NUMBER 32 SPRING 1997

TCN

TEXTILE CONSERVATION NEWSLETTER

TCN

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Disclaimer

*Articles in the **Textile Conservation Newsletter** are not intended as complete treatments of the subjects but rather notes published for the purpose of general interest. Affiliation with the **Textile Conservation Newsletter** does not imply professional endorsement.*

*The **Textile Conservation Newsletter**, published twice yearly is a forum for textile and costume news from around the world. Submissions related to textile conservation, history, technology and analysis, information regarding recent publications, supplies and equipment, health and safety, employment opportunities and upcoming courses, conferences and exhibitions are invited. They should be typed, or preferably, forwarded on an IBM compatible 3.5" disk in Wordperfect, Microsoft Word or ASCII formats.*

TCN
FROM THE EDITORS

Did you ever notice lifes' dramatic changes are rarely like they are in movies? On the big screen, seminal changes are often accompanied by grand orchestras and unusual alterations in lighting. In real life things don't happen that way.

If you were a baby boomer, your life with television began with occasional programs shrouded in a what appeared to be a swarm of gnats on the screen. I can remember our family snuggled up to watch Walt Disney on Sunday evenings. A lifelong memory is of Dad fiddling with the "rabbit ears" while the rest of us hollered about what position gave the best picture. Little by little things improved. First it was colour, then it was cable. Day by day, television has insinuated itself into our lives to the point that we can no longer imagine being without it.

During my teens, the University of Waterloo had one of the most powerful mainframe computers in Canada. It took up an entire building. A two story hall housed the main body of the beast, with a gallery around the upper level so you could view its' majesty. Little cubicles off to the side held the machinery required to prepare punch cards, an unwholesome and frustrating job. Access was strictly controlled and times were so limited that many students did all their work in the middle of the night. It was a world as dark and mysterious as a bad fantasy novel.

The computer entered my life like a door-to-door brush seller. First it got its toe in when it came home with my husband for the purpose of book-keeping. Then the hand came in when I learned how to write letters. One look at the internet and I knew the beast was here to stay.

I sit at my computer to begin work on the current issue of TCN. Helen has done the hardest task, soliciting the articles. Leslie R. will proof the first draft. My job is simple. Each of the articles comes to me in one of two ways, either transported on a disk or submitted over the internet. I open the files, put them into their correct positions, pretty them up a bit and off we go to the printer. Nothing could be easier! It is a tribute to the previous editors that they ever managed to produce even one issue a year, let alone two.

My grandmother was born before cars were widely used. She witnessed the development of a technology that transformed society, yet she never seemed impressed. I always wondered at this, because it seemed so important a development. Now I think I understand. I think they just snuck up on her.

Lesley Wilson

CORRECTION

The first verse of Julie Hughes' poem "Artefacts: Endangered Species", published in the Fall '96 issue of TCN should have read: "Tenderly we entered here <u>with</u> dignity..." and not as published. The editors apologise for any inconvenience this may have caused.

INTRIGUING CRAYON ART WORK

Children will have fun rubbing in the crayons!

No. 999. A crayon art idea that will make for nursery neatness! No more blocks, tops, balls cluttering up the room after play hours when you or the children make these attractive, practical bags to keep their toys in! The kids will have fun putting in the crayon colors! Simply outline the design in embroidery and then color solid parts with wax crayons. Each bag can hang on a separate wall hook to save floor space and yet be within easy reach. These bags teach neatness, protect toys, and take the place of an awkward toy bin. To be made of unbleached muslin or other strong cotton fabric. Blue transfer, 25c.

From: McCall Needlework - Winter 1942-43

More On Moisture:
Cohesive, Temporary, or Permanent Set and Hygral Expansion

One doesn't usually read back issues of the Textile Research Journal (published by the Textile Research Institute in Princeton, New Jersey) for the humor. Nor does one expect smiles and laughter from an article co-authored by Werner von Bergen, the renown editor of the multi-volume Wool Handbook (published by John Wiley and Sons, New York, 1963). Yet von Bergen's article[1] on hygral expansion in TRJ provides both amusement and insight into the behavior of worsted fabrics when the relative humidity changes. Illustrated is a beautifully finished man's suit jacket (20% RH) and the same jacket, rumpled and puckered, when it was subjected to high 90% relative humidity (Figures 1a and 1b). One can imagine the dismay of a senior scientist and textile technologist emerging from a first class Pullman railroad car for a winter Florida vacation with such disheveled attire. Dr. von Bergen's work on this topic, together with those of his colleagues and, more recently, his successors in the textile field, is actually quite worthwhile--and cogent reading for textile and costume conservators today. The effects of set and dimensional stability not only answer questions pertaining to relative humidity for worsted garments and textiles, but they also begin to answer three important questions for conservators:

1) what is the effect of heated deionized wash water on wool?
2) can you reset the dimensions on a tapestry or carpet that has been stretched out of shape (creep)?
3) will the new "wet" dry-cleaning techniques damage antique textiles?

This paper will review the properties described in the literature as set and especially the hygral expansion of wool. It will discuss the implications of these properties for the appearance of costume and textiles in museum collections. A glossary is provided as an aid to readers; a bibliography is included for further reading.

In the case of Dr. van Bergen's worsted jacket, the wool fabric had elongated with an increase in relative humidity. By contrast, the cotton sewing thread became stronger and slightly swollen at high humidity; any temporary tension produced by the winding of the thread on the bobbin or by sewing was relaxed with the increase in moisture content. Where the gabardine was restrained by seams and tapes, it grew in "the third dimension"--bubbling outward. Thus, the jacket puckered along the back seam and bagged out along the bottom hem. To some extent Dr. van Bergen and his colleagues understood this problem.

