

INTRODUCTION

TENS of billions of dollars are spent annually in the United States on personal wardrobes and household textiles. It is easy to see the economic necessity of conserving and preserving these garments and household items, and to do this the American public spends over two billion dollars a year for drycleaning services alone. Cleanliness of clothing goes hand in hand with the feeling of being well-groomed, and makes necessary the proper renovation of garments by either drycleaning, wetcleaning, or laundering.

Drycleaning involves the application of some very definite physical treatments to a fabric, so that it must necessarily have a certain fastness of color and finish, firmness of construction, and permanency of design application to withstand these treatments. (1) The net effect of drycleaning on a fabric is considerably less drastic in its action than soap and water in the majority of cases.

In some instances the fabrics themselves are lacking in some essential quality to withstand drycleaning without damage. In others, the garment contains a component such as a shoulder pad or interfacing, which is found to have harmed the color or finish in the fabric, or even to have damaged the fiber of which it is made. But by far the greatest number of cases of damage that may show up in drycleaning are traceable to some condition of use entirely unrelated to drycleaning. In these instances, the user of the product may be at fault, or the fabric may be lacking in serviceability.

Because of the mysterious nature of most damage problems, a three-way controversy be-

tween the retailer, drycleaner, and consumer is a common occurrence. It is the purpose of Part II of this book to present information on those fabric and garment performance problems that frequently become points of issue and which are difficult to resolve without some authoritative guide to the cause of damage.



FIGURE 1
More than 30,000 textile items are analyzed annually in NID's Textile Analysis Laboratories.

For many years, the National Institute of Drycleaning has conducted research and educational activities concerned with the problems of fabric behavior in drycleaning. The material in this book has been drawn from this long experience.

Textile Analysis Laboratory

The Institute has maintained a Textile Analysis Laboratory at its headquarters in Silver Spring, Maryland, since 1927. A branch laboratory in Glendale, California, has served

West Coast member drycleaners since 1948. Today, these laboratories annually process over 30,000 fabric damage problems for NID members, and, as an auxiliary service, for the complaint departments of Better Business Bureaus, retail stores, and manufacturers.

Textile Analysis Advisory Committee

In January 1957, NID formed a Textile Analysis Advisory Committee composed of textile consultants and consumer relations experts. The membership of the committee was as follows:

MR. CHARLES A. SEIBERT, formerly Head of DuPont's Dyestuffs Application Laboratory.

MR. CHARLES W. DORN, Textile Consultant, formerly Director of J. C. Penney Company Research Laboratory.

MISS MARY C. WHITLOCK, Professor and Head, Textile and Clothing Department, College of Home Economics, University of Rhode Island.

MRS. DOROTHY C. MATTHAI, Merchandise Manager, Better Business Bureau, Inc., Baltimore, Maryland.

The committee membership has remained the same over the years with one exception. Mr. Charles A. Seibert resigned from the committee membership early in 1960. He was replaced October 27, 1960 by the able Dr. Harley Y. Jennings, Professor of Textile Chemistry, School of Textiles, North Carolina State College. He was formerly Director of Research for Dan River Mills.

With the guidance of this committee, the Textile Analysis services of NID are closely



FIGURE 2

NID's Textile Analysis Advisory Committee. From left to right, Dr. Jennings, Mrs. Matthai, Mr. Dorn, Miss Whitlock.

controlled to assure the utmost accuracy of investigation and fairness of reporting.

Fabric Performance Research

The Research Department of NID has, over the same period of years, conducted a fabrics research service for its members which investigates new problems that are sent to the Textile Analysis Laboratory, new fabrics as they come on the market, and new processing methods designed to improve handling of troublesome products. The results of this work are reported in technical bulletins to members and in special bulletins to the field of education, retail stores, Better Business Bureaus, and the various segments of the textile industry.

Textile Relations Department

Through this department, which is located in New York City, NID keeps in close touch with the textile industry concerning textile performance problems of all kinds. Since 1947 it has carried on investigations in fabric problems, working with trade organizations and individual manufacturers to first learn the causes of the problems and then initiate steps toward their correction.

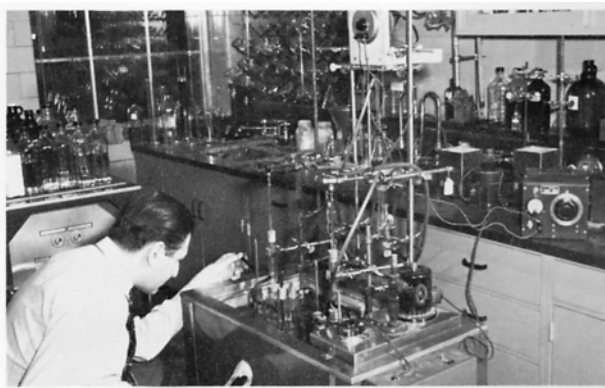


FIGURE 3

Fundamental and applied research studies are carried on in NID's Research Laboratories.

Through this department NID has also cooperated in and contributed to the development of minimum performance standards of the American Standards Association, a program that can do much to prevent the kind of complaints that appear on the pages to follow.

When Damage Occurs, Who's Responsible?

Often there is no easy answer to who is responsible when textile damage occurs. The circuitous route through which textile items

travel from fiber to consumer is a complex one. (See Figure 4, P. 394, 395—Flow of Textiles from Maker to Consumer.) Sometimes it is impossible to pin-point the responsibility.

Responsibility for satisfactory performance of textile items in end-use is four-fold:

1. *Control at the source*: It is the responsibility of the manufacturer to produce merchandise that will give consumer satisfaction.
2. *Control by the retailer*: It is the responsibility of the retailer to purchase goods for resale that will give satisfactory consumer performance.
3. *Remedy of soil and stain conditions*: It is the responsibility of the service industries to study and develop proper methods of handling and cleaning of textile items, recognizing the fact that some merchandise requires special processing techniques.
4. *Prevention and care in use*: It is the responsibility of the consumer to exercise discrimination in the selection of textile merchandise, to use the article as it is intended to be used, giving it the proper care in wear, cleaning, and storage.

What Is Satisfactory Performance?

The National Institute of Drycleaning is not alone in its search for answers to fabric behavior. The Kaufman Fellowship established at the Mellon Institute, Pittsburgh, Pennsylvania, tabulated and analyzed case studies of fabric behavior for over 27 years. Dr. Jules Labarthe, Senior Fellow, points (3) out that in order to establish justification of a consumer complaint or consumer dissatisfaction, it is necessary to set up a system of standards of serviceability and attitude measurements. He suggests that consumers ask themselves the following questions:

1. Why did I buy the item to begin with?
2. What did I expect it to do by way of performance?
3. How long do I feel the item should have lasted?
4. What did the store's sales person or representative tell me about it?
5. Did I misuse or mistreat it, or has it failed to live up to my expectations?

Of the 10,001 or more complaints Dr. Labarthe studied at Mellon Institute, (4) he found 66% were not the fault of the merchandise. This means that in some 6,000 cases the consumer, the laundryman, or the drycleaner had either misused or mistreated the textile item, thus causing its early failure, and that the fabric itself was not at fault. Thirty-four per cent of the complaints lie with the merchandise itself. In studying these figures, Dr. Labarthe pointed out that it is well to remember that an untold number of consumers do not bother to return merchandise when it fails to give satisfaction. Hence, the significance of a single complaint is great.

The Mellon Institute studies (4) show that women's wear accounts for the greatest number of returns (71.3%), followed by men's wear (13.4%), children's wear (8.3%), and all other types of textiles (7.0%).

Studies made by the Nutrition and Consumer-Use Research, Agricultural Research Service, U. S. Department of Agriculture, and research carried on by the U. S. Experiment Station cooperative textile projects all over the country for a period of many years, as well as independent research work at many of the degree-granting colleges and universities, have also pointed up the existence of certain shortcomings of fabric performance in end-use.

Many of the test methods currently used in testing fabrics fail to predict actual wear performance in all cases, the error being more frequently because the test is too mild than because it is too rigorous. (5)

Progress is being made in developing test methods and specifications that more accurately predict fabric performance under conditions of use. The Bureau of Standards, the American Society for Testing Materials, the American Association of Textile Chemists and Colorists, the American Standards Association, the Textile Distributors Institute, the National Retail Dry Goods Association, the American Home Economics Association, the American Hotel Association, and industrial, trade, and commercial laboratories are interested in and working toward tests that more accurately predict fabric behavior in end-use. Such efforts will result in greater satisfaction on the part of the consuming public.

Adjustment Guide Developed

In 1961, in response to the drycleaning industry's need for guidance in making claims

FLOW OF TEXTILES

COTTON TEXTILES

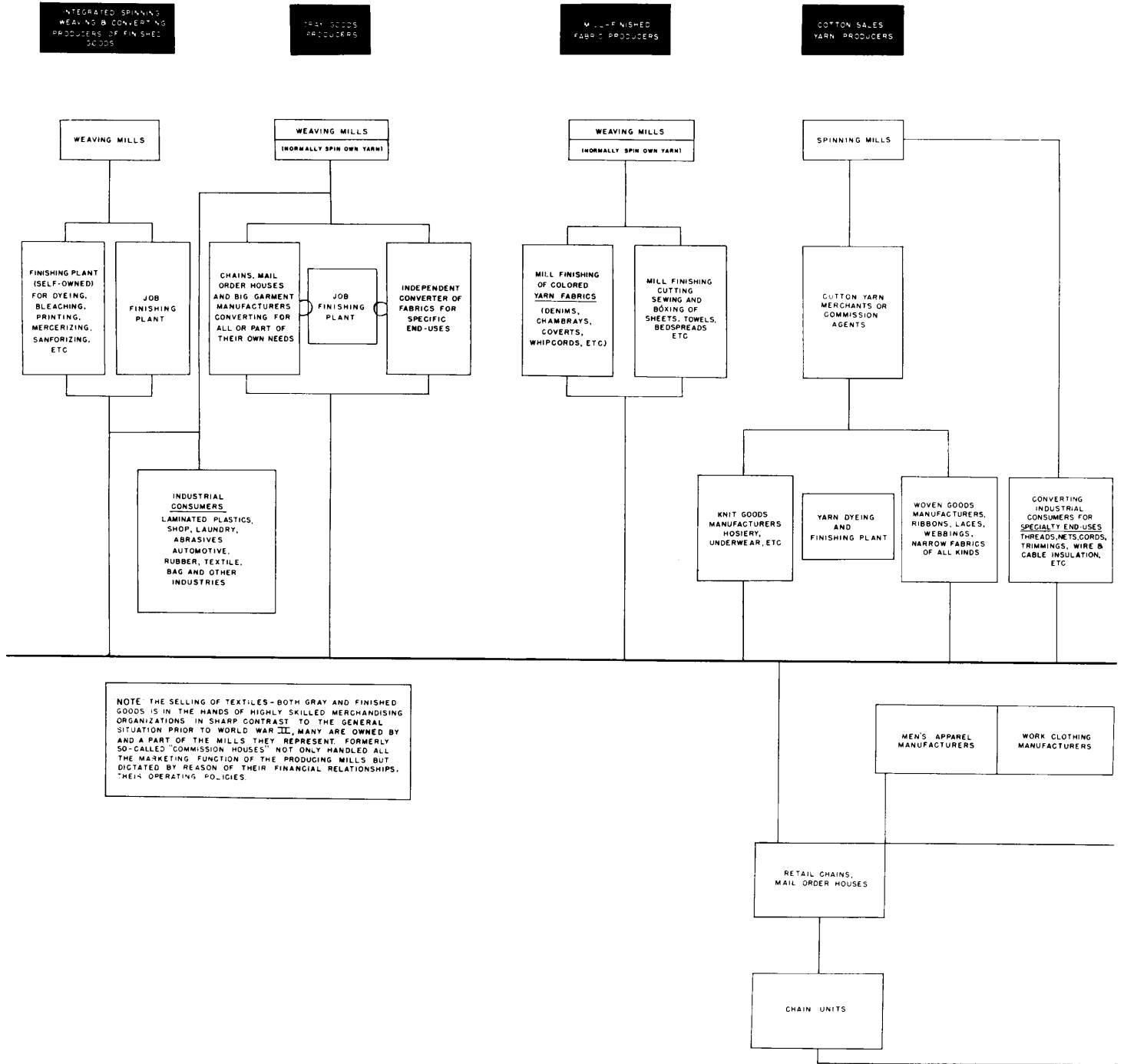
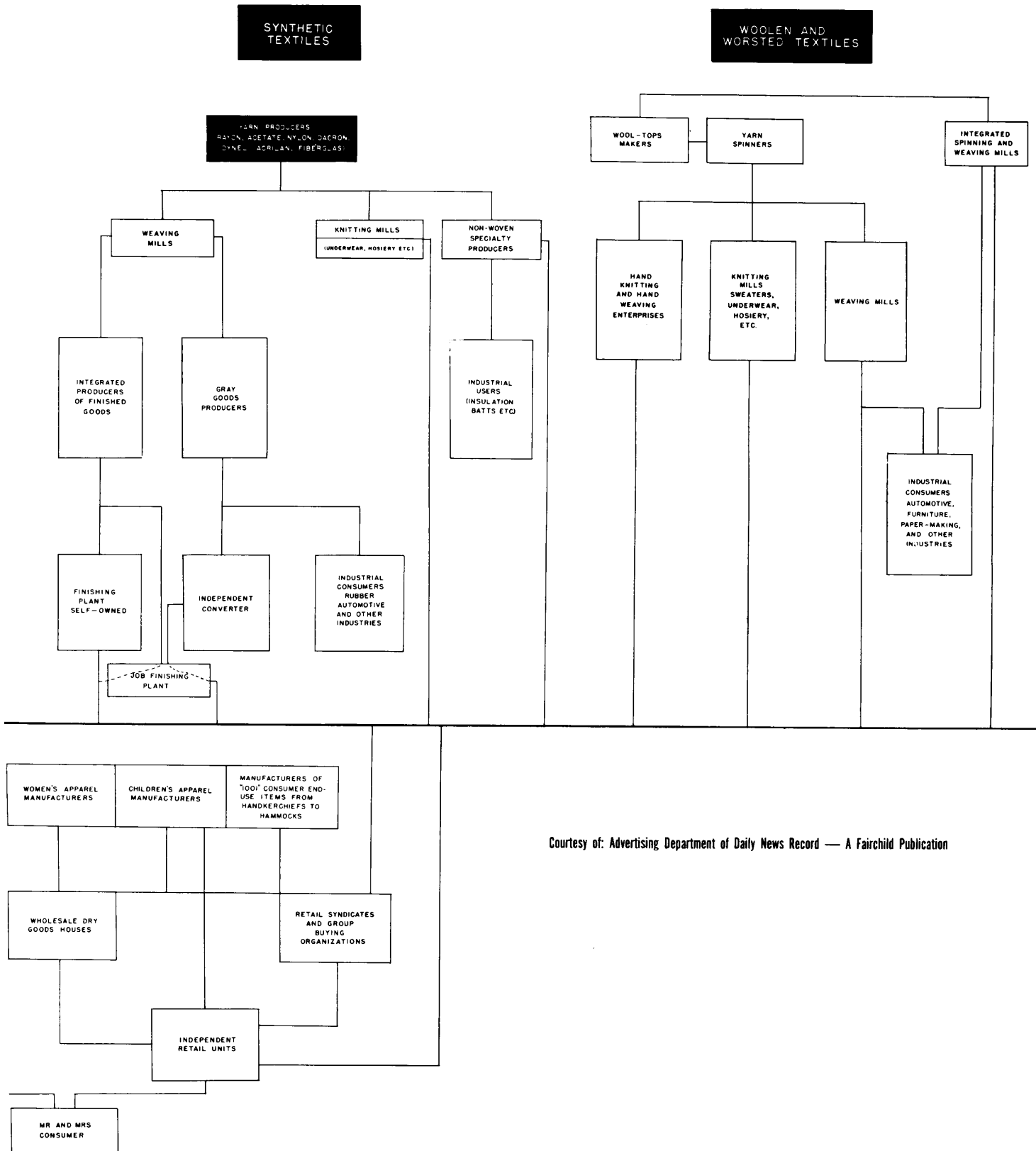


FIGURE 4

Flow of textiles from maker to consumer.

FROM MAKER TO CONSUMER



Courtesy of: Advertising Department of Daily News Record — A Fairchild Publication

adjustments, NID published the National Fair Claims Adjustment Guide for Consumer Textile Products. The Guide is based on the principle of depreciation. It contains a formula for calculating the value of an article according to its life expectancy, age, condition and replacement cost. The basic elements of the Guide are those taken into account by professional adjustors in evaluating insurance claims. Its success is seen in the record of its endorsement—insurance companies were the first to recognize the value of the Guide and thousands of copies have been obtained by insurance firms for distribution to their claims offices. One company ordered 20,000 copies.

The National Association of Municipal Court Judges circulated copies of the Guide to its membership of 3,500 judges, commending it for use in both civil and criminal cases, the latter for determining the degree of larceny in property thefts. The National Association of Retail Clothiers and Furnishers sent copies to its membership of 3,500 retail men's stores, and Better Business Bureaus use the Guide in counseling their members and consumers on adjustment value determinations.

In June 1962, the American Home Economics Association adopted a formal resolution at its annual convention commending NID for having produced the Guide, pointing out its value both to consumers and as a teaching aid.

In the textile industry the Guide has also had remarkable acceptance. A number of firms have adapted it to their own claims adjustment policies, and a prominent yarn producer made reference to the Guide's life expectancy rates in national consumer and trade advertising with regard to color performance.

Liability Guide Under Development

The Guide was intended only as a means of determining adjustment values. It was not

designed to serve as a guide for determining liability, yet there is a strong need for such a guide and NID is presently at work on an expansion of the Guide to satisfy this need. A standard for liability determinations must: (1) classify textile products according to the service that can be expected of them; (2) give standard definitions for various terms of reference commonly used to describe the functional characteristics of textile products; and (3) contain liability definitions for broadly classified types of damage.

FABRIC BEHAVIOR IN DRYCLEANING has been prepared with the purpose of supplying information that will promote better understanding among the producer of textile fabrics, the manufacturer of wearing apparel and household items, the retailer who sells the goods, the drycleaner who services them, and the consumer who wears and cares for the items purchased. In considering Part II of this book, it must be remembered that in relation to the total volume of merchandise produced, sold, and serviced, the percentage of fabric and garment failure is relatively small. However, it is this small percentage that causes misunderstandings involving the consumer, the drycleaner, the retailer, and the manufacturer.

