and Its Effect on Production in Subsequent Processing.
Applications of Statistical Methods to Textile Industry
Introduce Quality Control and Avoid Undue Adjustments
An Evaluation of Existing Time Study Methods in Assessment of Workload
The Effect of Increased Illumination on Production and Damages in Loomshed
Comparison of Productivity in the Different Mills of the Ahmedabad Textile Industry
The Group Norm Chart Method as an Incentive to Increase Production in the Loom Shed
Motivation to Work: An Improvement in Motivation to Work of Winders and Warpers and Its Effect on Loomshed Efficiency
An Analysis of the Attitudes of the Textile Workers and the Effect of these Attitudes on Working Efficiency
Job Evaluation: An Analysis of the Existing Wage Structure in the Ahmedabad Textile Industry
Workloads and Working Conditions in the Ahmedabad Textile Industry
Applications of Psychology to Industry
Determination of Optimum Size on Warp and Variations found in Warp Sizing
Determination of the Optimum Conditions for Desizing Agents
A Study of the Factors Affecting the Bleaching of Cotton Textiles with Hypochlorite Solutions
Commercial Cotton Bleaching Processes and their Effect on Fabrics
A Study of Tamarind Kernel Powder as a Sizing Material for Cotton Warps
A Study of the Effect of Hard Water on the Dyeing of Vat Dyes.
Case Histories of Some Problems in Wet Processing of Cotton Textiles
The Estimation of Dye Strength of Fabrics by Light Reflection
Effects of Laundering, Perspiration, and Light on Fabrics
Textile Auxiliaries
Solution of Cellulose in Sodium Zincate Containing Excess Sodium Hydroxide
Recent Developments in the Finishing of Cotton Textiles
The Complex Diethanolamine Copper Hydroxide
Effect of Processing on Neps
Effect of Card Speeds and Settings on Reduction of Card Waste
Bibliography on Blending of Cotton: 1925-1953
Bibliography on End Breaks in Different Processes of Textiles: 1936-1952.
Bibliography on Cotton Combers with Special Reference to Adjustments, Settings and Patents: 1936-1952
Bibliography on Labor Redeployment, Wages, Workstudy, and Time and Motion Study with Special Reference to Textile Industry

There is an ideal situation and opportunity for the establishment of an outstanding textile educational program of high level under a cooperative arrangement between ATIRA and Gujarat University, similar to the arrangement between Princeton University and Textile Research Institute and to the arrangement between Gujarat University and the Physical Research Laboratory. In such an arrangement the courses of instruction would be by staff members of the University and ATIRA, the research phases would be conducted at ATIRA, and the graduate degrees would be granted by the University. There is need for the training of highly qualified research personnel in the field of textiles and this matter should receive early and careful consideration. Such an arrangement should be not only attractive to Gujarat University, but would enhance the reputation of ATIRA and of its staff, and it would be very beneficial to the Textile Industry and thereby aid and promote the National Economy of India.

73. Lectures and Discussions, Ahmedabad, India, October 3-5, 1955.

ATIRA: "Physics of Textile Materials"
ATIRA: "Evaluation of Performance Properties of Fabrics in Terms of Some Measurable Characteristics"
Ahmedabad Millowners' Association: "Trends in Current Textile Research and Benefits to the Industry"

Each lecture was attended by several hundred and was followed by an extended discussion of mutual interest.

74. Luncheon and Teas, ATIRA and Staff, Ahmedabad, India, October 3-7, 1955.

At a luncheon by ATIRA and at teas by staff members opportunities were had to meet key people in more informal and relaxed situations for discussions of both technical, social, and economic problems and these are believed to have been mutually beneficial and have led to better understanding, and they were greatly appreciated and are highly treasured. It was also possible to discuss the proposed itineraries for the visits of Mehta, Chitale, and Shah to the United States and to give suggestions and assistance. Mehta and Chitale have now been in the United States for a number of months.