Textile scientists and technologists had studied the effect of moisture on mechanical properties for several decades (see the Textile Conservation Newsletter No. 28, Spring 1995, p14-28 for a review). Under high (90-100%) humidity conditions, the wool fiber's stress-strain curve becomes flat (Figure 2). Consequently, the same stress or weight on wool can cause the fiber to stretch from its initial 5% extension to almost 30% extension. That is, the fiber can grow longer of its own accord. Yet there is a difference between the reaction of an individual fiber and of a woven fabric. Wool fabric exhibits "the dry extension paradox"--because the drier wool cloth (in equilibrium with 65%RH) elongates more than the wet cloth at low stress loads. In Figure 3a, stress (weight load) at low levels produces more extension on wool cloth at 65%RH than on wet cloth while it is the opposite for the wool fiber--fiber at 65%RH stretches less than wet fiber. If more stress is applied, the comparative extensibility of the cloths is reversed and wet wool fabrics are more

[1]von Bergen, W. and C.S. Clutz, "Dimensional Stability of Woolen and Worsted Fabrics," Textile Research Journal, vol. 20 (August, 1950):580-591.

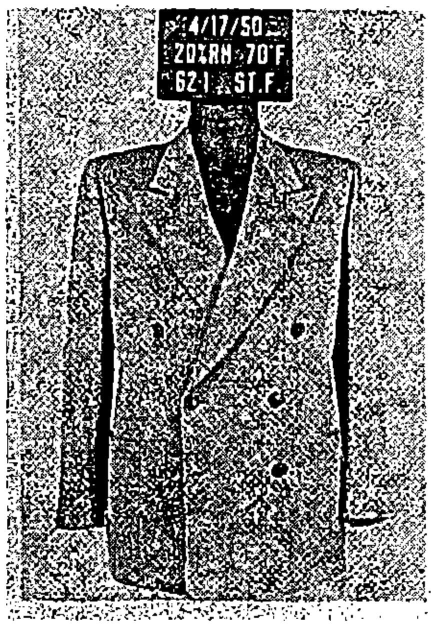

Figure 1a. Freshly pressed jacket at 20% Relative (after van Bergen and Clutz)

Figure 1b. Slightly closer view of the same jacket as in Figure 1a at 90% Relative Humidity (after van Bergen and Clutz)

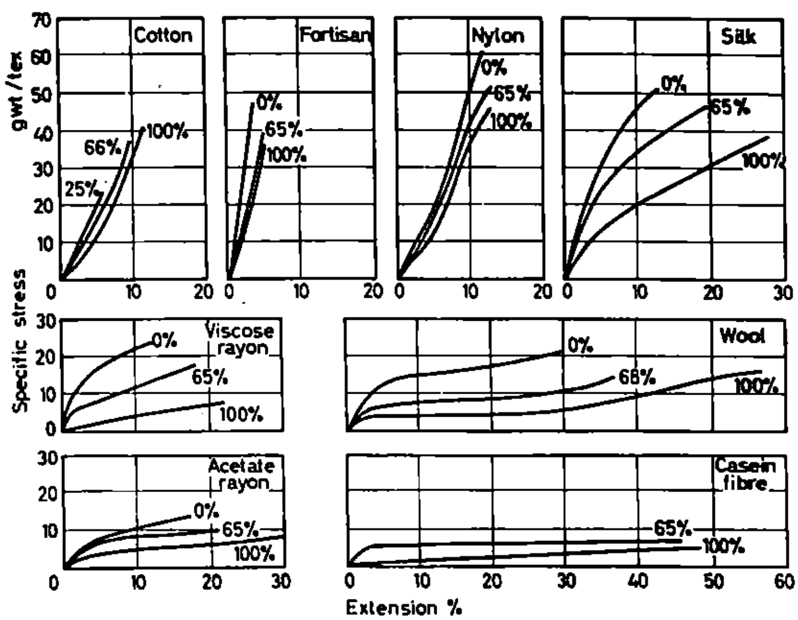

Figure 2. Stress-strain curves of major fibers at various humidities (after Morton and Hearle)

easily extended than dry ones. At the top of Figure 3b, the larger stresses produce weaker, stretchier wet fibers and wet cloths: both the wet fiber and the wet cloth will break with a smaller load at a level of greater extension. Because the garment was relatively lightweight, the load (weight of the jacket) should not have produced dimensional instability at high humidity, given the dry extension paradox.

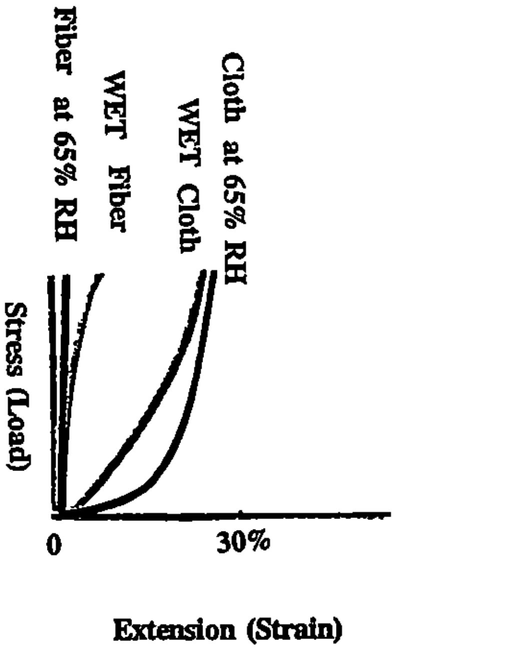

Figure 3a. A comparison, at low stress levels, of load-extension curves for wool single fibers and for wool cloth at 65% relative humdity and in a wet state. Load axes for fiber and cloth use different scales. (after Anon., Wool Science Review, 1963)