No book could possibly cover all the problems of fabric behavior in drycleaning. The illustrations and discussions here of case studies are representative examples. There are many variations. For the purpose of discussion, we have grouped the examples into six classifications:

- Section 1—Loss or change of fabric finish;
change in fabric construction
- Section 2—Transfer and bleeding of color
- Section 3—Loss or change of color
- Section 4—Fabric damage
- Section 5—Change in fabric dimension
- Section 6—Spot and stain removal

SECTION I

LOSS OR CHANGE OF FABRIC FINISH CHANGE IN FABRIC CONSTRUCTION

LOSS OF ANTI-STATIC FINISH: LOSS OF SOFTENER

Why does this occur? Synthetic fibers are classed as hydrophobic. They resist or repel water because they also have a tendency to produce static electricity. Manufacturers use anti-static chemical agents to minimize this property. They may also add chemical products in spinning or weaving to improve the hand or feel of the fabric.

When does this occur? Some of the chemical reagents used are removed in drycleaning; others are removed in wetcleaning or laun-

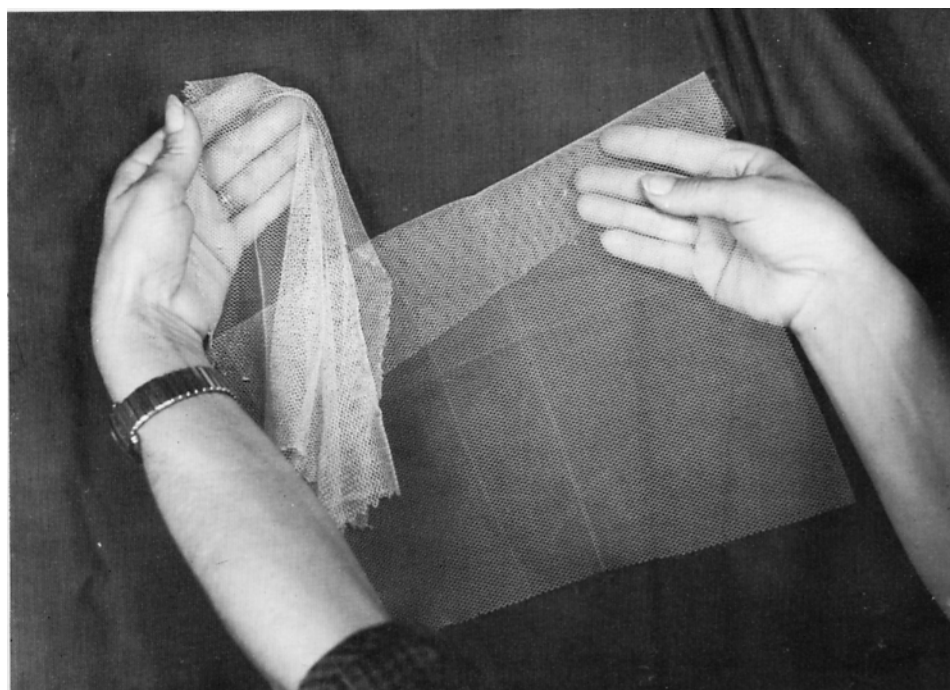
dering. With the removal of the softeners, the fabric takes on a harsh to boardy feel.

How may this be corrected or remedied? There are some consumer products available called fabric softeners or conditioners. They may be added to the final rinse in laundering or wetcleaning. Some are effective on some fabrics; others are not effective.

(Reference: NID Fabrics-Fashions Bulletins FF-97; FF-100.)

FIGURE 5

Loss of finish can completely alter the appearance, hand or feel of a fabric. When an anti-static finish or softener is lost in drycleaning the fabric becomes harsh.



LOSS OF CRISP HAND—MARKINGS—STREAKS

Why does this occur? Fabrics like silk organza and silk organdy have a semi-stiff to stiff hand or body. Some of the natural gum (sericin) is left on the silk fiber to produce this effect. The silk yarns are treated to solidify the sericin that is permitted to remain on the yarn as a protective coating. The silk fabrics are dyed at a low temperature, hence the dye has poor penetration into the fiber, and poor colorfastness properties.

When does this occur? Dyes may crock off readily in wear and in drycleaning. Because of the stiffness of the yarns, bending, flexing, rubbing or abrasion causes the gum or sizing as well as the filaments, to break. This is more noticeable on dark colored fabrics, particularly at the collar line, around the waist-

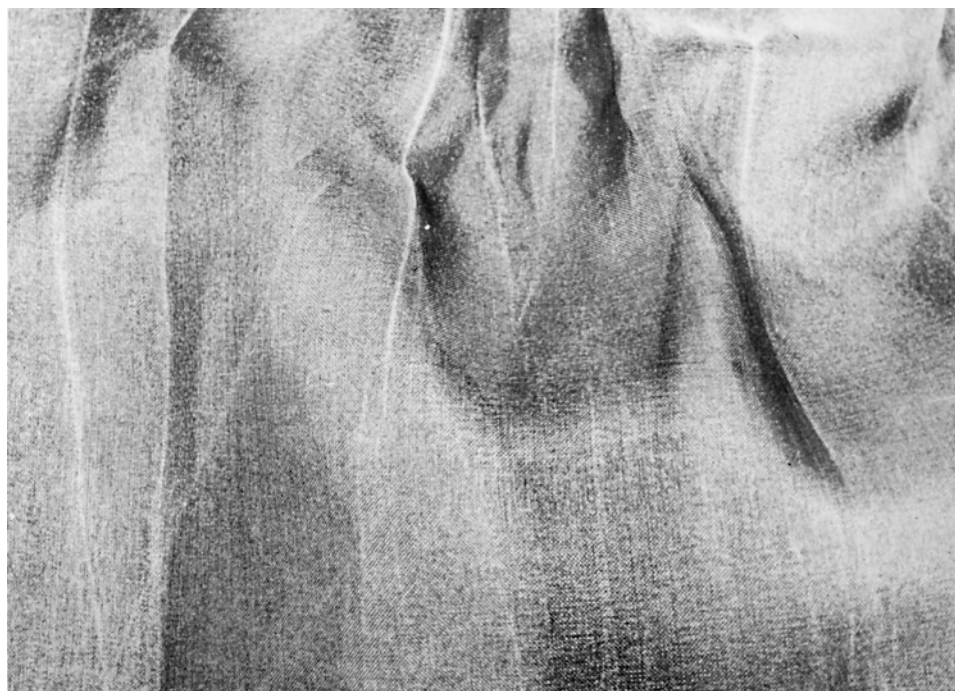
line, at the bottom edge of a fold or hemline. Sometimes streaks may develop in irregular lines throughout the garment.

How may this be controlled? Silk organza and silk organdy are luxury fabrics with limited serviceability. If the fabric develops streaks or white markings during wear, the condition will be aggravated by drycleaning. These fabrics require special handling in drycleaning. It is generally not difficult to determine if the streaking occurred in drycleaning or if it is due to fabric construction and wear. The edge of pleats and hems are particularly vulnerable.

(References: NID Technical Bulletin T-328; Fabrics-Fashions Bulletin FF-70.)

FIGURE 6

Light streaks develop in silk organza when the fabric is folded, pleated, darted or tucked. Abrasion in wear may also cause them to develop.



LOSS OF GLAZED FINISH

Why does this occur? There are two methods of producing a glazed finish; one is non-durable, the other is durable. In the non-durable class, the fabric is given a starch finish and then passed between a heated roller or calender to produce a high luster or polish. The starch gives it a stiff hand and a gloss. In the durable type the fabric is treated with a polymerizable resin, with or without mechanical pressure, under special methods of application and curing to produce a high luster. Fabric failures fall into four classes: (1) Change of appearance or hand because of loss of finish; (2) Dulling of the fabric surface; (3) Crazing or streaking.

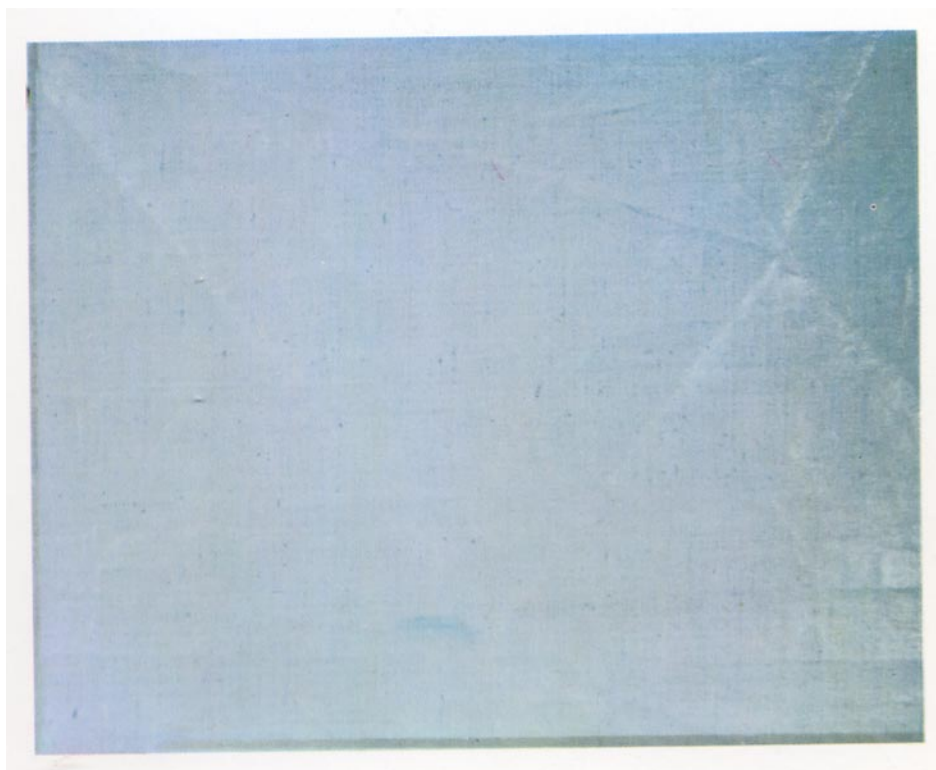
When does this occur? The starch finish is removed in both drycleaning and wetcleaning. The resin-type glaze may be partially removed, and gloss achieved by calendering may be partially lost. If the fabric is very stiff, streaks will develop along folds or in the bending, flexing or abrading of the fabric. Removal of the sizing causes limpness.

How may this be controlled? Durable finishes give better serviceability than non-durable finishes. Apply a small drop of iodine solution to a sample of the fabric. If the brown iodine spot turns blue, the finish is the non-durable type. If it remains brown in color, the finish is the semi-to-durable resin finish.

(References: NID Fabrics-Fashions Bulletin FF-71.)

FIGURE 7

Bending, flexing, folding, rubbing, abrading may break up a glazed finish and leave white streaks. The markings are more visible on solid shades than on prints. Some finishes are dulled in drycleaning and wetcleaning.



LOSS OF LACQUER-TYPE FINISH

Why does this occur? Textile finishers use certain lacquer finishes not only to impart stiffness, but to give the fabric a distinctive "rustle." Drycleaning action causes these fabrics to lose some or all of their characteristic stiffness or "rustle."

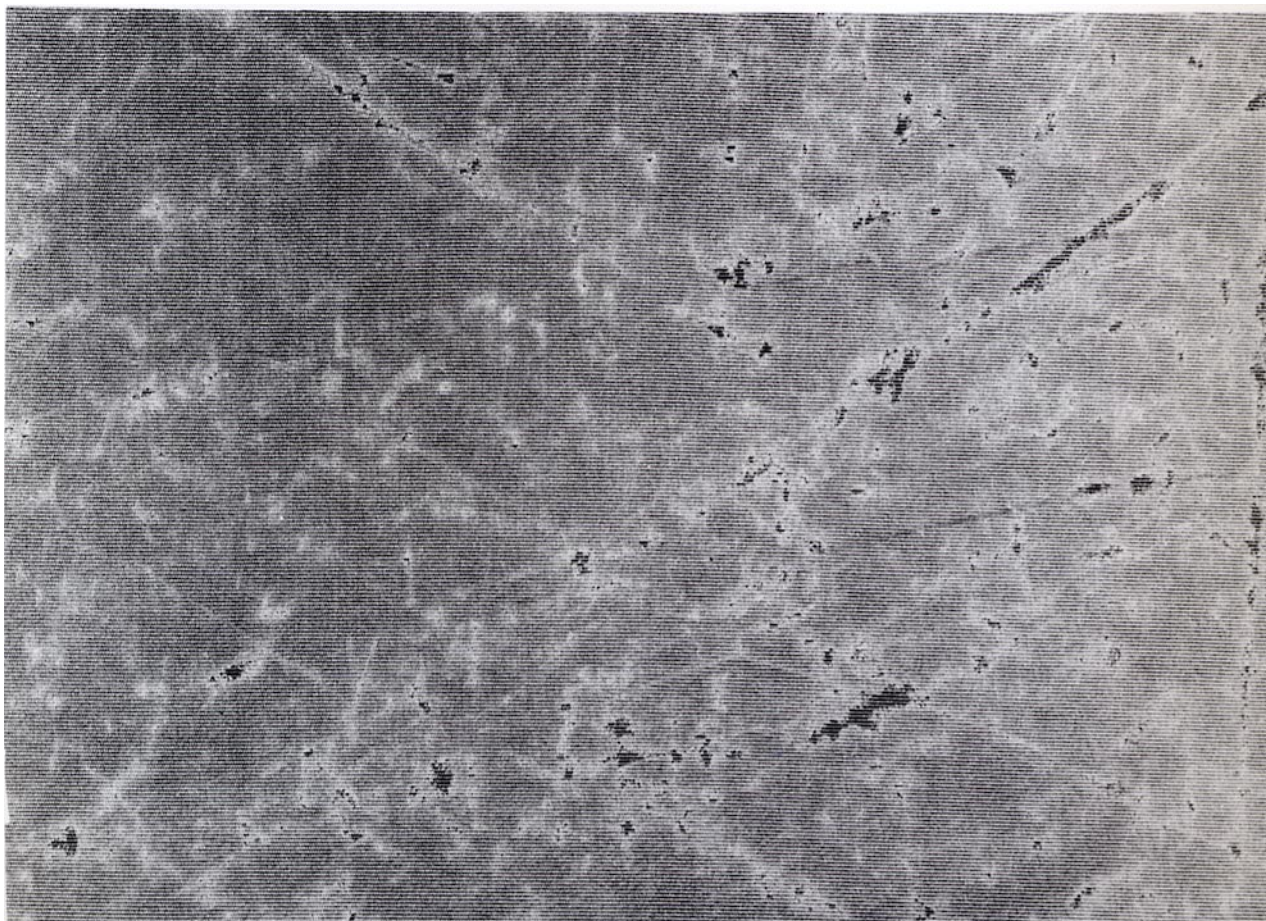
When does this occur? This type of finish is affected by both petroleum and synthetic drycleaning solvents. On drying, the finish leaves deposits on the surface of the fabric which usually appear white and flaky.

How may this be controlled? In some cases it is possible for the drycleaner to restore the stiffness of lacquer finishes by spraying with amyl acetate. Success of this technique depends on fabric and garment construction and the amount of lacquer finish originally applied to the fabric. This problem may be controlled in manufacture by the selection of textile finishing agents that are not affected by drycleaning solvents.

(Reference: NID Technical Bulletins T-196; T-205; T-28¹; Fabric Facts C-13.)

FIGURE 8

Paper Taffeta. Note the white, flaky deposit on the fabric surface. A finish disturbed to this extent cannot be restored by any techniques now available to the drycleaning industry.



LAMINATED FINISH—PARTIAL OR COMPLETE SEPARATION

Why does this occur? Lamination is used to bind fabrics to urethane foam, simulated leather to fabric, fabric to fabric, and fabric to film. Fabric bonding or lamination may be done by heat fusion or with the use of an adhesive.

When does this occur? Delamination or separation of fabric from foam or fabric from fabric may occur in wear, drycleaning, or spotting.

How may this be controlled? Delamination or separation may be controlled in manufacture by being selective of fabrics to be laminated, by choice of a binder or adhesive, by controlling the conditions of bonding, and by combining drycleanable or wetcleanable fabrics in garment construction. Spotting agents should be tested on a sample of fabric to avoid delamination in spotting.

(References: NID Fabrics-Fashions Bulletins FF-63; FF-80; FF-98; FF-104.)

FIGURE 9

A jacket was made of simulated leather and knitted cotton laminated to foam in a sandwich construction. In wet-cleaning the simulated leather and the cotton knit separated from the foam. The cotton knit shrank. The garment could not be restored to original size.



OPAQUE FINISH—ALTERATION OR LOSS

Why does this occur? Special surface finishes are applied to lining fabrics to make them opaque. Various substances are used, such as vinyl resins and synthetic rubberized materials. They may differ in color—white, black, grey, silver, gold. Formulation of the coating material and method of application to the fabric consists of using an opaque layer and a laminating layer. Some products may add an additional layer. The polyvinyl chloride resin binder and the softening chemical or plasticizer are identical in each layer. But they may not react the same way to drycleaning.

When does this occur? Some of these finishes may be affected by both the solvent action and the mechanical action of petroleum and synthetic drycleaning. Successive cleanings

cause more and more of the finish to be lost. Some of the fabrics stiffen when cleaned, and with age. Some surface coatings may separate or peel off from the lining fabric, crack, wrinkle or stiffen as the fabric dries.

How may this be controlled? It is recommended that the synthetic rubber coated drapery lining be wetcleaned if the drapery fabric can withstand wetcleaning. Combination of drapery fabrics with these types of linings limits the method of cleaning. Stiffening and separation of the surface finish from the lining fabric may be controlled by the selection and application of the finish during manufacture.

(References: NID Technical Bulletin T-289; Fabrics-Fashions Bulletins FF-39; FF-50; FF-83; FF-101.)

FIGURE 10

Some coatings used to make drapery linings opaque may be removed with drycleaning. Left: Original coated lining fabric. Right: The same fabric after several drycleanings.