75. Symposium, ATIRA, Ahmedabad, India, October 4, 1955.

A symposium was held among members of the ATIRA staff and technical personnel from cotton mills from Ahmedabad. After publication of results by Prof. J. Bogdan of N.C. State College concerning studies on neps and their control and on the reduction in card waste by setting and speed changes of

the card, a cooperative study was undertaken by ATIRA and a number of cotton mills in Ahmedabad. At this symposium, the first results of this study were presented and discussed. In the main, these preliminary results confirmed those reported by Prof. Bogdan, namely that the card waste is materially reduced, neps were reduced, and the yarn was stronger and more uniform. There was much interest in this work because of the large potential savings to the industry. Participation in this symposium was very gratifying in view of my personal contact and close association with the work at N.C. State College and it was also stimulating to witness the application of research results in another country almost immediately after publication (March 1955) in the United States. It is also a typical example of applied research at ATIRA for immediate use and benefit to the industry.

76. Physical Research Laboratory, Gujarat University, Ahmedabad, India, October 5, 1955.

Dr. K. R. Ramanathan, Director and Professor of Atmospheric Physics
Dr. V. D. Desai, Professor in Electronics

The Physical Research Laboratory was established in 1947 and its present new and excellent facilities were completed in 1954 on a site adjoining ATIRA and Gujarat University. The two story building contains 14 research rooms, library, reading room, seminar room with 75 seating accommodation, dark room, workshop, carpentry shop, store, and preparation section. The Laboratory is recognized for research and for the training of students for the M. Sc. and the Ph.D. degrees at the Gujarat University. It has a research staff of about 40 engaged in the Departments of Atmospheric Physics, Cosmic Ray Physics, Theoretical Physics, and Radio-Physics and Electronics. About 20 percent of the research staff have Ph.D. degrees, 50 percent M. Sc. degrees, and 30 percent B. Sc. degrees. Since 1950 over 20 advance degrees have been granted of which about 1/3 were Ph.D. and 2/3 M. Sc. It was a privilege to observe the research facilities and to discuss the research programs. The problems being investigated are as follows:

Radiosonde ascends for study of upper air conditions
Studies in atmospheric ozone
Studies of twilight sky intensities
Periodic variations of cosmic ray intensity
Meteorolcgical factors effecting the daily variations of cosmic ray intensity
Studies on the anisotropy of the primary cosmic radiation
Size of the atomic nucleus
Systematic study of the ionosphere
Measurement of ionospheric winds

The publications for 1953 are listed below and they are typical of the work of the Laboratory:

Daily Variation of Meson Intensity and its Possible Solar Origin. Nature, 171, 122 (1953).
Meteorological and Extra-Terrestrial Causes of the Daily Variation of Cosmic Ray Intensity. Proc. Ind. Acad. Sci., A, 37,287 (1953).
Height Distribution of Atmospheric Ozone. Proc. Ind. Acad. Sci., A, 37, 321 (1953).
Worldwide Effects of Continuous Emission of Cosmic Rays from the Sun. Phys. Rev., 90, 204 (1953).
Effects at Godhavn and Lower Latitudes of Changes in Energy and Composition of Solar Cosmic Rays. Phys. Rev., 91,688 (1953)

Interpretation of the Daily Variation of Meson Intensity. Report of Internaional Congress on Cosmic Radiation held at Bagneres-de-Bigorre, 33, July 1953.
Effects of the Geomagnetic Field on Solar Cosmic Rays. Phys. Rev., 92, 415 (1953).
Some Interesting Atmospheric Soundings of Pressure and Temperature made with Vaisala Radiosondes at Ahmedabad. Proc. Ind. Acad. Sci., A, 38, 327 (1953).
Daily Variation of the Amount of Ozone in the Atmosphere. Nature, 172, 632 (1953).
The Quantum Mechanical Equations of Motion and the Commutation Relations. Proc. Phys. Soc. (London), A, 66, 657 (1953).
The Born Yang Nuclear Model for High Energy Electron Scattering. Proc. Phys. Soc. (Lond.), A, 66, 773, (1953).
Jastrow's Nuclear Model for High Energy Nuclear Scattering. Proc. Phys. Soc (Lond.), A, 66, 1276, (1953).