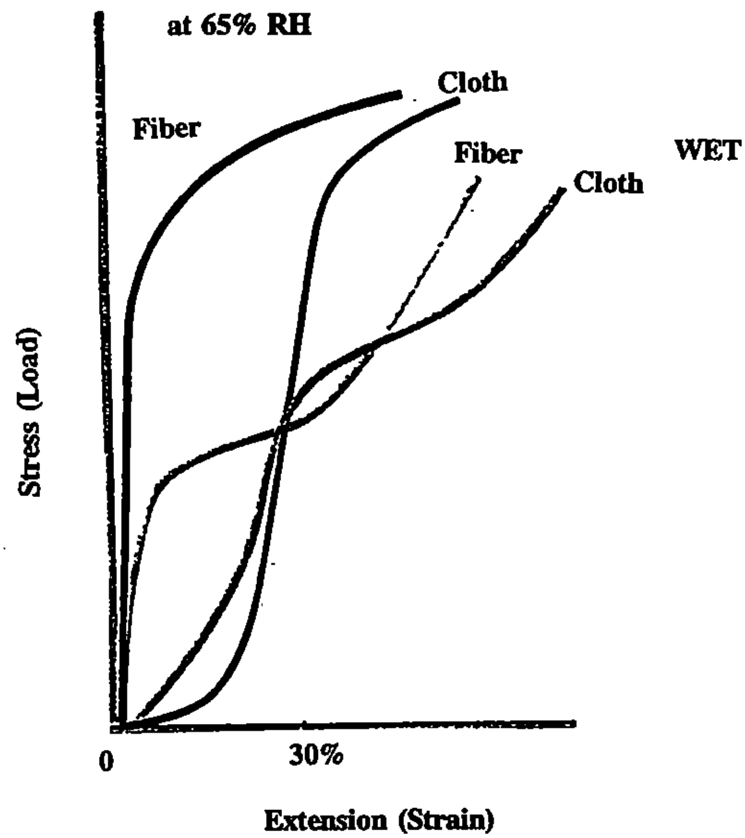

Figure 3b. A comparison, at low and high stress levels, of load-extension curves for wool single fibers and for wool cloth at 65% relative humdity and in a wet state. Load axes for fiber and cloth use different scales. (after Anon., Wool Science Review, 1963)

What Dr. van Bergen observed with his jacket study was actually a special and peculiar property most noticeable in the areas of uncut, unrestrained worsted cloth: a dimensional movement of wool fabric by 2%-4% as a reaction to changes in relative humidity. He also distinguished the phenomenon from either relaxation shrinkage or felting shrinkage. In his study, the dimensions of the fabric actually see-sawed (Figure 4). With unrestrained fabric lengths, worsted cloth could grow and shrink repeatedly, a phenomenon he termed "R.H. motion of the fabric." Cycling 12 oz. gabardine between 20% and 90% produced fluctuations in size of 4.4% if the fabric was resting flat on a table, but 5.7% if it was suspended. Steam pressing and relaxation shrinkage were repeatedly reversed with "water relaxation." The changes in dimensions might be related to creep, elongations due to constant stress over time (Figures 5a and 5b), or to elastic and plastic deformations, the sort of cycling of stress on and off that produce elongations (Figure 6), but the dimensional instability described by Dr. van Bergen is primarily moisture-related, a function of the wool cloth and its equilibrium with various relative humidities: it can occur when the fabric is at rest, flat on a table!

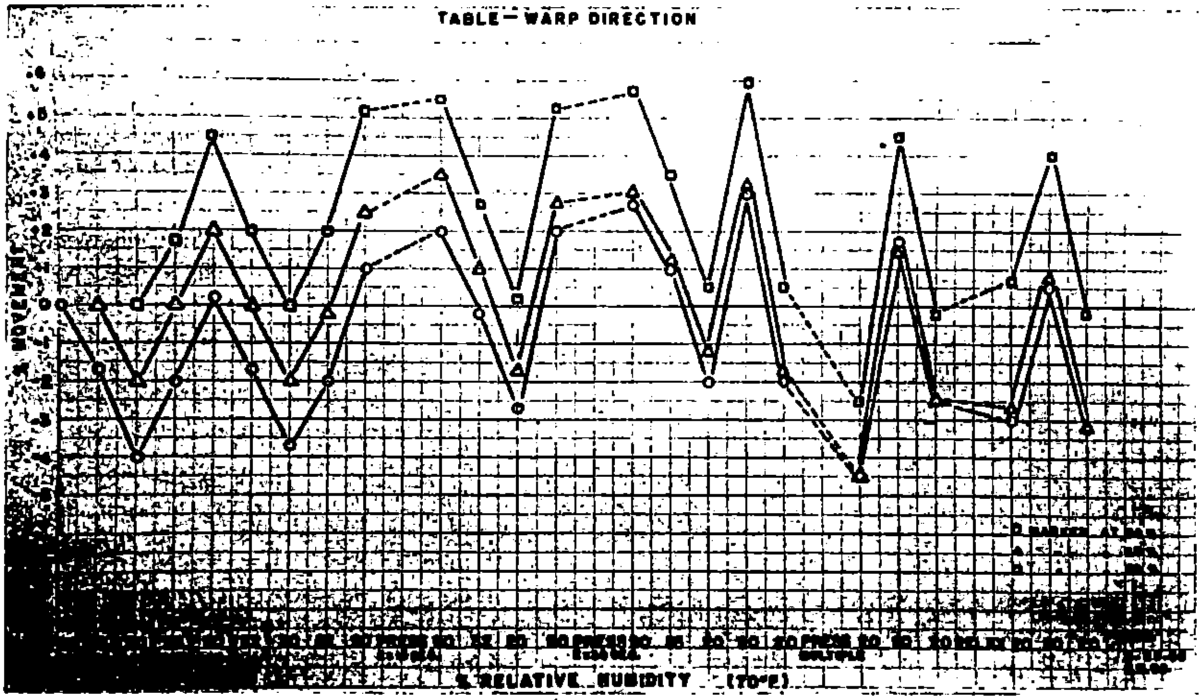

Figure 4. Movement of a 13oz. gabardine cloth, flat on a table, with changes in relative humidity (after van Bergen and Clutz).