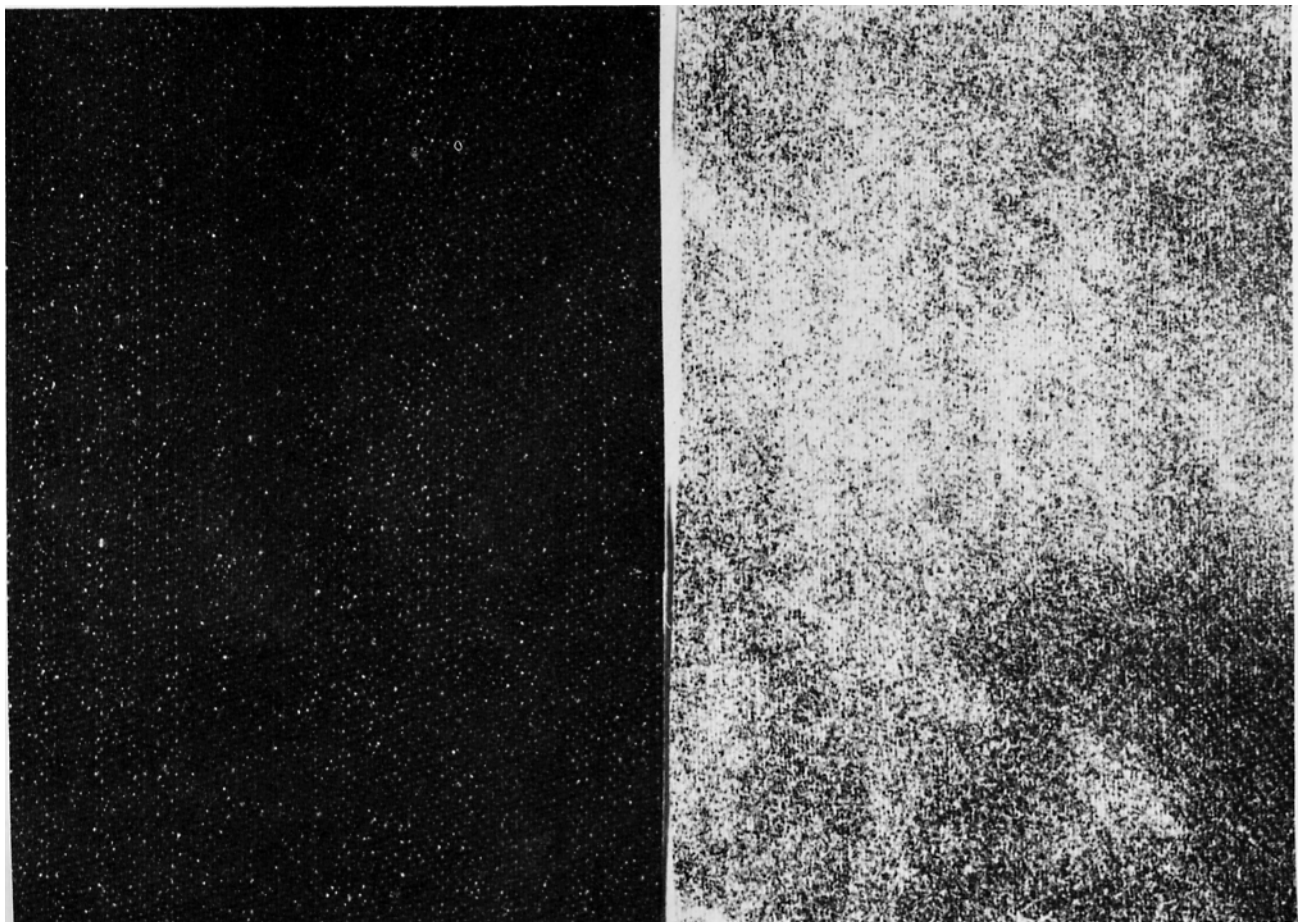


FIGURE 11

Some coatings used to make drapery linings opaque stiffen in dry-cleaning. The heat of pressing softens some of these fabrics. Others cannot be restored.

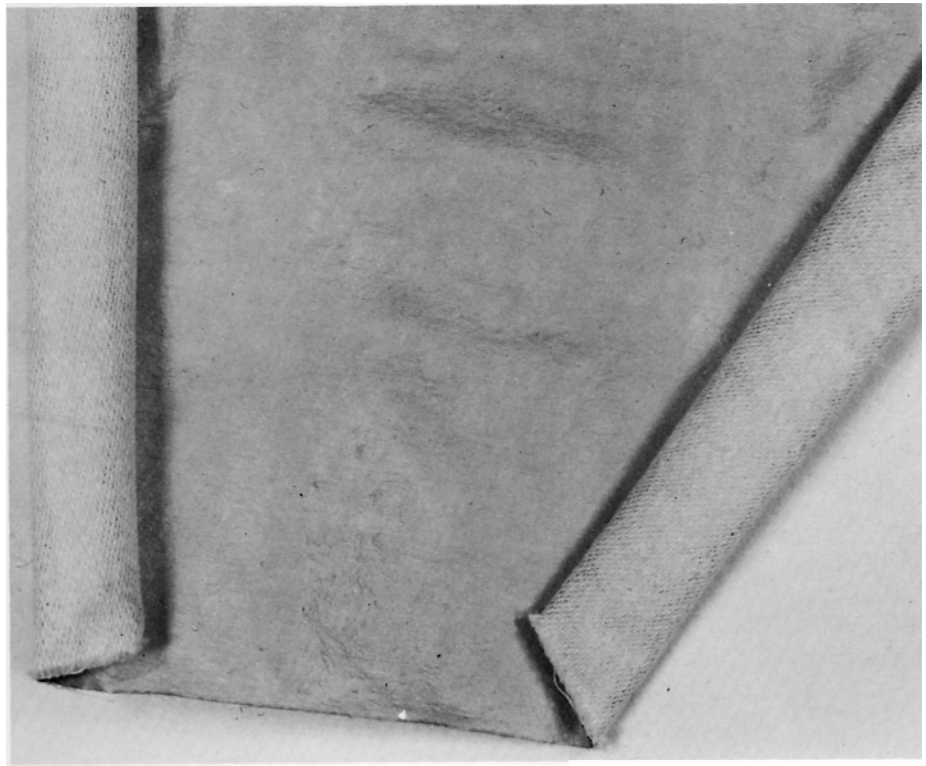


FIGURE 12

Some coatings used to make drapery linings opaque, will wrinkle, separate, and stiffen with drycleaning.

LOSS OF PRESENSITIZED FINISH

Why does this occur? Dyed wool fabrics are presensitized with a special non-resinous, wool-setting chemical (monoethanolamine sulfite). It is activated with water and steam to form permanent pleats and creases. The chemical affects some wool dyes. Staining may occur through contamination of the solution with metals, particularly iron. Glazing and moireing may develop in pressing hard-finished fabrics. Durability of pleats and creases may vary from fabric to fabric. The amount and concentration of the solution applied to the fabric, the condition of curing or steaming, and the degree of acidity

of the finished fabric all contribute to crease durability.

When does this occur? Pleat separation and loss of crease sharpness may occur in wear and drycleaning. Resetting of pleats or creases is not difficult unless the garment has been altered or improperly pressed.

How may this be controlled? Control of conditions in manufacture of permanent creases or pleats is the first step in serviceability and durability. Care in making alterations and pressing on original pleat or crease lines is important for satisfaction in wear.

(Reference: NID Fabrics-Fashions Bulletin FF-67.)

FIGURE 13

Crease lines remain sharp, but pleat separation may occur in wear and drycleaning. Steaming will bring pleats back into line quickly in most cases.



FIGURE 14

These trousers were labeled "Creases guaranteed for the life of the garment. Dry clean only. Press on original crease only."



REFLECTIVE FINISH—ALTERATION OR LOSS

When does this occur? Some reflective finishes may be affected by the solvent action and/or the mechanical action of petroleum and synthetic drycleaning. Some fabrics stiffen; in others the metallic particles are removed. Successive cleanings usually cause more and more of the finish to be lost.

Why does this occur? Special surface finishes are applied to wearing apparel and drapery lining fabrics. Various types of lining fabrics such as satin, taffeta, sateen, and simple figure weave constructions are surface-treated with metallic particles. Closely

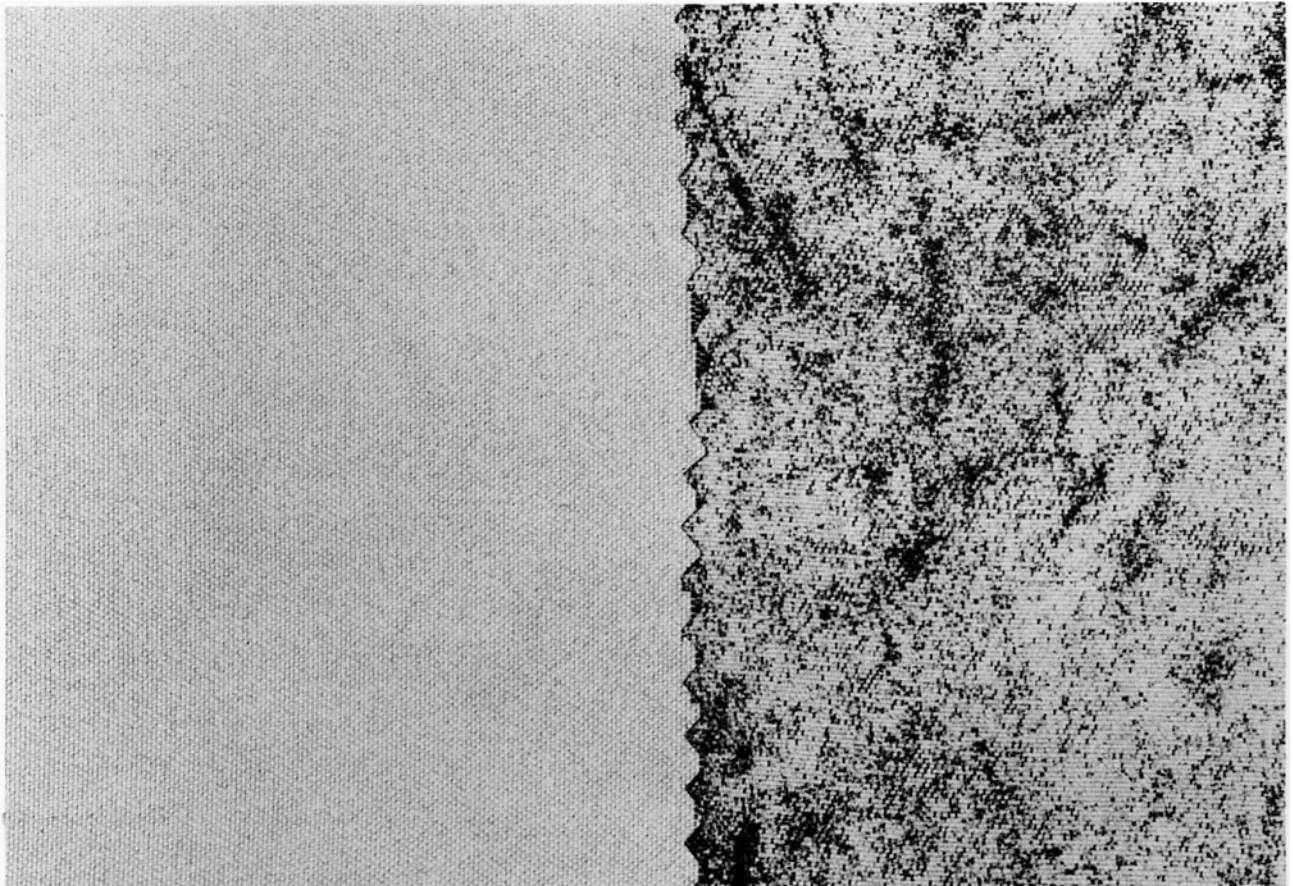
woven fabrics generally give better performance than loosely woven fabrics.

How may this be controlled? It is suggested in making draperies that the reflective surface of the lining fabric be placed against the back or underside of the drapery fabric, just as you do when placing a reflective lining in a coat. Some loss of metallic particles should be expected in use and cleaning. Excessive loss of the metallic particles may be controlled by better selection and application of the finish during manufacture.

References: NID Technical Bulletin T-265; Fabrics-Fashions Bulletin FF-92.)

FIGURE 15

Some reflective lining fabrics lose their metallic particles in drycleaning. Left: Original. Right: Drycleaned fabric.



RESIN FINISHES

Resin finishes are applied to add functional or performance characteristics to many different types of fabrics. Some of the resin finishes are changed or altered in wear, drycleaning and wetcleaning. Consumer performance problems caused by the change or breakdown of resin finishes are:

1. Retention of chlorine. See page 463.
2. Loss of tensile strength. See page 463.
3. Shrinkage. See pages 532 and 540.
4. Objectionable odors.

OBJECTIONABLE ODOR FROM TEXTILE FINISHES

Why does this occur? Textile producers use many types of resin finishes to impart crease resistance and shrinkage control to fabrics. Urea formaldehyde or melamine formaldehyde resins, when improperly cured in textile finishing, may break down and the objectionable odor may not become noticeable until after wear, storage, or drycleaning. Some of these give off a fish-like odor. This problem may occur if a textile finisher fails to wash out the excess chemicals after the curing or heat-setting operation; if he cures the fabric for too long a time or at too high a temperature; or if he uses an old resin solution that has been stored for too long.

When does this occur? These improperly cured resins break down and produce odor-forming compounds (aliphatic amines) at any time after manufacture.

How may this be controlled? Proper curing of the resin finish by the textile finisher is the only sure method of control. There have been cases where such an odor has been removed by wetcleaning in an alkaline solution of water and detergent, but there is no guarantee that this treatment will always be effective. Frequently, fabric combinations and garment design do not lend themselves to a wet processing treatment.

RUBBERIZED FINISH

Why does this occur? Some rainwear fabrics are coated with a rubber film or coating to make them resist rain and wind. Natural rubber is affected by drycleaning solvents. Some synthetic rubber coatings may not be affected by solvent, while others may be affected to varying degrees.

When does this occur? When the fabric is drycleaned, the rubber film separates partially or completely from the outer fabric. When the film separates partially, small blisters form on the outer surface which cannot be smoothed out in finishing.

How may this be controlled? Rubber coated fabrics should be wetcleaned, provided all parts of the garment, including lining and interlining are wetcleanable.

(Reference: NID Fabrics-Fashions Bulletins FF-56; FF-83.)

SEE FIGURE 16, NEXT PAGE

FIGURE 16

The rubber film separates partially or completely from the rainwear fabric, causing small blisters to form on the outer surface. The fabric cannot be made smooth by finishing.



FIGURE 17

The coated surface of a rainwear fabric completely separated from the base fabric in dry-cleaning. The gray side of the film was held to the surface of the outerwear fabric. The black side of the film (or underneath side of the coated fabric) was not visible since it was hidden by a woven lining fabric.

LOSS OF SOLVENT-SOLUBLE SIZINGS

Why does this occur? Textile finishers may use complex chemical sizings to give the desired stiffness to certain fabrics such as taffetas and nets. Some of these sizings may be partially or completely soluble in drycleaning solvents.

When does this occur? These sizings are affected by both petroleum and synthetic solvents during drycleaning. The sizing may be changed by softening, or it may be par-

tially or completely removed, depending on the type of textile sizing compound used.

How may this be controlled? Restoration depends on fabric and garment construction. In some cases, special sizings may be reapplied by the drycleaner but usually the fabric never regains its original hand or appearance. This problem will exist until permanent sizings are developed.

(Reference: NID Technical Bulletins T-220; T-233; T-235; T-271; and Fabric Facts C-13.)



FIGURE 18

Some sizings, used to give stiffness to net, soften with drycleaning. Upon drying, the fabric becomes stiff and wrinkled.

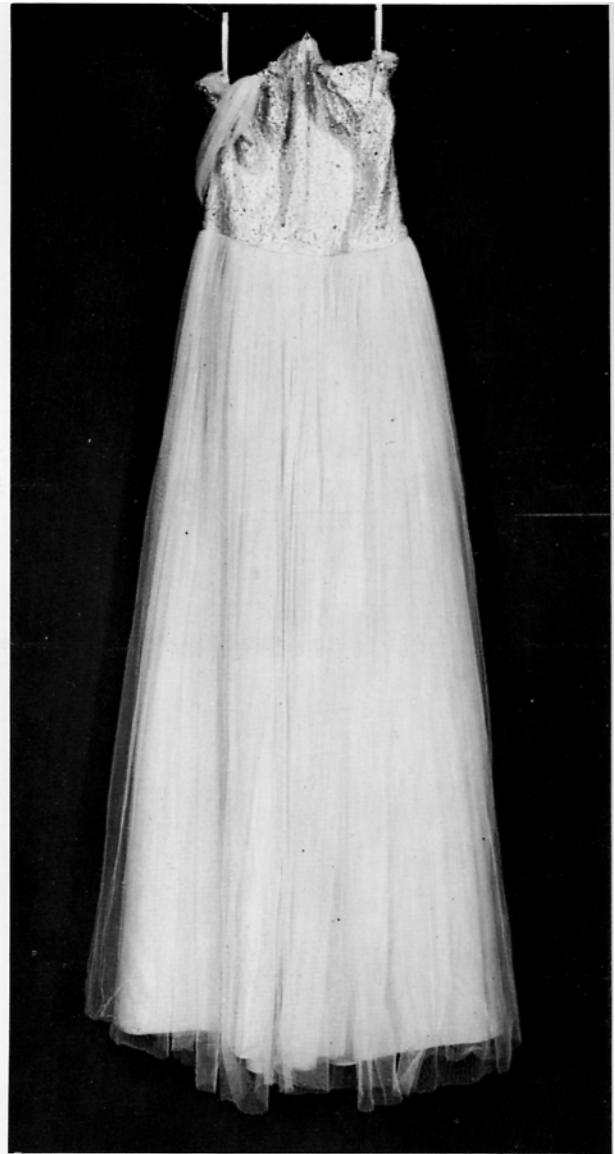


FIGURE 19

Here the drycleaner has removed the resin sizings and softened the fabric, but it no longer resembles the original net.

STIFFENING OF FABRICS

A variety of coatings applied to fabrics are altered in drycleaning. The fabrics may be grouped as follows: Rainwear; Coat linings (see page 209); Drapery linings (see page 211); Self-lined draperies (see page 213).

Why does this occur? Thermoplastic coatings differ in chemical composition. They are used to impart waterproofing and wind resistance to outdoor apparel. Some of these resins stiffen when drycleaned. The surface finish becomes cracked and broken.

When does this occur? When fabrics with this type of finish are drycleaned in either petroleum or synthetic solvent, the plasticizer is removed. When the fabric dries it becomes stiff. The finish remaining on the surface of the fabric may appear cracked and broken. Some of these fabrics stiffen with age, too.

How may this be prevented? If garment design permits, these items can be wetcleaned. They should not be drycleaned. In some cases, the fabric may be softened by the application of a plasticizer. This problem may be prevented in textile finishing by using plastic coatings not affected by solvents, or by permanently labelling this merchandise: "Wetclean Only—Do Not Dryclean."

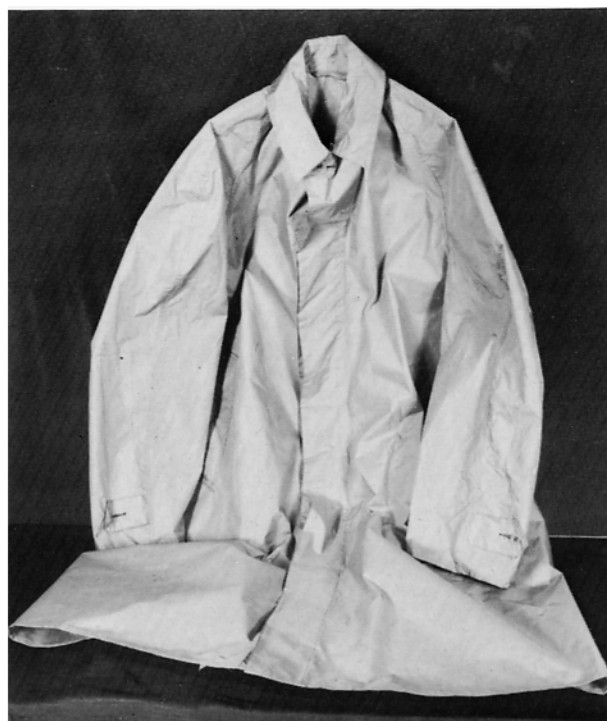


FIGURE 20

This plastic-coated raincoat became stiff in drycleaning. A garment of this type can be made pliable again by the application of a softening agent.