77. Mill Conferences and Visits, Ahmedabad, India, October 6, 1955.

Calico Mills, Shri Gautam Sarabhai, Chairman
Jethalal Thacker, Works Manager
Technical Staff
Jubilee Mills, B. B. Mitra, Manager
Avind Mills, Manager and Technical Staff
Ahmedabad Millowners' Association, Madanmohan Mangaldas, President

The Ahmedabad Millowners' Association is comprised of over 70 mills equipped with 2,200,000 spindles, 47,000 looms producing 1,200,000,000 yards annually, and employing 150,000 workers. The Calico and Avind Mills visited are each equipped with about 100,000 spindles and equivalent number of looms. From the discussions it was apparent that management and technical staff were progressively minded and anxious to employ quality control techniques, apply the results of

research, and to try improved processing methods. There were complaints that the cotton that was imported from the United States was not processing satisfactorily and yielded textile products of inferior quality. This experience has given rise to some concern in view of the generally good reputation of American grown cotton. There were no satisfactory reasons given for these conditions and it would seem advisable to investigate the causes for them.

78. ATIRA Staff Conference, Ahmedabad, India, October 7, 1955.

A final conference was had with the senior research staff of ATIRA and it was felt that, eventhough the visit was entirely too brief, the opportunities to discuss a great variety of textile research problems resulted in mutual benefits, better understanding, closer friendships, and genuine desire for continued exchange of textile research information.

79. Pakistan Central Cotton Committee Laboratory, Karachi, Pakistan, October 8, 1955.

Dr. M. Kamal, Technical Secretary
Mr. J. A. Phatty, Technologists

The new laboratory has been constructed under the direction of Dr. Nazir Ahmad, formerly director of the laboratory at Matunga, Bombay. The new building was completed over a year ago and a large number of excellent laboratory instruments and also cotton processing machinery have been purchased. For the most part much of this equipment still remains unused and no processing machines have been connected for operation. Lack of technical personnel, direction, power supply, and utilities appear to hinder the work. The wonderful facilities and laboratories should be utilized as soon as possible to assist the cotton textile industry of Pakistan. Dr. John Wright of the U.S. Department of Agriculture was stated to have accepted the position as Director of Research.

80. Pakistan Wool Grading and Testing Institute, Karachi, Pakistan, October 8, 1955.

Dr. Israr-ul-Haq, Director

The Pakistan Wool Grading and Testing Institute was established in 1953 and laboratory and testing facilities were provided in 1954 on a site adjoining the new Cotton Laboratory. Some 30,000,000 pounds of wool are produced annually in Pakistan and the bulk of this is exported. Much of it is coarse carpet wool. The export market was essentially lost because of inadequate classing and grading of the wool. The Wool Grading and Testing Institute was founded to establish standards for classing and grading and this has been accomplished, following very closely those established in the United States. Inspectors were trained and then stationed at various inspection centers of the wool growing districts. The inspection service is stated to function very successfully and the export wool market has been essentially recaptured as a result. The classes and grades assigned to the wool at the inspection centers meet the established standards and are accepted abroad. The Institute has undertaken testing and research with the aim of producing higher quality wool.

81. Pakistan International Industrial Fair, PIIF, Karachi, Pakistan, October 8, 1955.

At the suggestion of the U.S. Embassy official in Delhi in charge of International Exhibitions in Asia, the Pakistan International Industrial Fair was visited on Saturday evening

to observe the reactions of the public and also to view the industrial exhibits of other countries. The attendance exceeded the exhibition facilities. The largest exhibition facilities were those of Russia, China, and Pakistan. Then followed those of the United States and Japan. The Russian and Chinese exhibitions were dominated by industrial and agricultural machinery and tools and the public reaction appeared impressive.

The exhibition of Pakistan featured native resources, culture, arts, crafts, and manufactured products. The Director and Chief Physicist of the recently established Pakistan Council of Scientific and Industrial Research, C.S.I.R., explained the exhibits and stated that the functions C.S.I.R. cover a wide range of activities, generally directed towards the promotion and fostering of scientific research having a bearing on the industrial development of Pakistan and the utilization of its natural resources to the best economic advantage. Side by side with fundamental research on a number of problems, developmental research and applied research are also being carried on in the Central Laboratory at Karachi and the Regional Laboratories in Lahore, Peshawar, and Dacca. An extension of its program for research development, C.S.I.R. has also sponsored a number of specific research schemes at the laboratories of various Universities and Research Institutions of Pakistan. Unfortunately time did not permit to accept the invitation to visit the Central Laboratory at Karachi, which is the Pakistan equivalent of NBS.