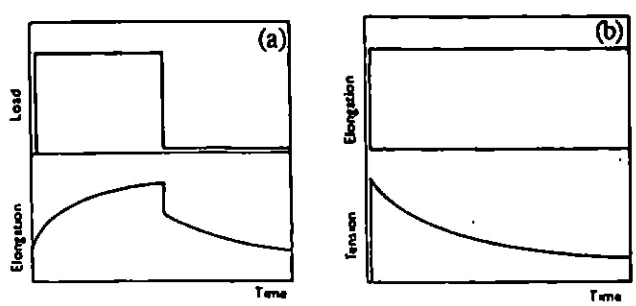

Figure 5. Viscoelastic behavior through time: a) Creep under constant load and recover under zero load; b) stress relaxation under constant tension (after Morton and Hearle).

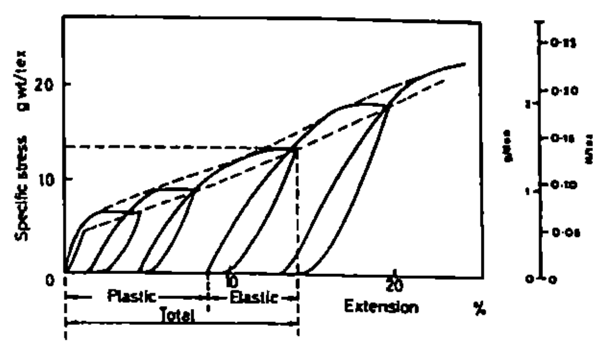

Figure 6. Stress-strain loading and unloading of viscose rayon. There is both elastic recovery and more permanent plastic deformation (after Morton and Hearle).

Other wool scientists and technologists also studied the problem of dimensional stability. Margareta Cednäs distinguished four types of shrinkage for wool fabrics: felting shrinkage due to the directional entanglement of the fibers; relaxation shrinkage when fabrics, strained during manufacture, are relaxed by water or by wet steam; a dimensional change caused by a change in moisture content; and a "press shrinkage" during steam-pressing. She focused upon the effect of cloth construction and the effect of finishing processes (dyeing, etc.) and tailor pressings to induce permanent and temporary set. Like Dr. van Bergen, she expressed concern that the subsequent moisture conditions be correlated to the construction of a garment or "make-up" of fabrics into clothes. Her assessment, unlike Dr. van Bergen's, was conducted on the advent of durable-press cotton fabrics. She was confident that the shrinkage, handle, and crease-recovery research incorporated factors useful in the future treatment of other fibers.

Meanwhile, at the C.S.I.R.O. Wool Research Laboratories in Australia, Dr. Baird, was able to characterize the peculiar, reversible dimensional changes observed by Cednäs and van Bergen, now termed <u>hygral expansion</u>, as a function of moisture content, fiber swelling, and weave crimp. Dr. Baird plotted the change in length of a worsted fabric against its moisture regain (Figure 7a). He demonstrated that a maximum of expansion corresponds to about 20% moisture regain, after which a slight contraction occurs. In part, Dr. Baird's explanation of fiber swelling pertains to the different longitudinal effects of ortho and para-cortices of the wool utilized for worsted yarns. Comparing the fibers of a yarn, bent into a weave crimp, to those of a homogenous rod, Dr. Baird postulated that swelling from moisture caused the yarns' fibers to straighten, increasing the radius (R) and the yarn's length (DE) in Figure 7b. When these weave crimp forces of warp and weft swell to a level of mutual constriction, the increment in dimension ceases (Point B of Figure 7a). Any more moisture and the fabric will shrink slightly. Dr. Baird pointed out that the swelling shrinkage of section BC in Figure 7a parallels the swelling shrinkage occurring in cotton and rayon fabrics. At low moisture regains, this fiber swelling produces hygral expansion. At higher moisture regains (i.e. in equilibrium with higher relative humidities), the decrimping of the yarns takes precedent in promoting hygral expansion.

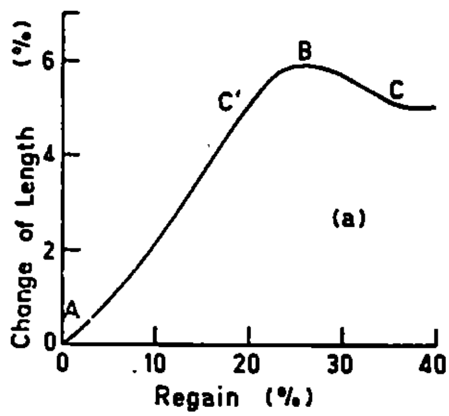

Figure 7a. Typical Hygral expansion in a worsted wool fabric (after Baird).

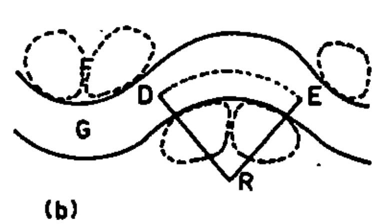

Figure 7b. Cross-sectional view of a worsted fabric (after Baird).

Thus, <u>hygral expansion</u> combines fiber swelling forces and yarn decrimping ones; both these forces occur with moisture adsorption and desorption simultaneously in worsted fabrics (Figure 8). <u>Hygral expansion</u> is the physical sum ("observed behavior") of these two types of forces in a fabric at rest when there are changes in its moisture content. In the literature, the "bent beam" analogy is used to describe both forces (Figure 9):

> In a wool fabric, bent beam forces (associated with single fibers) operate at low regains to reduce weave crimp in the yarns and increase fabric dimensions as the regain is increased, and to increase weave crimp and reduce fabric dimensions as the regain is reduced....At high regains, a point is reached with unset yarns...where a contraction in dimensions occurs as the regain is further increased....As the regain increases, the separation of the

yarn centers at the cross-over points increases, and this leads to a reduction in the spacing between adjacent threads. The opposite behavior occurs as regain is reduced.[2]