(References: NID Technical Bulletins T-158; T-186 and Fabrics-Fashions Bulletin FF-92.)

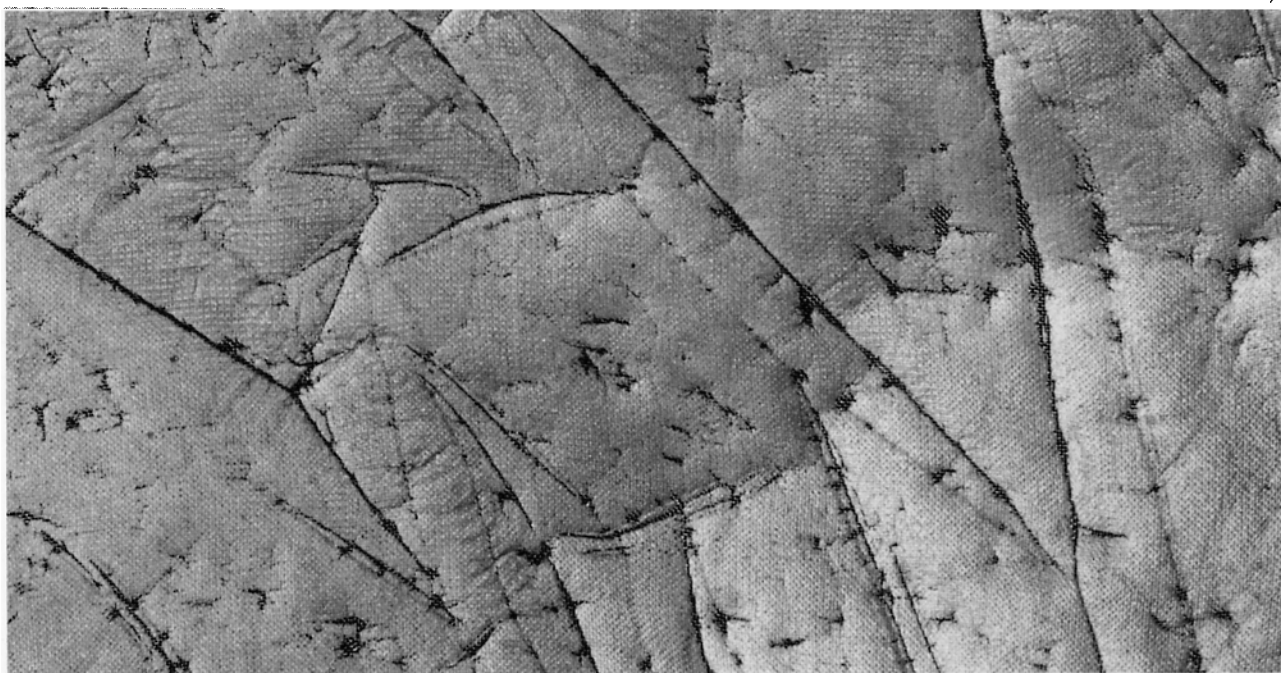


FIGURE 21

Plastic-coated lightweight lining, drapery, and dress fabrics often cannot be softened after they become stiff in drycleaning. For example, this sleeve lining from a man's suit coat could not be softened with the application of a softening agent, because the plasticizer would stain the fabric.

STIFFENING OF FABRICS—SIMULATED LEATHERS AND SUEDES

Different types of fabrics are made to look like genuine leather and suede. See pages 195-203. Sometimes they are difficult to distinguish from genuine suede and leather. These fabrics are used to make coats, jackets, jumpers, skirts, dresses, hats and caps. They are frequently used as trim on coats, raincoats, dresses, sportswear. Many times they are combined in complex garment design with fabrics which must be drycleaned. Many garments are not labeled with care instructions.

Why does this occur? The chemical formulas of the vinyls used to make these fabrics are a guarded secret. But the principle of fabric performance is the same. The chemicals used in the vinyl formulation to keep the fabric soft and pliable are affected by drycleaning solvents. After drycleaning and drying, de-

pending on the formulation, the fabric may shrink, stiffen; the flocked or smooth surface may separate partially or completely from the background fabric.

How may this be prevented? Garments made of or containing trim or sections of simulated leather or suede should be permanently labeled with care instructions. If fabric combinations and garment design permit, the item may be wetcleaned successfully. However, complex garment designs combining simulated leather with drycleanable fabrics cannot be drycleaned or wetcleaned. Garment makers may control this problem by combining simulated leather only with wetcleanable fabrics in garment design.

(References: NID Technical Bulletin T-326; Fabrics-Fashions Bulletins FF-91; FF-92; FF-98; FF-101; FF-102; FF-103.)



FIGURE 22

White simulated leather trim is a basic part of the design of this garment made of a drycleanable wool jersey fabric. It became stiff in drycleaning. This garment cannot be drycleaned or wetcleaned.



FIGURE 23

Pink simulated leather is a basic part of the dress made of a drycleanable gray wool fabric. The simulated leather stiffened with drycleaning.

FIGURE 24

This simulated leather jacket is so stiff it stands alone. The garment was labeled "dry-cleanable." It could be softened by a method recommended by NID. (See *Fabrics-Fashions Bulletin FF-91.*)

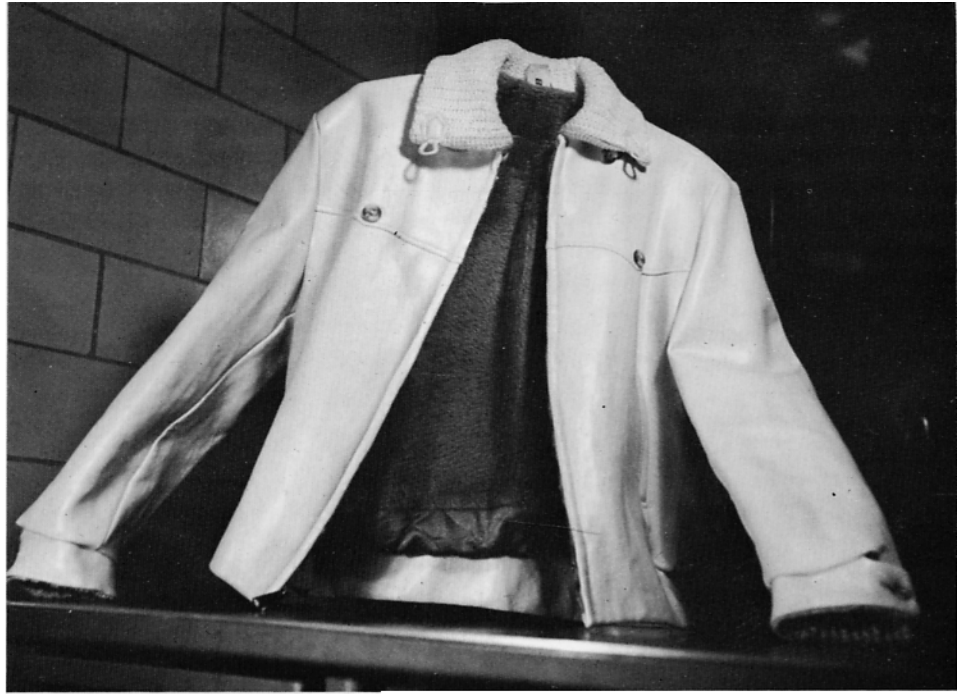


FIGURE 25

These garments are typical of the simulated vinyl suedes that separate and stiffen with drycleaning.

LOSS OF WATER-SOLUBLE SIZING

Why does this occur? Certain types of gelatin, gums, starches (called water-soluble sizings) are applied to fabrics, in order to:

1. Give strength to the yarns during the weaving operation; and
2. Give the desired feel, hand, drape, or weight to the fabric. Some taffeta, organza, satin, mousseline de soie, marquisette, organdy, shantung, and net fabrics are finished with this type of sizing. Whenever water or an aqueous solution comes in contact with these fabrics, the water-soluble sizing may be disturbed.

When does this occur? This class of sizing is affected by perspiration, spilling water or

drinks on a garment during wear, or by removing spots and stains with water. The sizing may be partially removed in drycleaning; completely removed in wetcleaning or laundering.

How may this be controlled? Restoration depends on fabric and garment construction. In some cases it is possible for the drycleaner to restore these sizings; in others, it is impossible to restore the fabric to its original appearance. This problem may be controlled by the use of sizings that are resistant to water.

(References: NID Technical Bulletins T-239; T-241; T-263; T-271; T-279; T-328 and Fabrics-Fashions Bulletins FF-9 and FF-35.)

FIGURE 26

Loss of water-soluble sizing may leave some fabrics darker, others lighter in the area spotted.

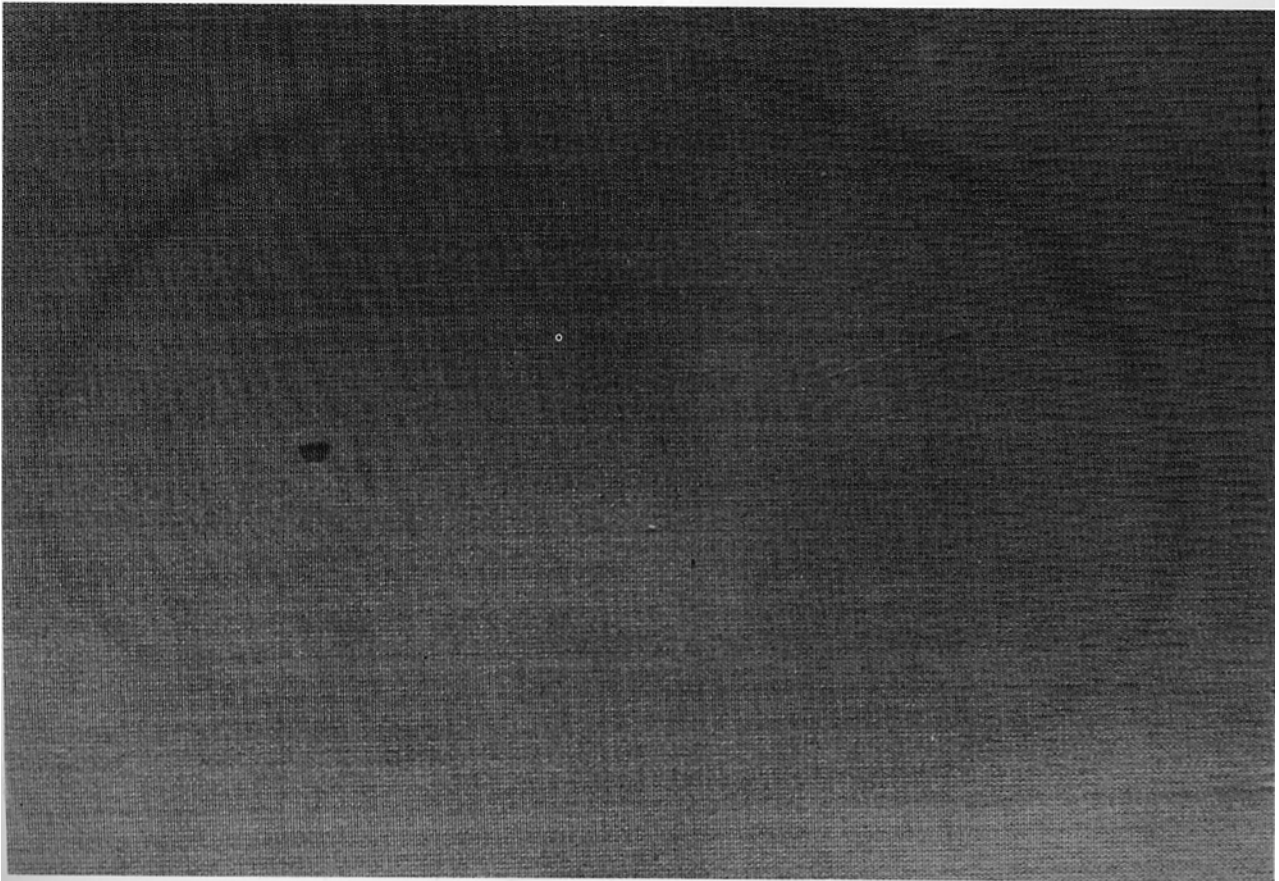


FIGURE 27

Removal of water-soluble sizing may result in distortion of a net fabric. Left: Original fabric. Right: Net fabric after immersion in water.

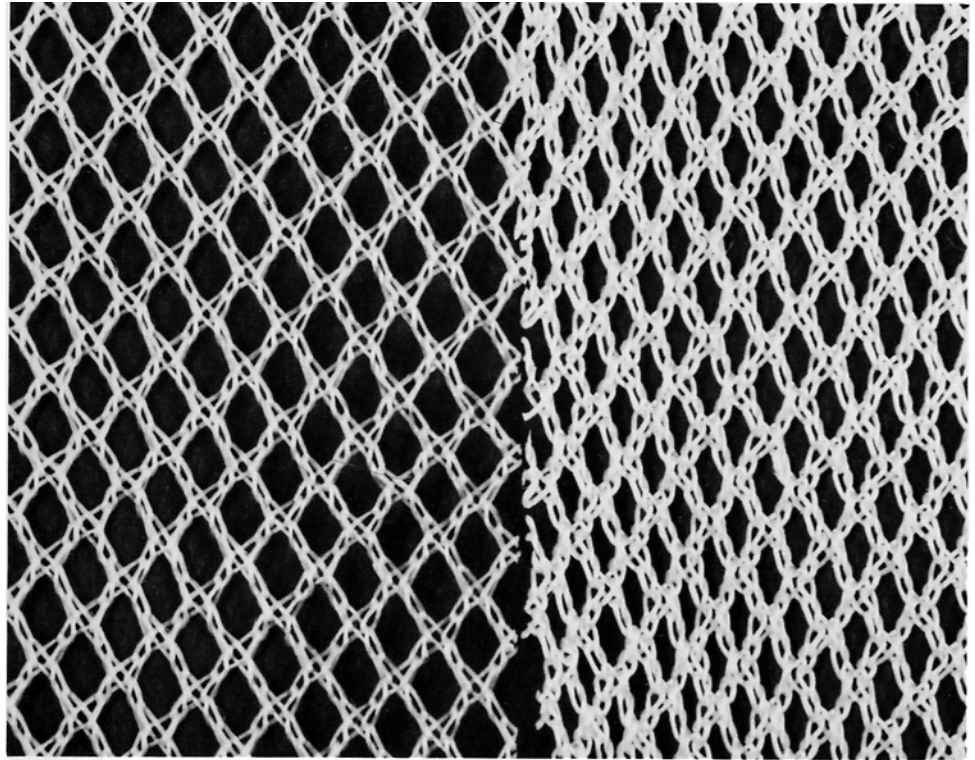


FIGURE 28

The drycleaner may stiffen some fabrics by spraying sizing onto them.

SECTION II

TRANSFER AND BLEEDING OF COLOR

TRANSFER OR BLEEDING OF DYE IN DRYCLEANING

Why does this occur? Several conditions during the dyeing and printing of a fabric may contribute to the transfer of color in drycleaning:

1. An excess of dye may be left in the fabric.
2. The proper amount of dye may be used, but it may not be fixed properly to the fabric.
3. A dye may be used that is solvent-soluble. The dye bleeds in drycleaning solvents.
4. Improper selection of dyestuff for the particular fabric.

In some cases, the original hue remains; in others, it becomes lighter in color. The dye may be carried off in the drycleaning sol-

vent, or it may transfer to a lighter background of the fabric or to lighter trim on a garment.

When does this occur? The dye may bleed and transfer in drycleaning while the solvent is being removed from the fabric or while the fabric is being dried.

How may this be controlled? In some cases the drycleaner may be able to correct or improve this condition. Success depends on fiber content and construction of the fabric, garment construction, and the degree of intensity of the dye-staining. This problem may be controlled by the textile dyer and printer. The danger of its occurrence can be minimized by careful color classification before drycleaning.

(References: NID Technical Bulletin T-165; Fabrics-Fashions Bulletins FF-98; FF-101.)

SEE FIGURES 29 AND 30, NEXT PAGE



FIGURE 29

The dye of the purple print is solvent-soluble. The color printed off onto the white background during dry-cleaning.



FIGURE 30

The red dye of the wool lining of this coat bled in drycleaning and stained the light-colored outer fabric.

TRANSFER OR BLEEDING OF DYE IN PRESPOTTING

Why does this occur? It is good practice to remove certain types of soil and stains before a garment is drycleaned. This is done by prespotting the fabric with commercial products especially prepared and sold to the drycleaner for this particular purpose. Improper use or application of prespotters by the drycleaner can result in bleeding of the dye in some fabrics.

When does this occur? This type of color bleeding usually occurs on acetate fabrics or fabrics containing acetate. It usually happens when a prespotting reagent is applied to the

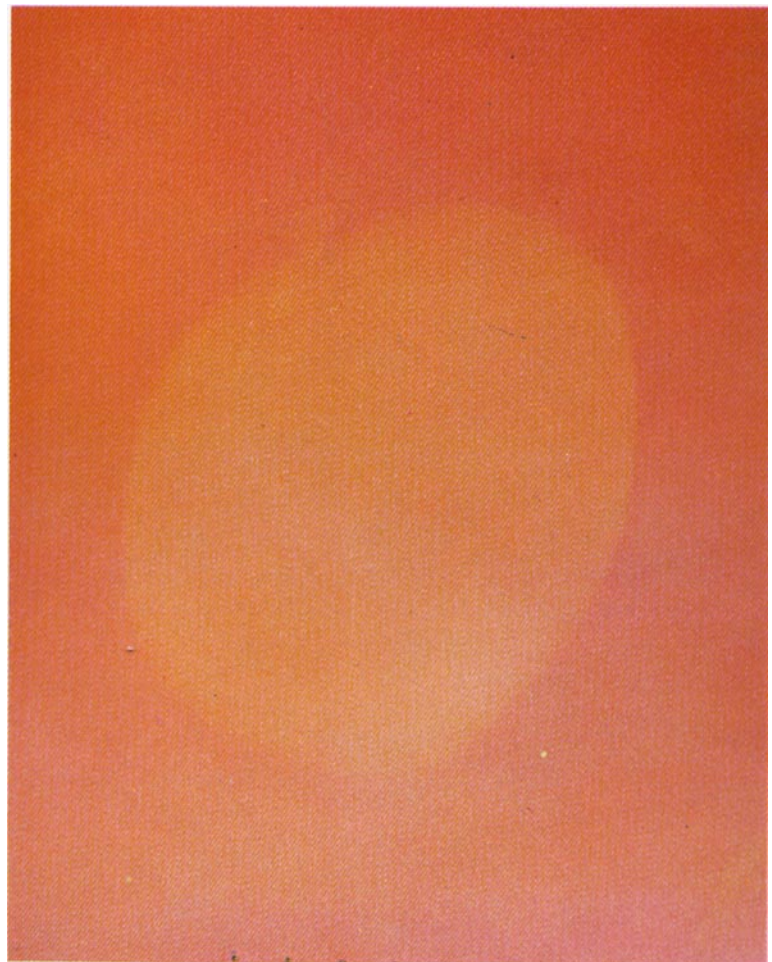
fabric to remove a lacquer or fingernail polish stain.