The main attraction of the U.S. Exhibition was a TV studio consisting of a glass enclosed and elevated stage for life performances and televising. A number of TV screens were mounted on the enclosure so that the public could observe the life performance and at the same time also view the performance on the TV screens. Additional TV screens were set up at many strategic points of the exhibition grounds. As far as public reactions and responses were concerned, to a typical square dance performance, they appeared to be the most impressive by far. The facilities for housing and displaying other excellent U.S. exhibits were inadequate to accommodate the crowd. However, the routing of the people from entrance to exit was good, not followed in exhibits of other countries, so that an individual obtained at least a fairly good glimpse of the diverse and excellent exhibition items.

82. U.S. Operations Mission to Pakistan, Karachi, Pakistan, October 10, 1955.

Roswell H. Whitman, Deputy Director for Program

An informal verbal report was made concerning the observations of the visits in Pakistan and current problems were discussed. Mr. Whitman mentioned that as part of their program there is need for qualified scientists to make surveys of the research and standardization facilities of Pakistan and he expressed the hope that some time in the future the National Bureau of Standards might be able to help this program in Pakistan.

83. Annual Leave Status, October 11-21, 1955.

During the travel from Karachi, Pakistan to Ghent, Belgium, although on an annual leave status, opportunities were had for several scientific contacts in Switzerland and Germany and these are briefly described.

84. Swiss Federal Institute of Technology, Zurich, Switzerland, October 17, 1955.
Professor Emil Honegger

Discussed textile research problems and visited laboratories and observed operation of a new Swiss loom. Saw a new Mettler precision balance which is much preferred to a previously used excellent microbalance, because of its much greater speed and ease of weighing. Reprints of the following recent publications were obtained:

The Uster Instrument for the Stapling of Cotton and Rayon Fibers
Neuere Erkenntnisse über das Trocknen von Textilien
Technical Developments Contributing to Greater Efficiency in Weaving
Neue Fortschritte in der Baumwollspinnerei

85. Zellweger Ltd. Uster, Switzerland. October 18, 1955.

Hans Locher, Development Engineer

The facilities (all very modern and many automatic) for manufacturing the well known line of Uster Instruments and Equipment for Textiles were observed and the new developments were explained. The automatic yarn tester for strength and elongation is now provided for automatically removing the specimens from ten different bobbins, graphically record the strength and elongation of each specimen, summarize the

strength values, and also give a frequency distribution of the strength values. The Uster Yarn Evenness Tester has been provided with a mechanical-electronic spectrograph for automatically separating the innumerable repeating periodicities that comprise the "character" of yarn, roving, and sliver. The predominating periods and their frequency length are easily read from the spectrograph chart making it possible to identify the causes for the variations in processing and for effecting corrective adjustments or actions. A special mechanical commutator disk containing 32 elements forms an essential component for translating the periodic variation information into 36 electronic memory circuits. Another new modification is the "Hy-Lo" counter which indicates at a glance the exact number of thick and thin places and neps, slubs and nubs. The deviation from the mean necessary to trip the two counters is adjustable. Technical literature describing these and other instruments was obtained.

86. Neuss Chemical Institute, University of Heidelberg, Heidelberg, Germany, October 20, 1955.

Professor H. Zahn

The new facilities of the Institute and the research programs in protein chemistry of over 20 graduate students for Ph.D. degrees were explained. These new facilities are by far the most modern and well equipped for fundamental research. Similar new facilities of other Departments of the University have also been erected on the new site.

87. Textil -Praxis, Heidelberg, Germany, October 20, 1955.

Curt Mierisch, Editor

Translations of NBS Research Papers RP 2589, 2590, and 2601 on "Stress-strain relationships in yarns subjected to rapid impact loading" were discussed. A translation of RP 2589 appeared in the November 1955 issue of Textil-Praxis. The editor expressed a desire to publish other papers from NBS on textile research.