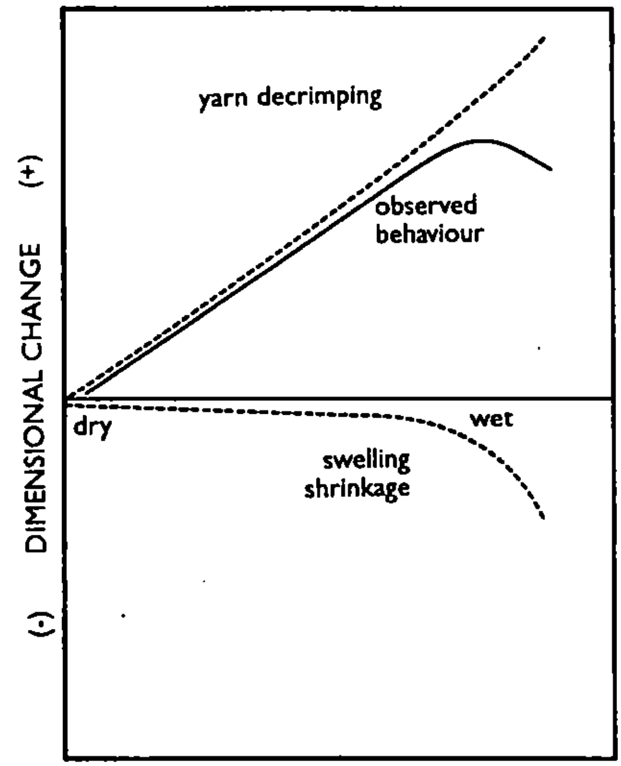

Figure 8. The Hygral expansion curve of worsted cloth is seen as the addition of the fiber swelling curve and the yarn decrimping curve. The horizontal axis is moisture regain (after Bona)

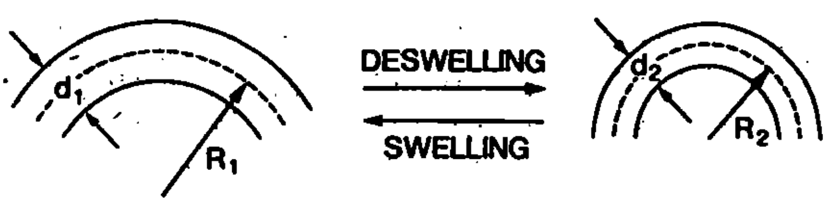

Figure 9. For a bent, elastic anistropic beam, the change in its radius on swelling and de-swelling. R = the radius of the curvature; d = the beam diameter. The realtionship of R_1 to R_2 is the same as that between d_1 to d_2 [i.e. $R_1/R_2 = d_1/d_2$] (after Cookson).

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[2]Cookson, P.G. "Hygral Expansion Behavior of Woven Wool Fabrics," Textile Research Journal vol. 60 (1990):580.

However confusing this mechanistic theory of hygral expansion appears to be, the nature of hygral expansion--the "observed behavior"--remains an important phenomenon. For costume and textile conservators seeking practical answers, the detailed, careful observation of wool scientists and technologists are themselves quite useful.

In the first place, wool technologists noticed that different worsted fabrics had different rates of hygral expansion and relaxation shrinkage (Figure 10 and Table I). Within these fabrics, the rates for the warp and the weft might not be identical. The calvary twill of Table I, for example, has a creped warp yarn; its weft yarn, more loosely twisted, is almost undeflected in the Z direction twill fabric. Those differences in the contortions of the warp and weft yarns as they interlace each other--the weave crimp--played a predictable role in the amount of hygral expansion (Figure 11). The greater a yarn is distorted out of plane as it intersects with its counterpart, the greater the weave crimp, the higher the hygral expansion--other factors being equal.

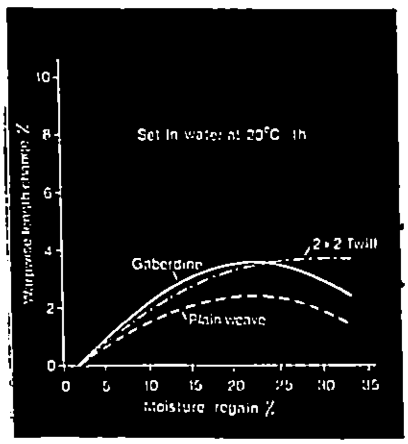

Figure 10. Hygral expansion curves for three worsted wool fabrics, showing the effects of weave structure and the degree of setting (after Shaw).

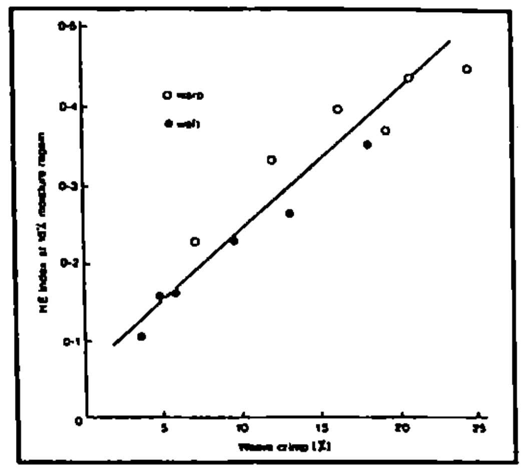

Figure 11. Hygral expansion plotted as a function of weave crimp for a series of wool worsted fabrics. The HE Index is the rate of change in dimensions with moisture regain; here the value of 16% moisture regain is used (after Shaw).