How may this be controlled? Commercial prespotters are formulated so as to be safe for use on all types of fabrics. They must have solvent action in order to remove the tenacious soil and stains. But this solvent action can also affect some dyes unless the products are used with care by the spotter. Laboratory methods are available to detect when prespotters have been improperly used.

(References: NID Technical Bulletins T-188; T-252; Fabrics-Fashions Bulletin FF-72.)

FIGURE 31

Some dyes are sensitive to prespotters the drycleaner may use to remove stains before drycleaning. The fluorescent dye illustrated in the acetate satin is a typical example. The prespotter caused the color change.



TRANSFER OR BLEEDING OF DYE IN PRESSING

Why does this occur? The use of moisture and steam causes some dyes to bleed or become dulled on some crepes, satins, and taffetas containing acetate. This type of damage may occur during steam pressing in combination with the use of moisture to dampen the fabric. This may cause bleeding and loss of color in some fabrics.

When does this occur? This damage usually occurs when a garment has been altered by letting out seams, or letting down the hemline. In an attempt to remove original

creases or lines of stitching, the fabric is sprayed with water and then steamed while wet. This practice may result in dulling of the area pressed, bleeding of the dye, or both.

How may this be corrected? If delustering or dulling of the fabric has occurred, the area may be sprayed with water and pressed with a dry iron (without the use of steam) until dry. When loss of color has occurred, there is no satisfactory method of restoration. Even redyeing is often unsatisfactory.

(Reference: NID Technical Bulletin T-210)

FIGURE 32

The color bled when this fabric was steamed while wet. To remove the crease line during alteration, the fabric was sprayed with moisture and then steamed.



TRANSFER OR BLEEDING OF DYE IN SPOTTING

Why does this occur? Fabrics in this class may be made of:

1. Two different fibers dyed separately and then combined into a fabric. For example, a felt may be made by combining green wool fibers with black rayon fibers.
2. Two yarns of different colors dyed separately and then combined into a fabric. For example, a silk fabric may be made of a black yarn in the warp or lengthwise direction and a lighter-colored yarn in the filling or crosswise direction. In this case the yarns may have been dyed at a low temperature, and hence possess poor colorfastness.
3. The same fiber content but dyed with colors that possess poor colorfastness;

improperly fixed dyes; or an excessive amount of dye.

When does this occur? Perspiration or a liquid spilled on the fabric may cause the dye to bleed. If controlled moisture is used to remove spots and stains, bleeding of the dye and staining of the lighter fiber, yarn, or fabric will occur.

How may this be controlled? Once a dye bleeds and stains a lighter area, it colors the lighter colored fibers, yarns, or fabric. Usually the dyed or stained area cannot be restored to its original appearance. This type of damage may be controlled by the textile dyer by the selection and use of colorfast dyes.

(References: NID Technical Bulletins T-180; T-281; T-318; Fabrics-Fashions Bulletins FF-59; FF-72; FF-98.)

FIGURE 33

In spotting, the dye of the black yarns bled and stained the light-colored yarns in the same fabric.



FIGURE 34

The black fibers in the felt skirt bled to moisture, staining the lighter colored fibers of the fabric.

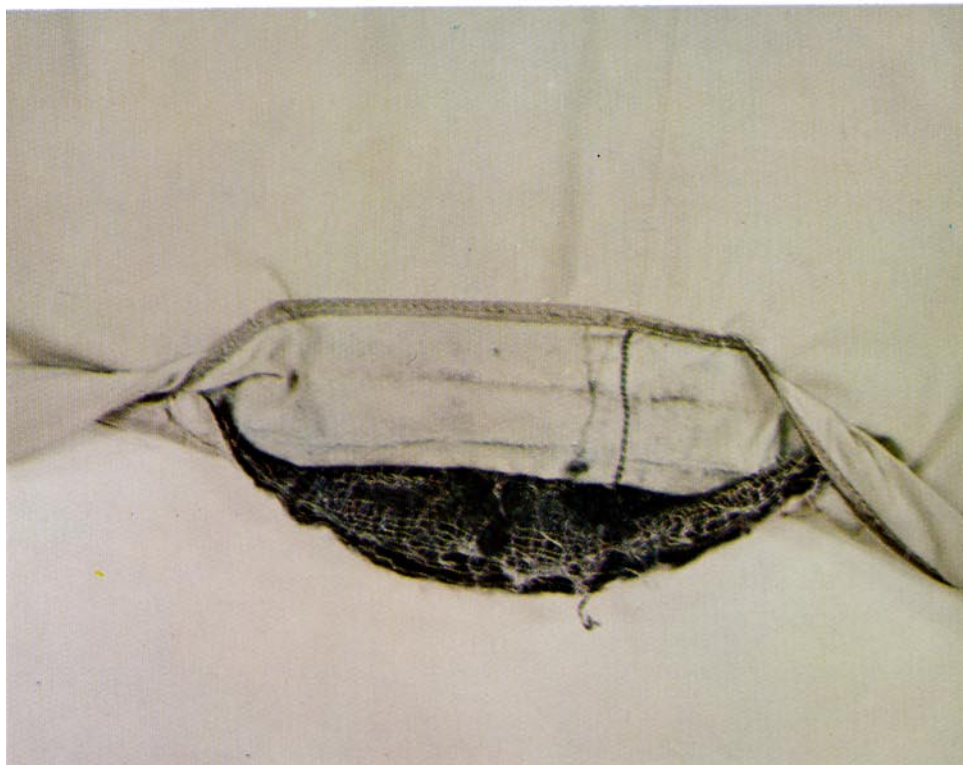


FIGURE 35

Dark interlinings are sometimes dyed with dyes that bleed. Frequently the spotter is not aware that such hidden fabric is part of a garment. Moisture necessary to remove spots and stains causes the dye to bleed, staining the outer fabric.

FIGURE 36
The black interlining of this car coat bled to moisture, staining the outer tan cotton fabric.

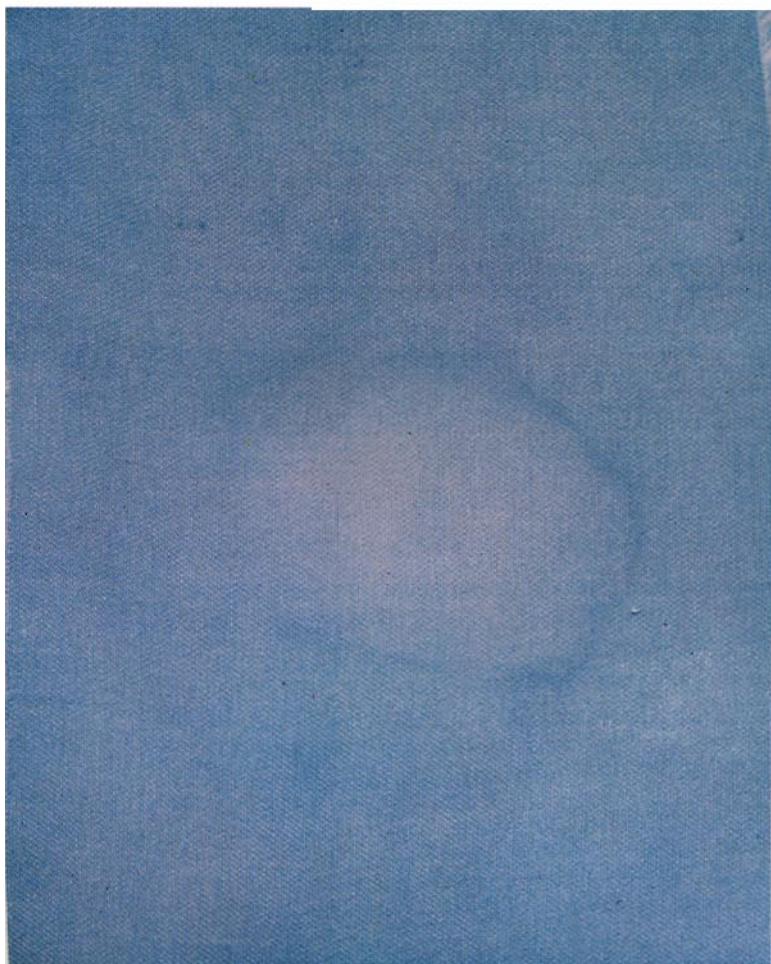


FIGURE 37
The spotting reagent used to remove a spot also removed the dye from this fabric. This illustrates wrong judgment on the part of the spotter.

TRANSFER OF DYE BY SUBLIMATION

Why does this occur? Some dark-colored acetate and nylon fabrics (blue, black, brown, red, green, yellow), when in close proximity to white or light-colored acetate and nylon fabrics, cause dye streaks on the light fabric. The dye on the colored fabric sublimates. The dye changes from a solid to a gas and then forms again as a solid on the light fabric.

When does this occur? This may occur when a light or pastel fabric is combined with a dark-colored fabric in a garment design—for example, a dark-colored lining or trim

to a lighter outer fabric. It may also occur when a light-colored garment is hung next to or near to a dark-colored garment. Sublimation or transfer of dye may also occur during the drying of a fabric and while a fabric is being pressed.

How may this be controlled? This type of problem may be controlled by the selection and application of dyes by the textile dyer and printer.

(Reference: NID Technical Bulletins T-15; and Practical Operating Tips Bulletin P-19)

SEE FIGURES 39 AND 40 ON P. 422, 41 ON P. 423

FIGURE 38

The yellow dye streaks on this checked jacket were caused by a transfer of the dye from a dark-colored garment that was hung close to it. The dye of the dark-colored garment sublimated (changing from a solid to a gas) and then formed again as a solid on the checked fabric.



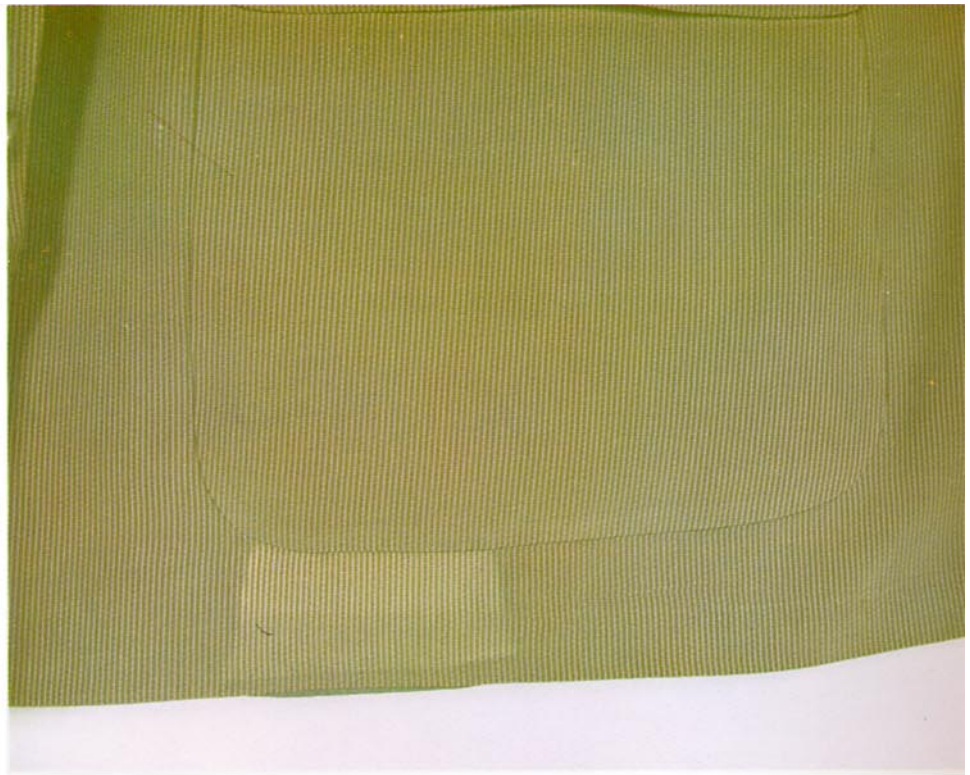


FIGURE 39

This coat was made with a cotton stay tape that contained a plastic yarn. Where the plastic yarns have come in direct contact with the outer fabric, they have affected the dye so that pressing removed it by sublimation. The tape is not stained in areas where it is protected from the outer fabric.



FIGURE 40

Opened lining shows stay tape. The stained area was in direct contact with the outer fabric.



FIGURE 41

Some dyes from dark colored Dacron yarns sublime due to the heat and steam of pressing, staining the lighter-colored yarns of the fabric.

TRANSFER OR BLEEDING OF COLOR DURING WEAR

Why does this occur? Transfer of color from a darker garment to a lighter garment occurs during wear usually because:

1. The dye in the fabric from which the outer garment is made possesses poor colorfastness to crocking (rubbing off of color).
2. The dye in the fabric possesses poor colorfastness to moisture.

When does this occur? Wear factors such as perspiration and friction may cause a dye transfer from a darker garment to a lighter

garment. For example, the dye of a red suit lining may transfer to a white blouse or to the skin. Dark-colored garments may crock or rub off onto a light-colored blouse or a light-colored slip.

How may this be prevented? In dresses, the underarm area may be protected with dress shields. But in many cases this is not possible or practical. Improved colorfastness of dyes and application of dyes fast to crocking and perspiration can help to prevent or control this problem.

FIGURE 42

The red dye of the jacket lining transferred to the white blouse in the underarm area while the blouse was moist with perspiration.



TRANSFER OR BLEEDING OF DYE IN WETCLEANING

Why does this occur? Several conditions during the dyeing and printing of a fabric may contribute to the transfer of color during wetcleaning:

1. An excess of dye may be left in the fabric.
2. The proper amount of dye may be used, but it may not be fixed properly to the fabric.
3. The dye may not be colorfast to water.

In some cases the original hue remains the same; in others, it becomes lighter in color. The dye may be carried off in the water; or it may be transferred to a lighter background

of the fabric or to lighter trim on the garment.

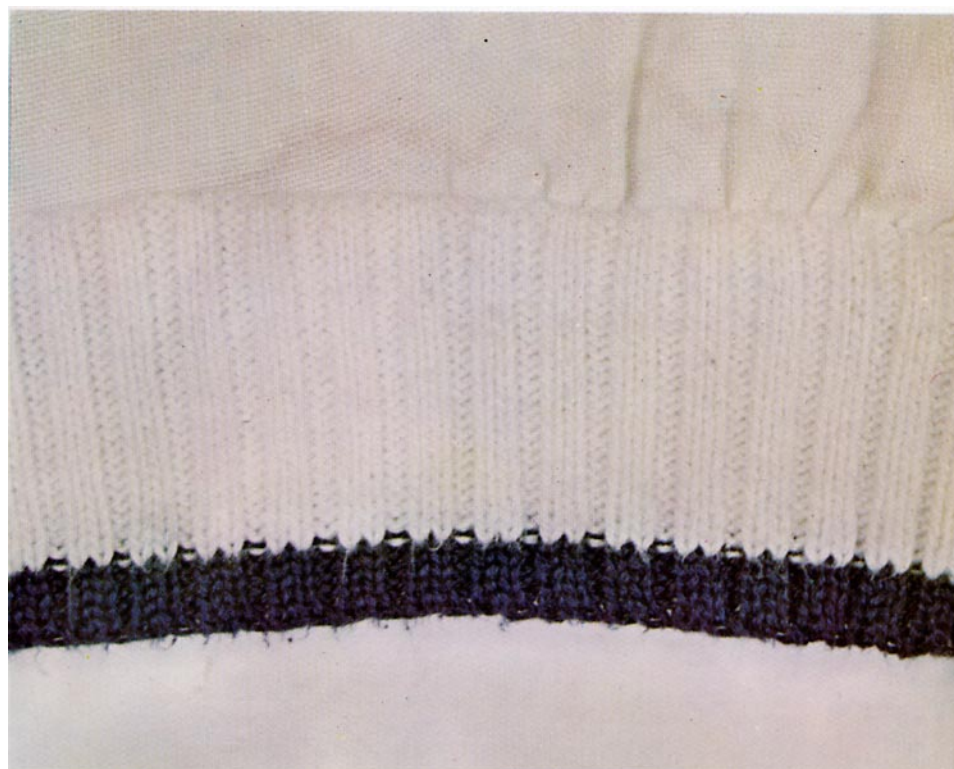
When does this occur? The dye may bleed and transfer in wetcleaning while the water is being removed from the fabric or while the fabric is being dried.

How may this be controlled? In some cases the drycleaner may be able to correct or improve the condition by using dye-setting reagents or by bleaching. Success depends on fiber content and construction of the fabric, the fabric finish, garment construction, and the degree and intensity of the dye-staining. The problem may be controlled by the use of dyes which are fast to water.

(Reference: NID Technical Bulletin T-165)

FIGURE 43

The blue dye bled in wetcleaning and stained the white fabric.



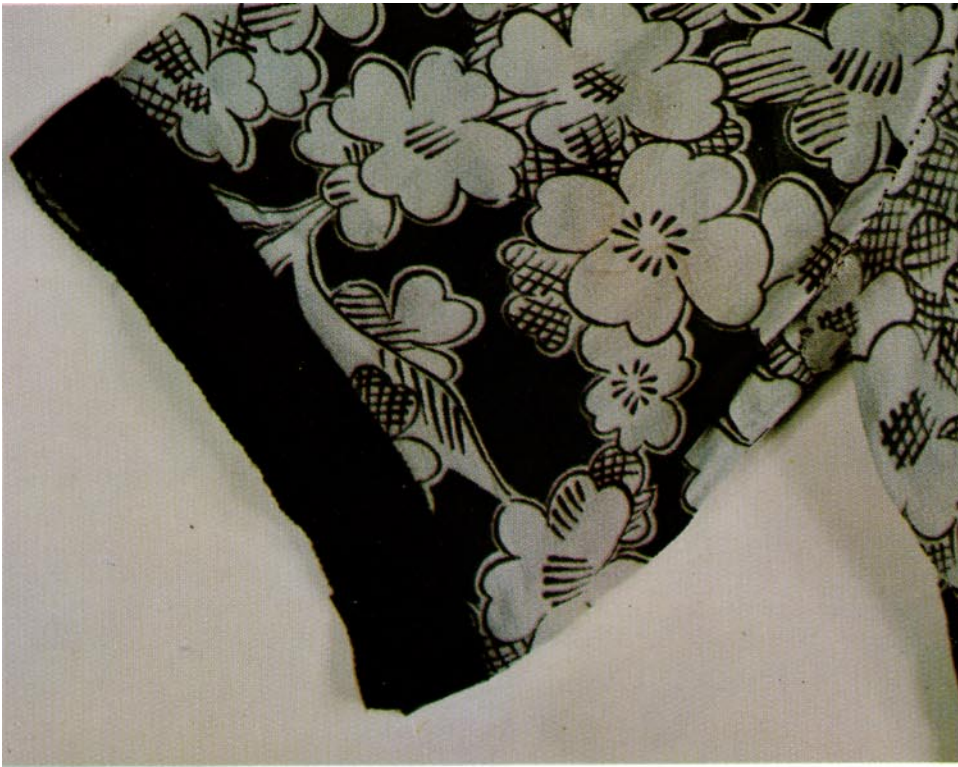


FIGURE 44

The dye of the black grosgrain ribbon trim bled in wetcleaning, staining the white background of this dress fabric.