88. Melliand Textilberichte, Heidelberg, Germany, October 20, 1955.

Manfred Melliand, President

Current textile research projects, facilities, and research personnel were discussed. Melliand has moved into new and expanded quarters and are also publishing technical books. A complimentary copy of "Technologie der Färberei und Textilveredlung" by Dr. Albert Schaeffer, Farbwerke Hoechst A.G., was obtained. Mr. Melliand requested permission to publish research papers from the Textiles Section of NBS.

89. Zellwolle-Lehrspinnerei, Denkendorf, Germany, October 21, 1955.

Dr. N. Reinfeld, Director of Research
Mr. Quass, Machinery Development

The Zellwolle-Lehrspinnerei was a leading textile research organization in Germany at the end of World War II. It is primarily a producer of spun rayon yarns and blends, having over twice its 1945 spinning capacity.

90. Staatl. Technikum für Textilindustrie-Textilingenieurschule, Reutlingen, Germany, October 21, 1955.

Prof. Schenkel, Director
Prof. Oeser, Textile Technology
Prof. Rath, Textile Chemistry
Prof. Wilhelm, Textile Physics

The school has acquired many new facilities since the last visit in 1950, including a very modern new building for textile physics and testing. Prof. Schenkel is the new Director, who succeeded the well known Prof. F. Walz.

91. Schloss-Hohenstein Textile Institute, Hohenstein, Germany, October 22, 1955.

Prof. O. Mecheels, Director
Senior Research Staff

The institute was established in 1945 in severely damaged buildings. Since the last visit in 1945 the damaged buildings have been repaired and rebuilt. The Schloss itself provides laboratory facilities for microscopy, X-rays, physiological studies of clothing, a dry cleaning and pressing plant, lecture hall, administration, and also very excellent living accommodations for the Director. The new building includes a chemical laboratory for 70 students and a two-story garment manufacturing and sewing facility for instruction and production. The bombed-out building has been rebuilt into a large lecture and motion picture auditorium. The income from the dry cleaning, garment manufacturing, and theater units provide enough income to support the educational, research, and testing programs of the institute. An illustrated and extemporaneous lecture was given, in German, concerning the work on "Stress-strain relationship in yarns under rapid impact loading" at the special request of the Director.

92. University of Ghent, Ghent, Belgium, October 24, 1955.

Prof. Emeritus D. DeMeulemeester
Prof. Gilbert Raes
Senior Textile Research Staff

Georges Quintelier, Research Director, Fabelta Rayon Company, Zwijnaarde, Belgium

The research, testing, and new processing facilities for cotton were observed and discussed as well as international standards for textiles. An illustrated lecture to the research staff and a class of graduate engineering students was given concerning the work on "Stress-strain relationship in yarns under rapid impact loading" at the special request of Prof. DeMeulemeester. In connection with the proposed International Exhibition at Brussels, the scale model of a proposed permanent tower building was examined. This tower was designed by the Faculty on Structural Engineering of the University of Ghent. The design of the tower is for "Pre-stressed" concrete construction and calls for a height of 1800 feet with a square base of 100 feet. In order to carry the load of the tower, the supporting ceiling beams and walls of the ground story are 8 feet thick, and they taper gradually to 2-1/2 feet for the top story. Permission to erect the tower had not been given by the aeronautical authorities of Belgium.

93. Cotonnière Nouvelle Orléans, Ghent, Belgium, October 24, 1955.

H. Brasseur, Manager

The cotton manufacturing facilities of this well organized mill were described and observed as well as the standards of quality and methods to control quality.

94. S. A. Cotonnière, Ghent, Belgium, October 25, 1955.

Mr. A. Vanden Abeele, General Director

New theories, methods, and procedures for quality control were discussed. Mr. Vanden Abeele is a leading authority in this field, and he expressed a desire to make contact with individuals in the United States who would be interested in the mathematical theories and procedures. Even as far back as the previous visit and discussions in 1950 he emphasized the need for minimizing the time between production, evaluation of the product for quality control, identifying source in processing that causes variation beyond control limits, and effecting corrective action in mill. Appropriate procedures, modification of testing equipment, and analysis of results to accomplish the above have been successfully developed and applied for a number of years in their Ghent mill, which is without question one of the most modern mills in Europe. The analysis of data is accomplished without any computations, and a concise visual summary is depicted in such a way to suggest also the source and cause of trouble, if any. This mill had just been completed at the time of the previous visit in 1950. It was one of the first buildings of "Pre-stressed" concrete construction and was equipped with new high production textile processing