Table I: Relaxation Shrinkage and Hygral Expansion in Different Worsted Fabrics (after Shaw)

Fabric	Direction	Relaxation Shrinkage (%)	Hygral Expansion (%)
100% Wool Calvary Twill, Piece Dyed	warp weft	1.5 0.5	6.0 2.5
100% Wool 2 x 2 Twill, Piece Dyed	warp weft	0.5 -1.0*	5.5 6.5
100% Wool 2 x 2 Twill, Top Dyed	warp weft	1.0 0	2.5 2.0
70% Wool, 30% Polyester Pain Weave, Top Dyed	warp weft	1.0 1.0	1.0 1.0

*indicates expansion

There are other factors; trying to define these factors was quite difficult. Wool technologists found that attempts to replicate experiments and results had certain difficulties. Depending upon the protocols and procedures, the effect might be diminished, enhanced, reversible, or made permanent. If we look closely at the gabardine jacket in Figures 1a and 1b, we can see that part of the problem with the jacket's appearance, after all, is its lack of consistent distortion: the seams at the lapels and sleeves, for example, exhibit less change in shape than the back-seam of the garment.

In Figure 12, we see that the hygral expansion of gabardine, plain weave, and 2 x 2 twill worsted cloths are all significantly increased when they are treated for one hour at 100° Celsius. Dr. Cednäs found that the temperature of the water, the duration of the treatment, its pH, the amount of physical strain on the fabric during treatment all affected the subsequent hygral expansion of the fabric. She termed the function of these effects as the set of a fabric. Dr. Cednäs illustrated and diagramed the overall result (Figure 13). She also noted that the steam-pressings, which occur while a garment is manufactured, provided similar setting problems.

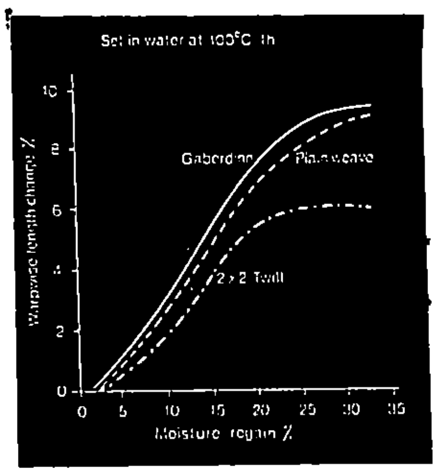

Figure 12. Hygral expansion curves for three worsted wool fabrics, showing the effects of weave structure and a high degree of setting (after Shaw).

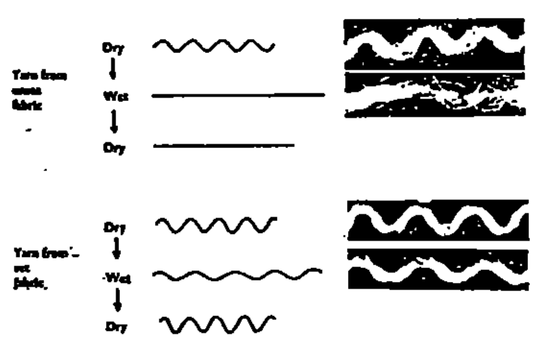

Figure 13. Diagrams and illustrations of the effect of hygral expansion on unset (top) and set (bottom) yarns from a worsted fabric (after Cednäs).

Wool technologists have subsequently catalogued a given worsted fabric as having four possible conditions: an unset state, fresh off the loom; a cohesively set state where water (saturation regain) at room temperature will relax and remove the predisposition of the weave crimp; temporary set, in which the fabric will not be altered by low temperature saturation but will be reset if it is subjected to factors more severe than those previously imposed; and permanently set fabric, the result of severe treatment. Figure 14a illustrates the mild hygral expansion (-0.37%) associated with unset fabric; Figure 14b, the higher hygral expansion (4.53%) of a temporary set fabric; and Figure 14c, the severe hygral expansion (9.73%) achieved with permanent set.

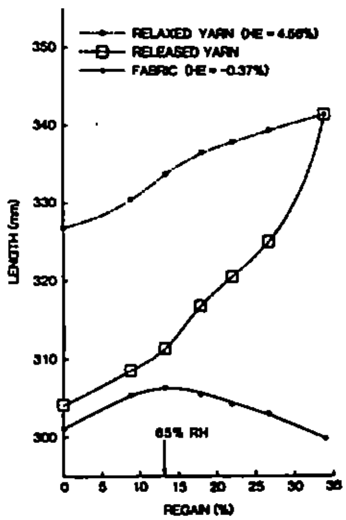

Figure 14a. Dimensional changes with regain of unset worsted fabric, relaxed yarn, and released yarn, all in the warp direction (after Cookson).

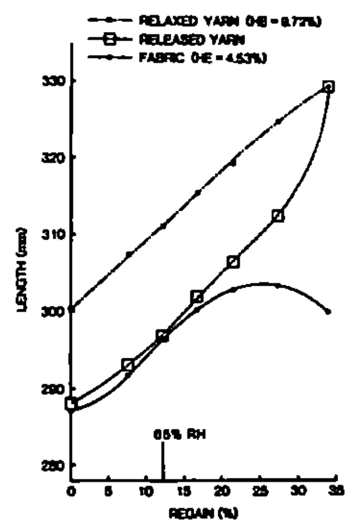

Figure 14b. Dimensional changes with regain of low-set worsted fabric, relaxed yarn, and released yarn, all in the warp direction (after Cookson).

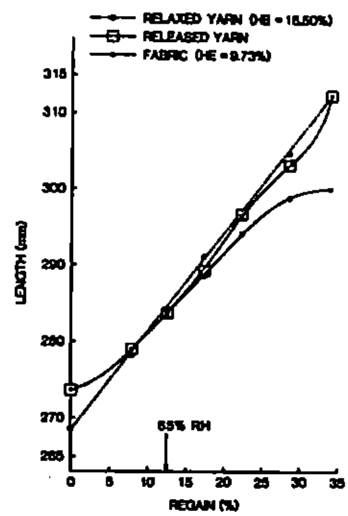

Figure 14c. Dimensional changes with regain of high-set worsted fabric, relaxed yarn, and released yarn, all in the warp direction (after Cookson).