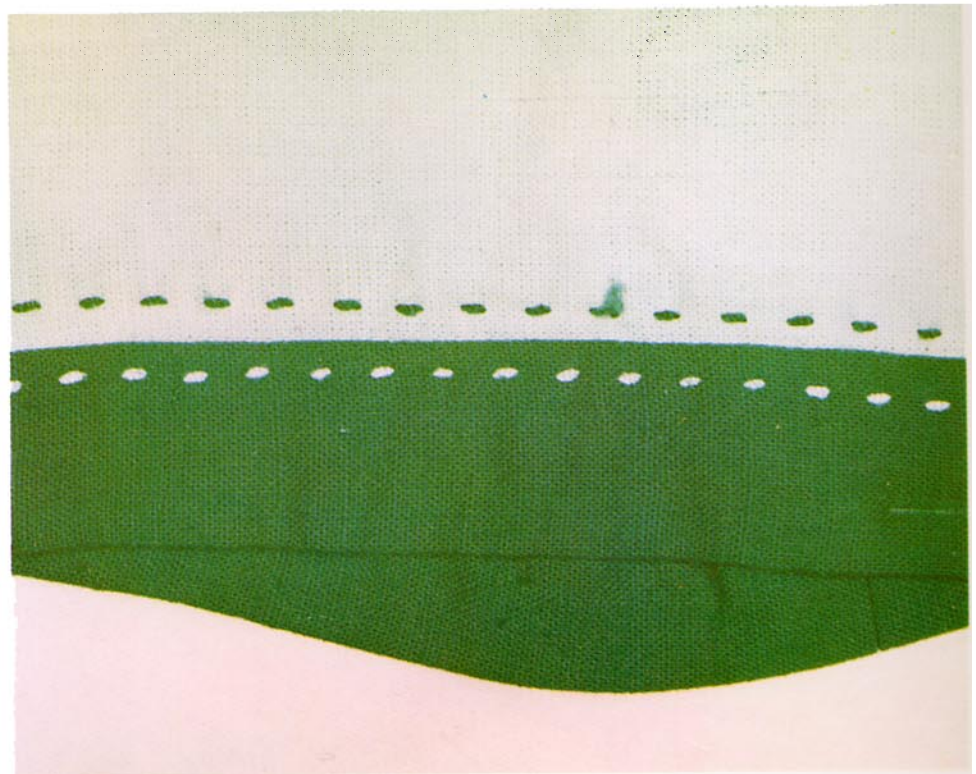


FIGURE 45

The dye of the thread bled in wetcleaning, staining the light-colored fabric.

SECTION III

LOSS OR CHANGE OF COLOR

COLOR LOSS FROM ABRASION

Why does this occur? Fibers, yarns, and the dye may be disturbed by rubbing or flexing of the fabric surface against a like or an unlike surface. In some cases the dye rubs off (crocks); in others, microscopic examination shows that disturbance of the yarns or fibers causes a difference in light reflection that makes the fabric appear lighter or darker.

When does this occur? This type of color change may occur as a result of rubbing a spot or stain in an attempt to remove it; natural abrasion in use and wear, such as

the rubbing action of the elbows on a desk, the shoulder and seat area against a chair; excessive mechanical agitation during drycleaning of the garment.

How may this be prevented? The surface of a fabric should never be rubbed in an attempt to remove a spot or stain. Proper techniques of stain and spot removal, as well as drycleaning, usually prevent this kind of color change. However, after long periods of wear some change in color can be expected in those areas subjected to hard abrasion in use. There is no satisfactory remedy.

SEE FIGURES 46 AND 47 ON NEXT PAGE



FIGURE 46

The surface of this fabric has been disturbed in the area where an attempt has been made to remove a stain.

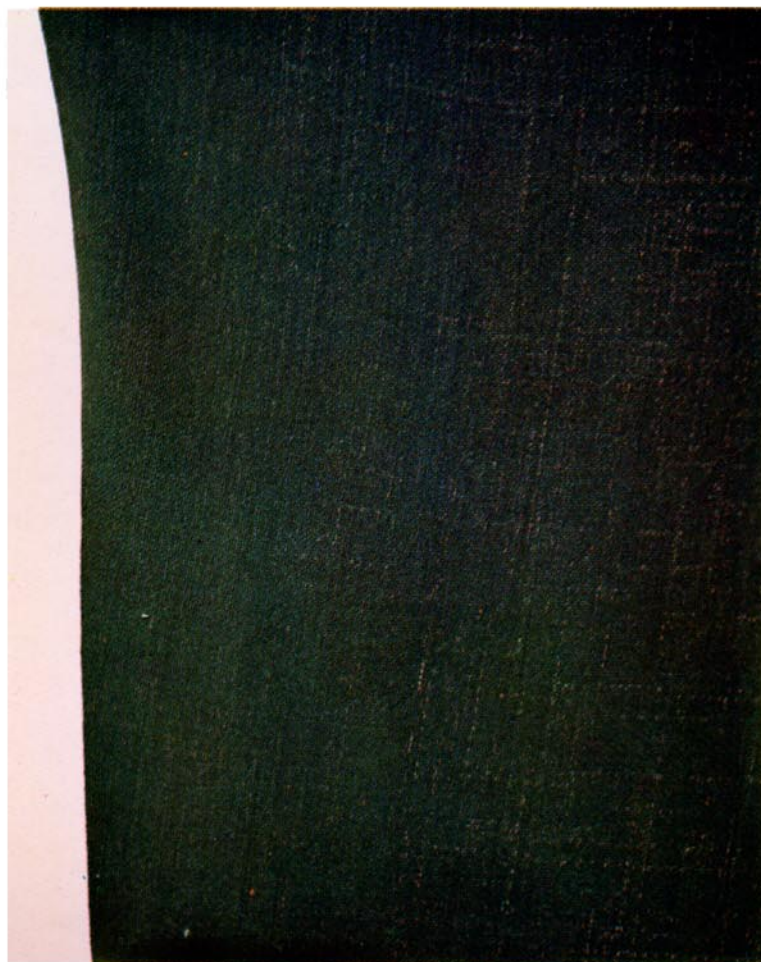


FIGURE 47

The fibers of this fabric were removed by abrasion in wear, resulting in removal of the pink yarns from the blue fabric.

LOSS OF COLOR IN ACETATE FABRICS

(Due to Combination of water and drycleaning solvent)

Why does this occur? Acetate colors usually do not bleed due to drycleaning solvent alone. But some bleed with a combination of moisture and solvent. Color loss does occur in some colors. Usually the red portion of the dye is lost. Gray dyes may change to green; reds to yellow. These colors are not affected by drycleaning solvents alone, or by water alone. Research has shown that the color loss occurs from a combination of water and solvent. A probable reason is that moisture swells the fiber, and allows the solvent to dissolve out some of the color.

When does this occur? In the prespotting operation, use of prespotter that makes the fabric damp with water can cause a color loss in some acetate fabrics. Damp or wet fabrics placed in the solvent for drycleaning, or placed in a water-repellent bath for re-treatment for water-repellency, may also lose color.

How may this be prevented? By the use of proper techniques in prespotting, drycleaning, and in the proper application of a water-repellent treatment.

(Reference: NID Technical Bulletin T-252)

FIGURE 48

The change in color of this acetate fabric resulted from a combination of water and solvent used to prespot the fabric. It is believed that the moisture swells the fiber and allows the solvent to dissolve the dye.



ACID COLOR CHANGE ON WOOL

Why does this occur? There are a limited number of dyes used to color wool fabrics that change color to acidic conditions. The color change occurs most frequently in blue, tan, and gray dyes.

When does this occur? It is common practice in the drycleaning process to use acidic spotting reagents on wool fabrics to remove certain spots and stains without any change in the original color of the dye. Certain kinds of stains such as ink, rust, tannin, and caramelized sugar, cannot be removed from many of the colored wool fabrics because acidic reagents are required to remove

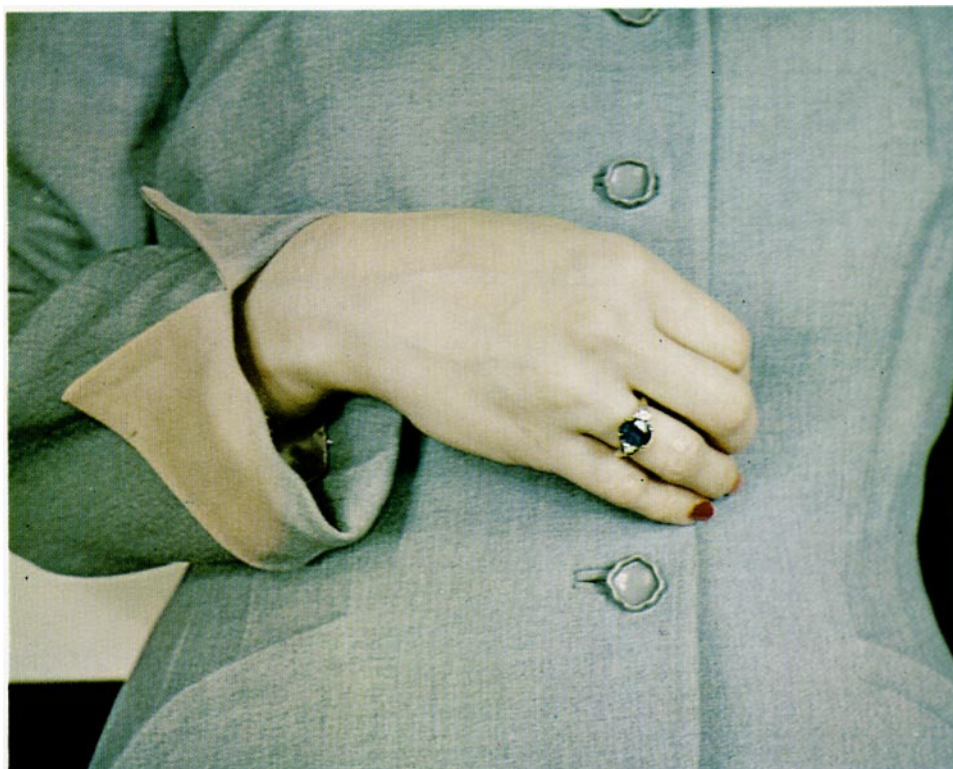
the stain. Thus there are some few dyes that are very sensitive to certain acidic reagents and they change color, either temporarily or permanently.

How may this be remedied? In some cases such color changes may be restored by spotting the area with water, followed by neutralization of the area spotted. Most cases require soaking the fabric in a detergent and water solution. However, these methods are not effective on some dyes, and the color change may be permanent.

(Reference: NID Technical Bulletin T-192)

FIGURE 49

The blue dye used to color this suiting fabric has changed to pink from contact with an acidic staining substance.



COLOR CHANGE CAUSED BY ALKALI

Why does this occur? Alkaline color changes are often noted on dark blue and black acetate fabrics. The color change is usually to a red. It is mistaken frequently for atmospheric gas fading (fume fading). A very common type of alkaline color change occurs on bright green wool fabrics and bright green silk fabrics. The color change is to a yellow. These color changes are caused by contact with alkaline liquids, foodstuffs, perspiration, and cosmetic preparations that have been allowed to remain in the fabric.

When does this occur? This color change will occur if alkaline staining substances and per-

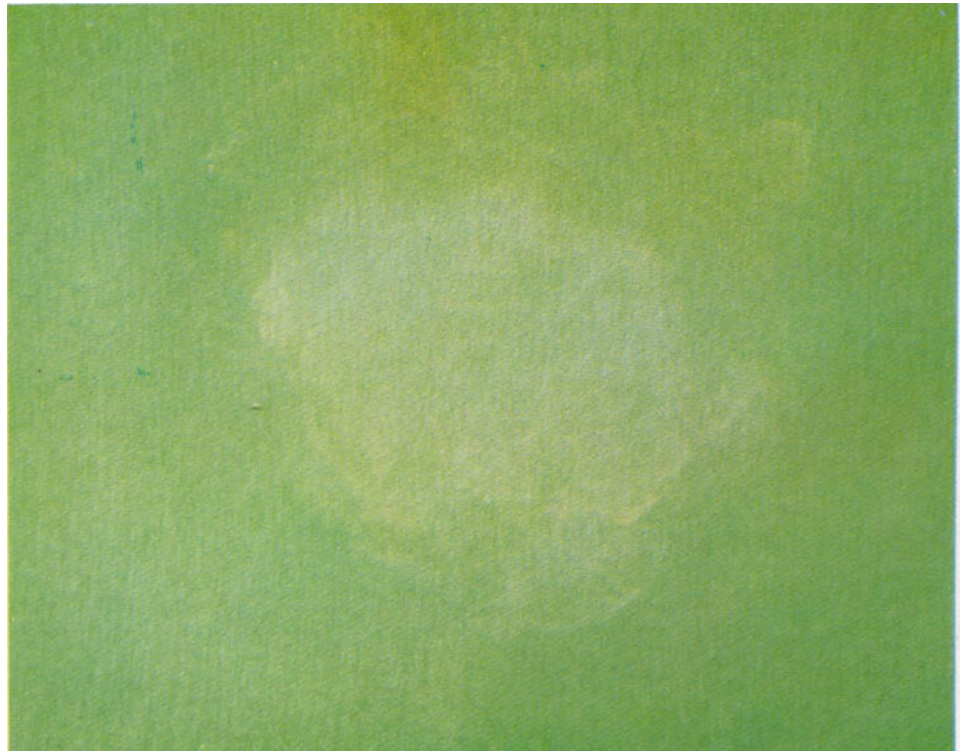
spiration are allowed to remain in the fabric. Stains of this type should be removed *as soon as possible*. The use of alkaline spotting and drycleaning reagents can also cause this type of color change.

How may this be remedied? Most alkaline color changes can be restored to the original color by the drycleaner. Success depends on the type of dyestuff. If a fabric is allowed to remain in an alkaline condition for a long time, the color change may become permanent.

(Reference: NID Technical Bulletin T-104)

FIGURE 50

The green dye of this fabric is sensitive to alkaline substances, changing the green color to yellow-green.



COLOR CHANGE FROM BONDED WOOL

Why does this occur? There is a type of shoulder pad and lining material made by binding wool fibers together with synthetic rubber containing chlorine. Under certain conditions the material breaks down and the synthetic rubber gives off hydrochloric acid. The acid is sufficient to change the color of some dyes in linings and outerwear fabrics.

When does this occur? Frequently the color change does not occur until after drycleaning. It may happen during a period when the garment is stored. Fabrics containing acetate change color in a manner similar to atmospheric gas fading—blue changes to

purple or red, greens turn brown. On wool fabrics, the commonest change is from brown to green.

How may this be controlled? Though this type of damage often shows up during drycleaning, its cause must be attributed to the presence of chlorine-containing synthetic rubber. Once the color change occurs, it cannot be restored to its original color. This type of damage may be controlled by selection of a more stable binder in manufacture of bonded wool.

(Reference: NID Technical Bulletins T-229; T-258—
Fabrics-Fashions Bulletin FF-29)

FIGURE 51

Sufficient hydrochloric acid was formed by the deterioration of the bonded wool shoulder pad to cause the blue color of this suit jacket to change to pink.



LOSS OF COLOR FROM COLD WAVE SOLUTION

Why does this occur? Cold wave solutions usually consist of two materials: (1) The waving solution that contains a salt of thioglycollic acid, a reducing agent used to condition the hair so it can be curled; (2) A neutralizing solution (potassium bromate or sodium perborate), an oxidizing agent used to counteract the reducing action of the first solution. Either of these solutions may cause color loss in fabrics under conditions of wear, drycleaning, and storage.

When does this occur? Research studies have shown that all cold wave solutions may not have the same effect on the same dyestuff. Dyes react differently too. In some cases,

the color loss may develop after exposure to the heat of pressing or finishing. In others there is no immediate loss of color; the color change may not be noticed for several weeks or months after drycleaning. Sometimes cold wave solutions cause a stain on the fabric rather than a color change.

How may this be prevented? When cold wave solutions are being applied to the hair, the dress should be removed or protected. All the solution should be rinsed from the hair before it comes in contact with wearing apparel.

(Reference: NID Technical Bulletin T-155; T-254)

FIGURE 52

Loss of color from cold wave solutions may not be noted on a fabric at the time of contact. Color loss may develop several months later.



LOSS OF COLOR FROM THE CROCKING OF DYE

Why does this occur? Some dyes have very low resistance to crocking or rubbing. The loss of color may occur as localized streaks, as streaks throughout a garment, or in spots and blotches.

When does this occur? It is common to find light areas where a fabric is folded and subjected to abrasion during wear, such as along the hemline and cuffline. The mechanical action in drycleaning, wetcleaning, and laundering may also serve to remove color and cause this type of damage.

How may this be controlled? The loss of color by crocking or rubbing in wear, drycleaning, wetcleaning, and laundering may be attributed to the type of dye, the method of application, or to improper cleaning techniques. This problem may be controlled in manufacture by the selection of dyes that possess good colorfastness to crocking or rubbing; and in drycleaning by good plant practices on the part of the drycleaner.

(Reference: NID Fabrics-Fashions Bulletin FF-11)

FIGURE 53

Here is a typical example of streaks due to color loss from crocking.