machinery. It was explained that the mill has run continuously three shifts per day, and production has been so successful that another mill, designed along similar lines, is nearing completion at Breugge. The mill appeared to run as smoothly as during the 1950 visit. Mr. Van den Abeele is also an active and leading participant in International Standards for Textiles. The following reprints were obtained:

Un Nouveau Schema D'Epreuves Repetees et son application à l'analyse statistique des variations de structure des fils textiles composés de fibres.

L'Irregularite De Titre Des Fils Textiles Composes Des Fibres.

Réflexions au sujet des concepts utilisés pour exprimer l'irregularité des fils textiles.

Recommendation pour la standarisations des nouveaux titres. (BISFA, Bureau International Pour La Standardisation De La Rayonne Et Des Fibres Synthetiques).

95. Textile Research Department, Algemene Kunstzijde Unie N.V., Arnhem, Holland, October 26, 1955.

R. Levison, Director of Research
Dr. H. L. Röder
Dr. J. Lako
Dr. V. E. Gonsalves
Dr. H. DeVries

The excellent research, testing, and processing facilities for textiles were observed and discussed, especially new instruments and methods for fiber and yarn evaluation and research pertaining to dynamic, optical, and electrical properties of fibers. Of particular interest were two new electronic instruments. One is for automatically measuring and recording the twist and irregularity of twist in tire cord as the cord is drawn at high speed through a photo-electric sensing element. Each turn of twist produces an electrical pulse, and from the pulse frequency and cord speed the number of turns of twist per unit length and irregularity of twist are obtainable from the values recorded on a bank of pulse frequency counters. The other instrument is a new improved "Vibrascope" called "No-Look" for measuring the denier of single fibers. The original Vibrascope was developed by Dr. Gonsalves during the last war and is used internationally for denier measurements of fibers. However, the procedure is tedious and strenuous since the operator has to observe the fiber optically and decide from the visual appearance of the vibrating fiber when resonance is attained as the input frequency is varied. The new improvement performs this operation quickly and automatically and the denier of the fiber is simply obtained from a meter reading. Descriptions of these and

other instruments and techniques have now been published in recent issues of Rayon Revue. It was stated that effective and permanent anti-static finishes have been developed for textiles. An illustrated lecture on "Stress-strain relationship in yarns subjected to rapid impact loading" was given to the research staff of over 100.

96. Midland Hotel, Manchester, England, October 27, 1955.

Mr. Donald Garrett, Physicist, ICI, discussed the arrangements which were made by the ICI staff for the visits in England and including five lectures on the NBS impact studies of textiles.

97. British Rayon Research Association Laboratories, Manchester, England, October 28, 1955.

Drs. Treloar, Wallis, Cowhig, and Tankard

The new laboratories were completed early in 1955. The excellent research and processing facilities for synthetic textiles were observed and discussed. In addition to an extensive program of research in the fields of chemistry and physics there is much work in basic studies of textile processing machinery. In the latter there are extensive applications of electronics. The following reprints were obtained and are typical of some of this research activity:

An Autocorrelogram Computer
Yarn Irregularity Picture Recorder (Yarn Patterning Predictor)
The Mechanical Efficiency of Pneumatic Shuttle Propulsion Loom
Electronic Yarn Tension Recording Equipment
An Electronic Loom Timing Indicator

An illustrated lecture on "Stress-strain relationships in yarns subjected to rapid impact loading" was given to the research staff of over 200.

98. Manchester College of Technology, Manchester, England, October 29, 1955.

Professors Meredith, Hearle, Peters, and Turner

The Textile Department of the College is undergoing an extensive construction of new facilities for fiber processing, dyeing, and finishing. Most of the dyeing and finishing equipment was already installed. The well-known and outstanding research studies on the electrical properties of textiles and the stress-strain relationships in yarns when testing over a very wide range of rate of straining were discussed with Professors Hearle and Meredith respectively. A great deal of this excellent work has already been published.