From their cataloguing of set and hygral expansion, we see that the greater the level of set in a fabric, the more reactive its dimensions will be to changes in relative humidity if equilibrium is obtained. Also, while moisture (wetting) can be used to relax a fabric, high wash water temperatures can induce a greater dimensional instability in a fabric than those which previously existed. From a closer reading of the experimental work on the topic, we find that higher pH values (of the washing water) produce more rapid fabric setting, in a manner similar to higher temperatures. The values of hygral expansion in Table I also help us to predict the likelihood of a problem: top dyed (i.e. prior to yarn formation) fabric will be more stable than a comparable piece dyed (after weaving) cloth; fabrics with fiber blends may have proportionately lesser problems. Highly twisted creped yarns, like calvary twill warps with a high weave crimp, will be more susceptible than low weave-crimped ones, like the calvary twill weft. In this last instance, the lengthwise dimensional instability will always be of greater concern than any deviation in the weft direction. During any wetting or pressing operation, the warp direction of this fabric would be the dimensionally more fragile.

Just as interesting, wool scientists and wool technologists have observed a relationship between set formation in water and the glass transition temperature (T_g) of wool. The T_g for amorphous polymers occurs when the polymer moves from a rigid state to a rubbery one. For wool, scientists have plotted two actual transition temperatures that change with water content (see Figure 15). The condition termed cohesive set corresponds to a point below room temperature for a wet wool fiber and rapidly increases to a temperature beyond 160°C. for a totally dry one. Permanent set begins to take place in a wet fiber above 65°C. In this respect, the condition of temporary set for wool is a calculable mixture of partial permanent set and partial cohesive set; the change from cohesive to permanent set for a wool fabric or fiber is not instantaneous: the time duration is also involved.

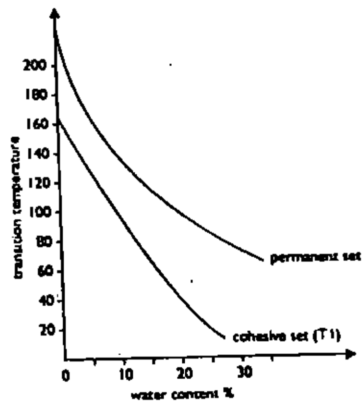

Figure 15. Curves of Cohesive Set (T_1) and Permanent Set (T_2) plotted against temperature in degrees Celsius and the moisture content of the fiber (after Bona).

Scientists see the action of water at the Tg_1 as the rearrangement of the weak hydrogen bonds. The unwrinkling of a wool bunting can be accomplished by sandwiching the creased fabric between damp blotters. The internal stress of the crease is relaxed; the flat, planar structure of the fabric is re-established. No additional heat is needed if there is enough moisture transferred from the blotters to the wool, and the wool is given enough time to relax and establish new hydrogen bonds. The permanent set (Tg_2) is related to a new and decisive ordering of cystine bonds; it cannot be altered unless the critical temperature and moisture regain levels are reached again. Although wise conservators may be reluctant to iron or to steam press antique garments, prior work of that type by a tailor or a garment maker may have induced the dimensional instability that the conservator would have preferred to avoid. Consequently, costume conservators may be dealing with Tg_1 and Tg_2 instability, a combination of cohesive and permanent sets that flat textile conservators do not normally face.

Yet the wool scientists might advise textile conservators of some equally confusing glass transition conditions: storing a wool tapestry--or exhibiting it--at a reduced ambient relative humidity raises its Tg_1, so the tapestry exists in its "rigid state" well below its Tg_1. In such a state, the tapestry develops a strain history, which wool technologists call **physical ageing**. By wetting out a flat, unconstrained tapestry, even at room temperature, the wool is raised above its glass transition temperature (the Tg_1). With this Tg_1 superseded, its physical ageing--its cohesive set--is erased. While raising the temperature of the water may reduce the time required in the bath for this relaxation to be complete, raising the temperature also moves the wool fiber towards Tg_2. In fact, the value of warmer water will be more to accommodate the requirements of surfactants and soil removal than for the fiber. This deageing can take place without immersion in water, because the Tg_1 is surpassed with equilibrium to 95% relative humidity at room temperature (20° C.) Thus, wool fabrics may be partly de-aged by humidification. However, recent research on wrinkles indicates that wrinkle recovery may be improved if this method of partial stress-decay is inhibited by maintaining constant ambient conditions (below Tg_1). To accelerate physical ageing, wool fabrics can be annealed: heated at a constant regain and then slow cooled. Although this effort improves wrinkle recovery, it does not survive de-ageing the fabric by wetting or pressing. Again, physical ageing is a low-set conditioned, reversible state.

Fortunately for both costume and flat textile conservators, the crimping-decrimping interchange in woven wool cloths (and the looped structure of weft-knitted machine fabrics) limit the stress-strain for most fabrics (Figure 16). Most fabrics are left well within the initial low-stress region during manufacture and use. The fiber-decrimping behavior, "the lateral movement of the fibers within yarns," and the nature of weave crimp combine to create a kind of "self-locking mechanism" at high stress levels while distorting easily at low stress-levels. This is a mechanistic description of those peculiar characteristics of wool which have made it physically such an enduring textile fiber for cloth manufacture down to the present century.

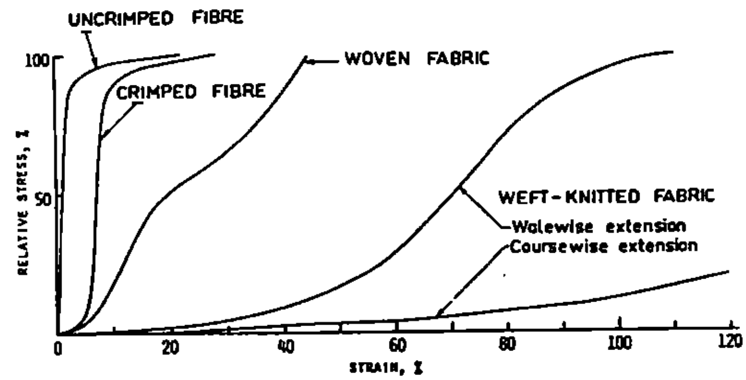

Figure 16. Typical stress-strain curves for wool fibers and wool fabrics. Note that "relative stress" is the percentage of breaking stress (after Postle et al.).