SEE FIGURE 54 ON P. 435

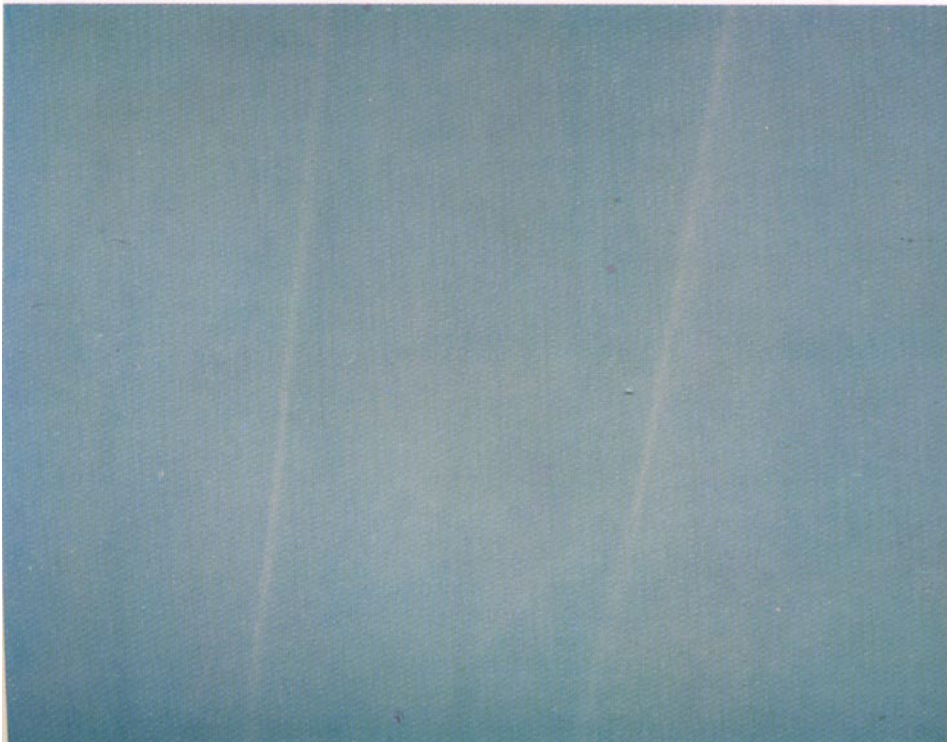




FIGURE 54

Crocking of dye may usually be determined by a simple test. Moisten a piece of cheesecloth with solvent. Rub over the colored fabric. Any transfer of dye to the white cloth indicates crocking. The same test can be made using water instead of solvent.

COLOR CHANGE—FLUORESCENT DYES

Why does this occur? Different compounds are used to produce a brightening or whitening effect on fabrics. Depending on the compound selected, a fluorescent brightener may produce a reddish, bluish, greenish, or neutral white. Fluorescent brightening agents are also used on pastel dyed fabrics and furs.

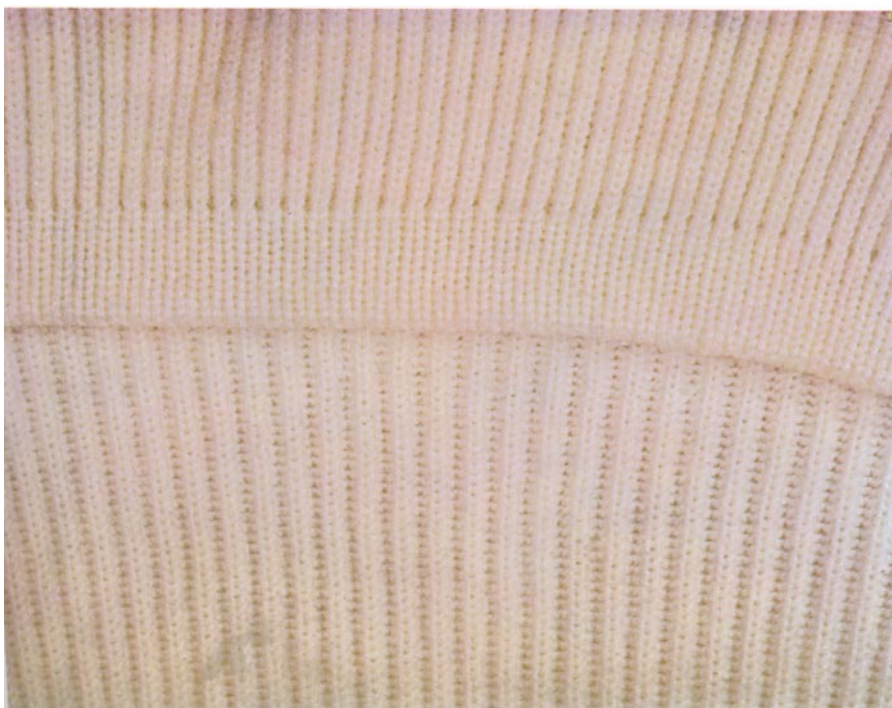
When does this occur? Exposure to light causes some brighteners to change from white to yellow. On wool, silk and fur the change is always permanent. Washable cottons may be retreated. Fluorescent brighteners vary in their fastness to light. The fastness properties of a single brightener vary considerably on different fibers. Some fluorescent brighteners have poor colorfastness to hypochlorite bleach. Detergents containing optical bleach can make a fluorescent dyed fabric become more sensitive to light. Some fluorescent dyes change from the heat of steam pressing.

How may this be remedied? Whether an article that has lost original whiteness can be satisfactorily whitened depends on how badly it is discolored and other factors. Some wet-cleanable items can be treated with a fluorescent brightener or detergent that contains an effective brightener. NID's research laboratories have been looking for fluorescent brighteners that can be applied in drycleaning solvents, and one firm has developed such a product. Chemical manufacturers are striving to develop fluorescent dyes and brighteners with better colorfastness properties. The dyer of fabrics should be selective in choosing the best brightener for the particular fiber to be dyed.

(References: NID Fabrics-Fashions Bulletins FF-60; FF-95.)

FIGURE 55

When a fluorescent dyed fabric loses its brightness the color changes to yellow and in some exceptional cases to brown or gray. Brighteners or fluorescent dyes and tints fluoresce under ultraviolet light. When the brightener is lost or becomes discolored, it loses its fluorescent property and will not fluoresce under ultraviolet light.



COLOR CHANGE DUE TO FUME FADING (ATMOSPHERIC GAS FADING)

Why does this occur? There are some dyes, when used to color certain fabrics (usually acetate), that change in color when exposed to gases in the atmosphere. These gases (oxides of nitrogen) come from the burning of coal, oil, and gas. These gases may be formed when hot metal is in contact with air, for example, when an electric heater is operating. Anything which leaves the fabric in an acid condition will hasten this color change, such as sulfur fumes in the air, the use of a sour in laundering or wetcleaning, or contact with perspiration or an anti-perspirant.

When does this occur? This color change may develop during the wear life of a garment or household item, or during storage. The color change may be hastened by drycleaning and finishing. The color change is not always even. Garments fade most noticeably over the shoulders, down the length of

sleeves, in lengthwise streaks along the sides of skirts and trousers. Draperies and curtains fade along the folds.

How may this be controlled? This problem may be controlled by the textile industry by several methods: (1) Solution-dyeing of yarns; (2) selection of dyes that are known to have good colorfastness to atmospheric gas fading; (3) after-treatment of the fabric with a durable anti-fume finish. The drycleaner may control this color change by: (1) Control of drying and finishing temperatures; (2) avoiding the use of a sour bath in wetcleaning. The customer may control this color change by: (1) Protecting the fabric from direct contact with deodorants and anti-perspirants; (2) hanging garments in a garment bag and in a clothes closet that is located a distance away from a chimney.

(Reference: NID Technical Bulletin T-93)

SEE FIGURES 56 AND 57 ON PAGE 438

FIGURE 56

The pink discoloration of the sleeve of this blue quilted robe is typical of the color change that occurs in dyes sensitive to certain gases generally present in the atmosphere. These gases come from the burning of coal, oil, and gas. This type of color change may be called "fume fading," "gas fading," "atmosphere gas fading."

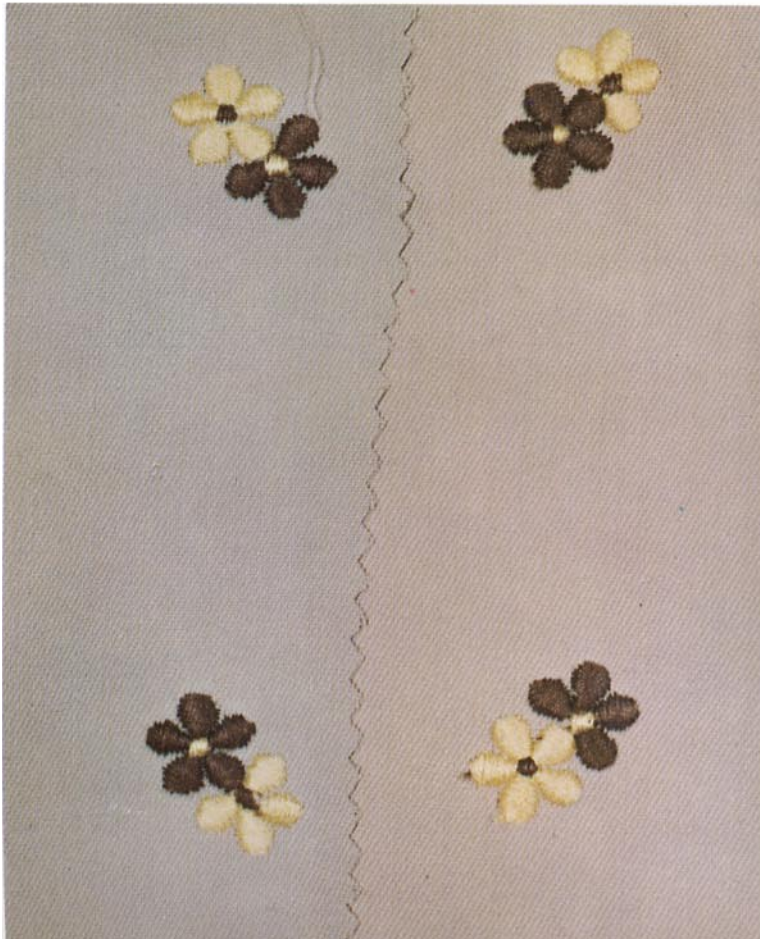


FIGURE 57

A complete color change may occur with dyes that are sensitive to the oxides of nitrogen. This fabric turned pink as a result of atmospheric gas fading.

COLOR CHANGE—PRESSING

Why does this occur? Heat sensitive dyes on cotton may change color slightly at temperatures lower than the cotton setting. When this occurs, the color change is permanent or may be only temporary. Upon cooling, the dye reverts to its original hue. But when the fabric is pressed with the iron set on the cotton setting and allowed to remain in contact with the fabric for a few seconds, the color change is permanent.

When does this occur? Some red dyes on cotton fabrics take on a blue cast with successive pressings between drycleanings. Any attempt to overcome this condition causes the dye to become darker.

How may this be prevented? Drycleaning itself does not cause this color change. Because some dyes are heat sensitive, particularly to the relatively high temperature often used in pressing cotton fabrics, dyes must be selected which are heat resistant.

(Reference: NID Fabrics-Fashions Bulletin FF-98.)

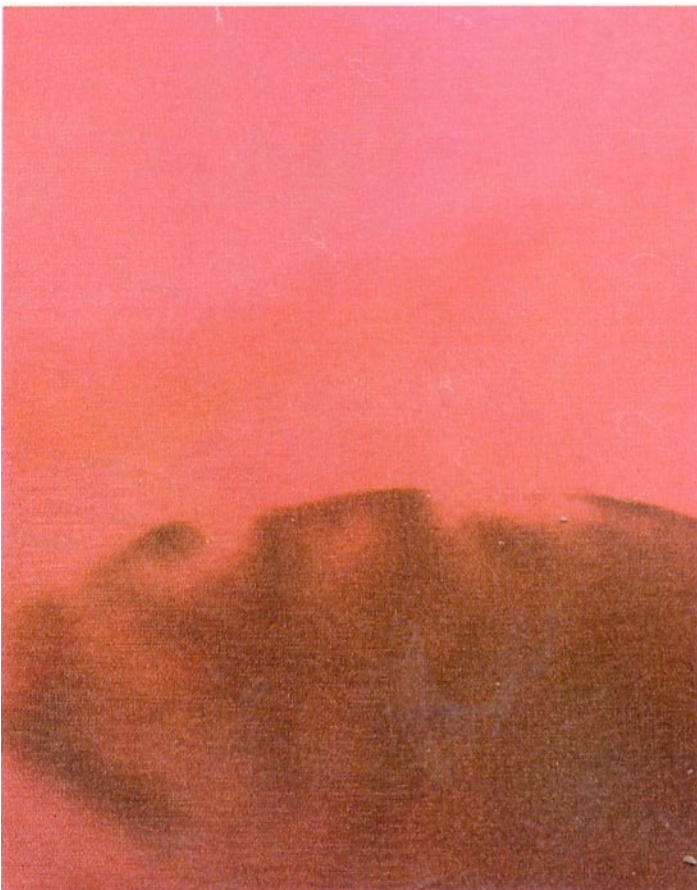


FIGURE 58

Some red dyes change to blue on cotton fabrics when pressed with the iron on the cotton setting.

COLOR CHANGE TO LIGHT

Why does this occur? Dyes are very complex in their chemical make-up. Some have limitations when applied to certain types of fabrics. For example, to obtain the brilliance of color desired on silk fabrics, a certain degree of colorfastness must be sacrificed. Too, the intended use of a fabric should determine the degree of colorfastness to light. For example, a fabric that is being dyed or printed for evening wear needs little colorfastness to light, whereas a fabric being dyed or printed for draperies would require a high degree of colorfastness to light.

When does this occur? Color change to light is caused from either the direct or indirect rays of light. The ultraviolet rays cause the greatest degree of change in most dyes. It is always possible to detect the degree of color change to light by comparing an unexposed area (underside of hem, collar, cuffs) with an area that has been exposed to light.

How may this be controlled? When the end-use of the fabric is known, dyes should be selected in manufacture which will meet light-fastness requirements.

FIGURE 59

The original blue color of this printed fabric is shown in the area of the opened pleats. This area was protected from light. The unprotected areas of the garment faded.



MILDEW

Why does this occur? Mildew is a fungus growth which will attack fabrics made of the cellulosic fibers under certain conditions of use and storage. It may appear as a stain, discoloration, or loss of color in the fabric.

When does this occur? Mildew will develop generally in warm, humid air. Lack of circulation of air, which is frequently found in clothes closets, garment bags, trunks, drawers, basements, contributes to the formation of mildew. Under certain favorable conditions, some types of mildew fungus will remove color from the fabric as a result of chemical action. The fabric may or may not be weakened (6).

How may this be prevented? Many mildew preventives are now available to treat fabrics to make them resistant to mildew, or for use in clothes closets and drawers. Occasionally, mildew stains can be removed or lightened with bleaching. In some cases, bleaching is unsafe because of the color of the fabric.

COLOR CHANGE TO O-FADING

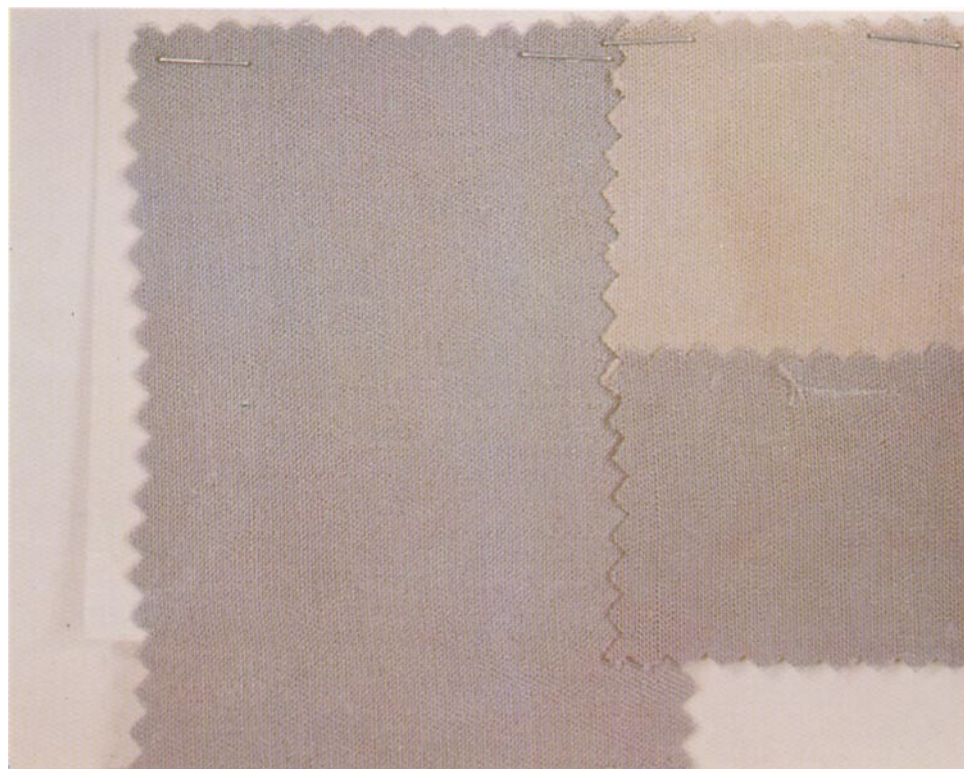
Why does this occur? There is a type of atmospheric fading that occurs on dispersed dyes on acetate, Arnel, and in some cases Dacron. The fading is caused by an oxidative factor which is designated as O-fading (7). This type of fading may occur on dyes that are colorfast to fume fading (atmospheric gas fading). Blue and red dyes seem to be affected to a greater degree than other colors. Yellow dyes do not seem to be affected by O-fading.

When does this occur? This color change may occur when certain dyed or printed fabrics are exposed to the atmosphere in normal use. In some cases this color change may be masked with soil, and may not be detected until after the soil is removed from the fabric. This sometimes leads to the belief that drycleaning itself causes the color change.

How may this be controlled? Proper selection of dye and the use of a small amount of inhibitor serve to control and eliminate this type of color change. Proper heat treatment in the manufacture of some fabrics helps to reduce this type of color change.

FIGURE 60

Left side shows original color of fabric. Upper right shows color change to ozone fading. Lower right shows no color change to fume fading (atmospheric gas fading).



LOSS OF COLOR FROM PERFUME

Why does this occur? The alcohol and essential oils in perfume may cause some dyes to bleed. Frequently the dyestuff migrates to the edge of the area wet with perfume. This causes a dye ring to form.

When does this occur? The movement of dye may take place where perfume is applied directly to a fabric or spilled on a fabric. The color change may be due to oxidation of the essential oils.

The color change may take place later while the garment is hanging in a clothes closet. In some cases the color change does not occur until the garment is drycleaned and finished.

How may this be prevented? Perfume should not be applied directly to a garment. It may be applied behind the ears; or a perfume lariat, ring, bracelet, or fob designed for this purpose, may be worn.

FIGURE 61

Perfume was spilled on this garment, loosening the dyestuff. The color loss became apparent during the drycleaning and finishing of this dress.



COLOR CHANGE FROM PERSPIRATION

Why does this occur? All human beings perspire—some more than others. Perspiration is a secretion given off by more than two million glands in the skin. It is mixed with sebum, an oily heavy viscous solution, and cast-off cells of the skin. It becomes contaminated with bacteria on the skin, hair, clothes, and in the air.