99. Imperial Chemical Industries, I.C.I., Blackley, Manchester, England, October 31, 1955.

Mr. George White, Director
Dr. T. Vickerstaff, Chief Dyer
Dr. Bartlett, Mr. Garrett, and Mr. Cross

Current research problems of mutual interest were discussed. The studies in the I.C.I. laboratories are primarily of a chemical nature pertaining to dyeing and dyestuffs, since the researches on mechanical properties and performance evaluation of textiles are now conducted in the new laboratories of the Terylene Council at Harrogate. The following reprints were obtained and are typical of current research activities:

A Nonpolarizing Light Modulator for the G. E. Recording Spectrophotometer
Some Applications of Organic iso-Cyanates.
Azoic Dyeing of Acetate Rayon.
Some Factors in the Measurement of Affinities of Vat Dyes for Cellulose.
The Use of Fading Lamps for Determining Light Fastness.
Affinity Effects during Padding.
The Behaviour of Leuco Vat Dyes above 100°C.
The Affinities of Vat Dyes in Relation to their Constitutions.
The Dyeing of Mixtures of Terylene Polyester Fiber and Wool.
The Relation of the Reflectance of Dyed Fabrics to Dye Concentrations and the Instrumental Approach to Colour Matching.

100. Shirley Institute, Manchester, England, October 31, 1955.

Drs. Toy, Hill, Collins, Tipton, Rees, and Pollit.

The new laboratories and facilities were observed and research problems of mutual interest were discussed. The excellent work on dynamic modulus of yarns as a function of strain by Dr. Tipton and on soiling of textile materials by Dr. Rees were of special interest. The results of the early work in these fields are now being published. An illustrated lecture on "Stress-strain relationships in yarns subjected to rapid impact loading" was given to about 100 members of the research staff.

101. Wool Industries Research Association Laboratories, Leeds, England. November 1, 1955.

Dr. A. B. D. Cassie, Director
Drs. Anderson, King, and Wildman.

The new laboratories and facilities were observed and research programs pertaining to abrasion resistance and soiling of carpets,

structure of wool fiber, infra-red reflecting microscope for fiber, and grating infra-red spectrograph were discussed. The basic work on chromatography was done in the Association's laboratories by Drs. Martin and Synge, for which they received the Nobel Prize. Two new developments in wool processing, the Auto-Leveller and the Auto-Count, were seen in operation. In the Auto-Leveller the instantaneous linear fiber density of a wool sliver or roving is measured, and the information is retained in a mechanical memory device as the sliver is passed through the sensing element to the drafting rollers at regular processing speed. When the evaluated material arrives at the drafting rollers, its speed is automatically adjusted in accordance with the linear fiber density, so that after fiber drafting the linear fiber density of the roving or yarn is constant. The Auto-Leveller thus makes a uniform product regardless of the non-uniformity of the product before drafting. The Auto-Count is an attachment to the card in worsted spinning which assesses the linear fiber density of the card webbing and automatically adjusts the speed of the card to produce a uniform worsted yarn. Both of these developments are considered very important to the wool industry. The laboratories are equipped with excellent mechanical and electronic shop facilities for specialized instrumentation.

102. Department of Textiles Industries, Leeds University, Leeds, England, November 2, 1955.

Professors Speakman, Astbury, Whewell, Nissan, Woods, Chamberlain, Onions, Peters, Vallentine, and Hannah

Discussed the broad research activities concerning protein chemistry, X-ray investigations, electron microscopy of fibers, rheology of polymers, physical testing of textiles, finishing and dyeing of textiles, processing engineering, dynamic modulus of fibers by sonic measurements, and mathematical treatments concerning movements of fibers in drafting and spinning processing. The latter is a very important and challenging study. A large new building is nearly completed to relieve the crowded conditions of the extensive research and educational activities in textiles. It was a great privilege to give an illustrated lecture to a staff of over 100 on "Stress-strain relationships in yarns subjected to rapid impact loading".

103. Terylene Council Research Laboratories, I.C.I., Harrogate, England, November 3, 1955.

Drs. Hill, Carlene, Hillier, Ford, and Senior Research Staff Members.

The facilities for basic research of high polymers,

properties of synthetic fibers, yarns, and fabrics, processibility of fibers and blends, spinning of fibers from new polymers in a pilot spinning plant, and performance evaluation of finished textiles made from the experimental fibers are housed in a group of new buildings. Excellent facilities in all areas of research are available as well as a large staff of able scientists and technologists. In the limited time available it was only possible to observe a small amount of the excellent research facilities and to discuss a few areas of research. There was considerable interest in the illustrated lecture on "Stress-strain relationships in yarns subjected to rapid impact loading," and several members are active in similar studies.

104. Research Laboratory, Courtaulds, Limited, Maidenhead, Berkshire, England, November 4, 1955.

Drs. Bamford, Elliott, Crank and others from Maidenhead
Dr. Morton from Courtaulds Bocking Laboratory at Braintree
Dr. Cotton and others from Courtaulds Coventry Laboratory

The research program of the Courtaulds Laboratory at Maidenhead is concerned primarily with fundamental and theoretical problems. The staff of relatively young and very able scientists maintain close contact with the Courtaulds Laboratories for applied research at Coventry and at Bocking, and this leads to early application and verification of the basic research results. For example, the results of the theoretical studies contained in the following reprints

The Effect of Cap-Edge Friction on Spinning
A Theoretical Investigation of Cap and Ring Spinning Systems
Balloon Diameters and Thread Tensions Calculated for Different Cap-Spinning Conditions

were almost immediately checked in the Bocking Laboratories under regular mill operating conditions. The basic infrared investigations of polymer by Dr. Elliott are well known. The work on synthetic polypeptides is outstanding. Of particular interest was the application of the optical diffractometer in the study of the molecular structure of synthetic polypeptides. Scale models of the spatial molecular configuration are constructed, and optical projection diagrams of the model are made in a plane surface. From these diagrams replicas are made on a thin plate of metal by drilling tiny holes of corresponding diameters in corresponding positions of the several images in the plane. The optical diffraction patterns of the replicas are then obtained and

photographed, and these patterns are equivalent to X-ray diagrams of the molecular structures simulated by the models. By this technique systematic studies can be made by varying the scale model according to a planned system of changes in molecular structure. The optical diffraction patterns of scale models of α and β keratin were shown to be remarkably similar, in fact identical, to the X-ray diagrams of α and β keratin. This technique, described by A. W. Hanson, H. Lipson, and C. A. Taylor, Proc. Roy. Soc., A218, 371 (1953), is considered a very powerful tool for basic studies of the structure of organic materials and of proteins in particular. It was an honor to give an illustrated lecture on "Stress-strain relationships in yarns subjected to rapid impact loading" to a staff of over 100 from the three Courtaulds Laboratories and to once more observe the great interest in this work of the National Bureau of Standards.

105. General Comments

It is estimated that close to 40,000 miles were travelled by air, tourist class, in less than 100 days. During this time it was possible to participate in discussions at over 100 meetings, conferences, research institutions, universities, plant visits, and other technical functions, and to give over 20 lectures to a total of several thousand people. To attain this goal necessitated very careful planning and strict adherence to the rigid schedule, even if it meant considerable personal discomfort or expense. However, the attainment of this goal would not have been possible without the splendid cooperation and assistance of very many individuals before and during the visits, and their collective help is gratefully acknowledged and deeply appreciated. In these visits it was possible to meet personally over a thousand scientists, technologists, executives, and men of many other occupations. The discussions of a great variety of scientific and technical subjects were immensely stimulating and thought-provoking and of great educational value. On the other hand, one felt very humble in his own contributions. However, honest and frank exchange of technical information resulted in better and sympathetic understanding and the establishment of friendly and personal acquaintances that will deepen and become more valued with time. So it is with a deep feeling of gratitude that I record my great appreciation to the Officials of the National Bureau of Standards and of the International Cooperation Administration, as well as to the many individuals in the countries visited, for making this trip possible and so valuable.

Herbert F. Schiefer

THE NATIONAL BUREAU OF STANDARDS

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