When does this occur? Perspiration is acid when it is first given off by the body. When decomposed by bacterial action, it becomes alkaline. The greater the degree of alkalinity, the greater the degree of color change in those colored fabrics that are sensitive

to alkalis. (8)

How may this be controlled or prevented? Garment manufacturers should consider colorfastness to perspiration in selecting fabrics where this property is desired. The consumer may do several things to prevent this type of damage: The underarm area may be protected with dress shields; anti-perspirants and deodorants should be used as directed by the manufacturer; clothes should be dry-cleaned regularly to reduce the alkaline concentration in garments. (8)

(Reference: NID Technical Bulletin T-192)

FIGURE 62

Perspiration is acid when first secreted. It becomes alkaline upon aging. It is destructive to many dyes used to color or to print fabrics.



COLOR CHANGE DUE TO REDEPOSITION OF SOIL

Why does this occur? Redeposition of soil may occur for several different reasons: (1) A particular fabric finish may have an affinity for attracting and holding soil; (2) the electro-static property of textile fibers, particularly some of the hydrophobic fibers, attracts and holds soil; (3) uncontrolled conditions of the drycleaning cycle may be responsible, such as improper classification of items, condition of solvent, relative humidity of the solvent, amount of detergent used, and length of the drycleaning cycle.

When does this occur? Redeposition of soil may take place during the drycleaning cycle of the drycleaning operation.

How may this be controlled or remedied? Not enough is known about the textile finishes applied and their ability to attract and hold soil. The use of durable anti-static finishes on fabrics made of the hydrophobic fibers may help to eliminate redeposition of soil in this class of fabrics. The drycleaner may greatly minimize redeposition of soil by following good plant practices. Improper plant practices can be determined by laboratory tests.

(Reference: NID Technical Bulletins T-72; T-96; T-112; T-157; T-160; T-283; Fabrics-Fashions Bulletin FF-3)

SEE FIGURES 63 AND 64 ON PAGE 445

FIGURE 63

Redeposition that results from poor dry-cleaning plant practices may be determined by laboratory test. Here the test has removed redeposited soil in one area and restored the original bright color.



FIGURE 64

Some textile finishes appear to have an affinity for air-borne dust, causing the fabric to appear dulled or greyed. These finishes also have the power to attract and hold soil during drycleaning. Left: Original color; Right: Greyed from reposition of air-borne soil.

LOSS OF COLOR—NAPTHOL RED DYE IN SPOTTING

Why does this occur? A class of dyes that can be affected by accepted spot and stain removal procedures is known as Azoic or Naphthol dyes. The dye is colorfast to water, petroleum, and synthetic solvent. Prespotting and spotting procedures required to remove stains and soil may loosen and remove the dye, leaving a yellow area.

When does this occur? The color change occurs when attempting to remove heavy,

greasy or waxy type soil by prespotting or spotting methods of soil removal.

How may this be prevented? On fabrics of this type there is a limitation on how much soil, spot or stain can be removed from the fabric. Apply the spotting solution to a small piece of fabric cut from an unexposed seam. Dry at room temperature. If a yellow-orange spot occurs do not attempt to remove the soil or stain.

(Reference: NID Fabrics-Fashions Bulletin FF-66.)

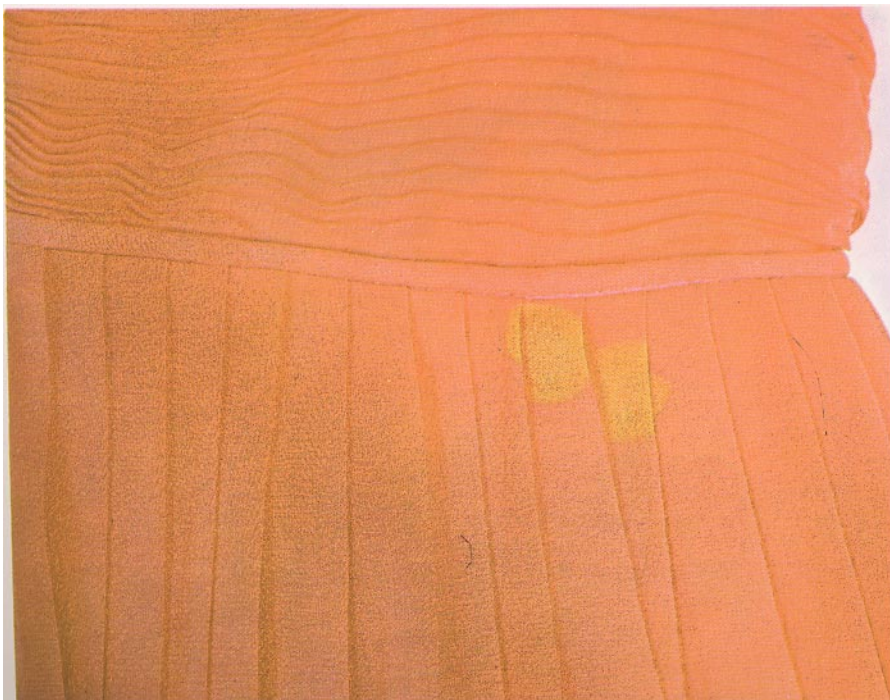


FIGURE 65

Red Azoic and Naphthol dyes are very sensitive to accepted prespotting and spotting procedures. The dye is loosened and removed, leaving a yellow area.

RESIN-BONDED PIGMENTS

Why does this occur? In pigment printing special pigments are attached to the fabric with a binder or an adhesive. The pigments are finely ground, insoluble substances which do not penetrate the fiber as dyes do. There are two common types of pigment prints: (1) The emulsion type; and (2) the lacquer type. Serviceability depends on the basic fabric (weave and finish) to which the print is applied; the type of binder used; and the curing or drying.

When does this occur? Some pigment prints have poor resistance to abrasion in wear and drycleaning. The lacquer type has poor fastness to drycleaning. The emulsion type is more common than the lacquer type and usually gives better performance in wear and

drycleaning. In some of these fabrics the pigment may rub off. The binder used in some pigment prints may be affected by certain spotting reagents required to remove spots and stains.

How may this be controlled? It is very difficult to distinguish these prints from regularly printed fabrics. Good performance depends on the proper selection and application of the pigment and the binder in the printing operation. This can be controlled by the textile printer. Certain precautions must also be exercised by the drycleaner in the cleaning and spotting of pigment printed fabrics.

(References: NID Technical Bulletins T-162; T-181; T-214; Fabrics-Fashions Bulletins FF-11; FF-46; FF-76; FF-85; FF-90.)

FIGURE 66

Some of the pigments used are soluble in drycleaning solvent, as in the illustration. One drycleaning removed considerable pigment from the design. The belt was not drycleaned. Serviceability depends upon the type of fabric, the pigment and binder used, and the curing of the print.



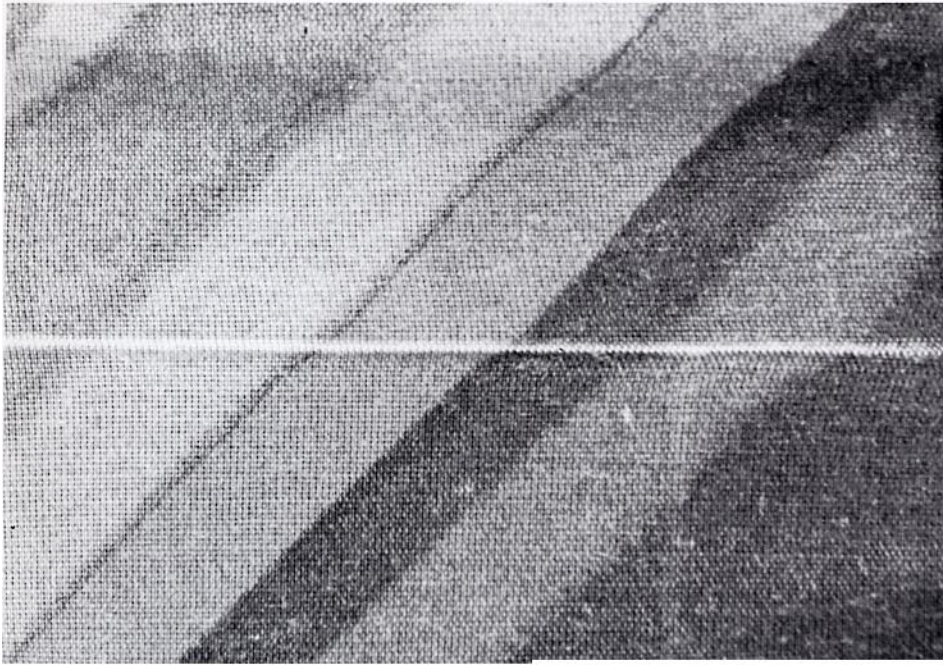


FIGURE 67

Note white streak along pleat line. Color was removed along the fold of the hemline too. This occurred in wear. It was accentuated with dry-cleaning.



FIGURE 68

The original color of the dress was melon. The yellow pigment was removed in drycleaning, leaving the skirt a pink color.

COLOR CHANGE IN SALT-SENSITIVE DYES

Why does this occur? This is rather an unusual type of color change that occurs on some dyes used to dye wool fabrics. Materials containing salt, such as perspiration, many food stains, or sea spray, may cause this color change.

When does this occur? This color change happens when salt (sodium chloride) comes in

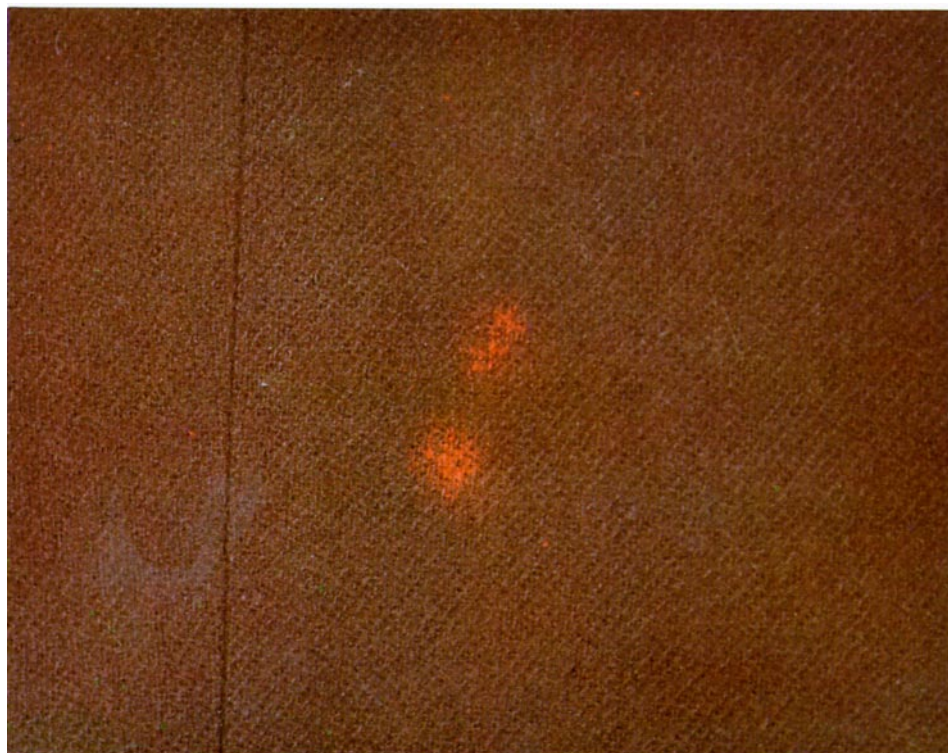
contact with the dye. The color change is usually toward red. It is most common on wool gabardine of brown, gray, and blue.

How may this be remedied? Discolored areas of this type may be removed by the dry-cleaner, by flushing the discolored area very quickly with a steam spotting gun.

(Reference: NID Technical Bulletin T-193)

FIGURE 69

The brown dye of this wool fabric has changed to red as a result of contact with salt (sodium chloride).



SOLVENT-SOLUBLE DYES

Why does this occur? Some dyed and printed fabrics have very good colorfastness to laundering and wetcleaning, yet may bleed or change color in drycleaning. This problem usually occurs because the textile dyer and printer does not realize that a particular fabric, designed for washability, may find use in a garment design that does not lend itself to washing. Nor is consideration given to the fact that many women prefer to have even the simplest garment drycleaned rather than washed at home. The public has come to believe that if an item can be washed, it certainly can be drycleaned. Such is not always the case.

When does this occur? Just as some dyes bleed or change color in water, others may bleed and change color in drycleaning solvents. For example, some yellows and pinks, either solid shades or prints, may wetclean perfectly. However, these same colors may be partially or wholly removed by drycleaning. Many of these dyes and prints are known to have good colorfastness to sunlight, laundering, and wetcleaning.

How may this be controlled? In dyeing and printing washable outerwear fabrics, dyes should be selected which are drycleanable.

(Reference: NID Technical Bulletins T-37; T-112; T-201)

FIGURE 71

The pink dye used to color this Orlon fabric was completely solvent-soluble. The belt, which was not drycleaned, is the original color of the fabric. Note the cotton thread used to make the buttonholes was colorfast to drycleaning solvent.



FIGURE 70

The fabric in one sleeve, right side of collar, and left panel of skirt have a blue background. Other sections have a white background. Fabrics bleached, dyed, and printed at two different times or in two separate lots are sometimes used in the same garment. In this case, the colors in one lot of fabric proved faster than those in the other.

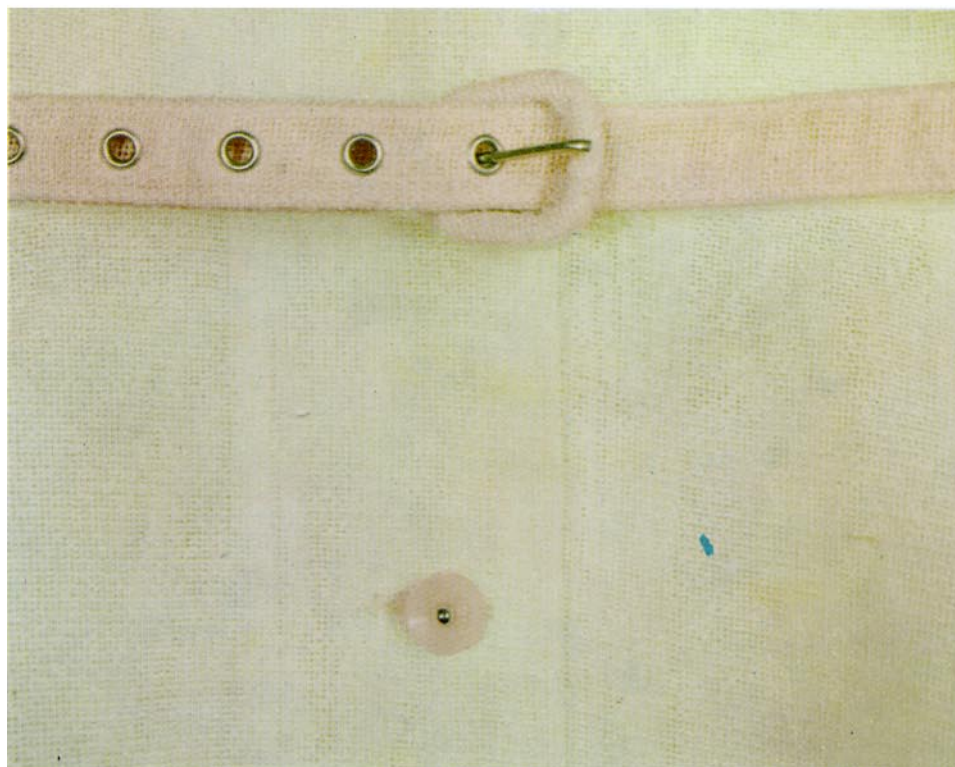




FIGURE 72

The pink dye of this cotton dress was partially solvent-soluble. The belt, which was not drycleaned, is the original color.



FIGURE 73

A part of the original color (left) of this printed slipcover fabric was lost in the first drycleaning. Left: Original color. Right: After drycleaning.

COLOR CHANGE OR LOSS IN STORAGE

Why does this occur? Some dyes change color during storage because of (1) diffused light; (2) heat and gases from a chimney; (3) the use of some moth and mildew preventives, alone or in combination with some types of plastic hangers.

When does this occur? Direct or indirect light from closet windows may cause color change or loss. Heat and fumes from a chimney in or next to a closet may cause fume fading. (Atmospheric gas fading). (See page 384). Heat also serves to develop and set some stains in fabrics during storage. Paradi-chlorobenzene (used in some moth-repellent

products) and paraformaldehyde (used in some mildew preventives) under certain conditions of use may cause some dyes to change color.

How may this be prevented? Wearing apparel and household items should be thoroughly drycleaned before storing them. Storage of fabrics in the dark and at low temperature gives the greatest protection (9). Moth and mildew products should be used and applied in accordance with manufacturer's direction.

(Reference: NID Technical Bulletins T-93; T-219)

COLOR CHANGE FROM WATER—RED DYE ON RAYON

Why does this occur? A red-blue dye that is used to dye rayon and rayon blend fabrics of different weight and construction is very sensitive to clear water. Water tends to wick out the blue component of the dye.

When does it occur? Water dropped or spilled onto a garment dyed with a water-sensitive red dye may occur during wear. It may also occur when a spotter attempts to remove a spot or stain from the fabric. The color change may also occur as a result of slow drying when the garment is clamped to a wind whip after wetcleaning.

How may this be remedied? The color of the dye cannot be leveled out with steam spraying or even by completely wetting out the garment. Double areas or thicknesses of fabric do not dry as rapidly as single thicknesses. Staining usually occurs in areas of double thickness of fabric. To be serviceable a dye should withstand the amount of moisture a fabric is exposed to during normal wear.

(Reference: NID Reporter N-269.)

FIGURE 74

Water and perspiration tends to wick out the blue component on a red dye used to dye rayon and rayon blended fabrics.



COLOR CHANGE FROM WATER—RED DYES ON WOOL

Why does this occur? Several theories have been advanced as to why a color change occurs in some red dyes used on wool:

1. The variables involved in manufacture and application of the dyestuff. The color change may be the result of some inherent characteristic of the types of dye used or their application to wool fabrics, depending on the shade of red involved.
2. This type of water spotting problem is not unusual in colors that are clear and bright. It may occur in colors other than red.
3. The phenomenon is not caused by fading or any color change in the dyed fabric, but is a complicated change in light reflection due to the absorption of water by the fabric and individual fibers. For example,

some broadcloths, flannels and gabardines other than red are known to water-spot readily.

When does this occur? The wearer may get caught in the rain and the red wool fabric water-spots. The fabric may change color when treated with distilled water or steam from a spotting gun. The red color changes from a lighter to darker hue.

How may this be remedied? Drycleaning will not remove the spots. The entire surface of the fabric may be sprayed lightly and evenly with a steam spotting gun, brushed lightly and cabinet dried. This results in an even shade of color, although the hue may be slightly darker than the original color.