As a footnote to this discussion, it is worthwhile to mention the parameters of set in other fibers (Table II) and its common usage in hair care. While human hair has a low level of hygral expansion (less than 1%), the permanent setting of hair does indeed alter the cystine bond arrangement of hair. The effect of water on the glass transition temperatures of various natural, regenerated, and synthetic fibers are listed in Table III. The methods used to diminish the effect of water on other viscoelastic textile polymers is outside the scope of this discussion; unless the regenerated or synthetic fiber is plasticized by moisture and purposely crimped to imitate the wool fiber, it will not possess any component of hygral expansion.

Table II: Parameters of Set after Hearle, 1971

Characteristic	Type	Examples
Purpose/Result	a) Intended (desirable) b) Unintended (accidental, undesirable)	a) Domestic ironing; hair setting; commercial setting b) Wrinkling, creasing; loss of shape; overstraining during processing
Agent of Setting	a) Moisture b) Heat c) Chemical d) Adhesive e) Mechanical Stress	a) Simple hair setting; aid to ironing b) Yarn bulking; much fabric setting c) Durable press treatments; cross-linking d) Hair spray; external (to the fiber) resin treatments e) Effects of overstraining (plastic deformation)
Form of Manufacturing the Set	a) As made or obtained b) Unrestrained, free to relax c) Restrained to given form	a) Flat setting of yarn, package, or fabric b) Fabric relaxation shrinkage; skein shrinkage c) Pleating; wrinkling; yarn bulking
Durability	a) Temporary b) Cohesive, reversible, semi-permanent c) Permanent, irreversible	a) Simple hair setting with rollers or clips; reduction of twist liveliness; some wrinkling of synthetic "set" b) Domestic ironing; wrinkling and creasing; shrinkage of fibers in high bulk yarns c) Most commercial setting

Table III: Glass Transition Temperatures in Fibers and Their Lowering Due to Water*
(after Bryant and Walter)

Fiber	T_g Dry in Air, °C.	ΔT_g (Dry-Wet), °C.
Polyethylene	-25	0
Polypropylene	-20	0
Nylon 66	60	60
Polyacrylonitrile	90	20
Dynel	90	15
Dacron	100	15-20
Arnel	180	75-80
Acetate	180	75-80
Wool	>240	>200
Cotton	>240	>240
Viscose	>240	>240

* These values were calculated in 1959; more recent studies will provide more accurate values and especially the relative importance of various additives, copolymers, and finishes.

Efforts to confer dimensional stability on worsted wool fabrics continue to be an active area of textile science research. In the past, attempts to control hygral expansion included the oxidative treatments which impart shrinkage resistance, those associated with lighter fabric finishing and the use of fiber blends. With the knowledge of hygral expansion and relaxation shrinkage now evident, textile manufacturers and apparel manufacturers have ameliorated many practices in concert with after-market equipment technology. The steam-presser and drycleaner technology is matched to the fabrics they service. Currently, this technology is changing away from solvent/extraction drycleaning towards a "wet" water-based cleaning program. The impetus is funding efforts for fabric and apparel manufacturers to develop "easy care" dimensionally stable worsted products. As these developments progress, conservators will want to review carefully the studies of Dr. van Bergen, his colleagues and his successors. The older the worsted fabric, the more likely it will conform in some respect to their unstable models of physical aging.

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Glossary

Aging In the technical parlance of testing the physical properties of textiles, the term aging refers to the induction of stresses upon a fiber or fabric, as in the conditioning of a fabric into a fixed shape by a load (weight) and elongation (strain), and the maintenance of those conditions through time for experimental purposes. Physical aging is reversible. other forms of aging, like chemical and mechanical aging, may be irreversible with time and permanently degradative to the fiber and fabric.

Cohesive set Used to describe a set on wool fiber or wool cloth that is reversed with cold water. For non-wool fiber/fabrics the term used is temporary set.

Corona treatment Use of an electrical plasma discharge (a pair of electrodes) to alter the surface and chemical structure of a wool fiber; some oxidative reaction is involved due to the generation of ozone during the process.

Crease The mechanical deformation of a fabric which may or may not involve the alteration of chemical bonds between the polymer chains of a fiber

Crepe A textured fabric that may be produced by a)highly-twisted, tightly twisted yarns of a hygroscopic fiber with good elastic properties (cotton, silk, wool, rayon) woven into a simple plain, twill, or satin weave or b) normally twisted yarns woven with a sateen or plain weave with modifications that produce a textured, irregular surface with no dominant feature (aka an oatmeal weave).

Crimp The inherent curl of many wool fibers, called crimp, is a function of the internal molecular arrangement of the orthocortex and paracortex. Merino sheep wool has a pronounced crimp due to the lamination of ortho and para cortices bilaterally in the longitudinal direction. Other wools, like Lincoln, have a sheath-like tubular arrangement which produces a smoother, less three-dimensional fiber with less crimp.

Cross-linking Permanent bonding inter and intra polymer chains inside a fiber.

Cystine bonds The disulfide (-S-S-) present in wool and hair (fur) fibers which covalently links two parts of the same molecular chain (intra-chain) or two different molecular chains (inter-chain). Cystine bonds are affected chemically by alkalis and by reducing agents; such chemical rearrangements of the cystine bonds can produce a permanent set.

De-aging In physical terms, the relaxation of induced stress in a fiber or fabric by reversing previous conditioning.

Decating or Decatizing While this term can refer to simple sponging with water to establish finished dimensions, luster, hand, and finish for a worsted or woolen fabric, it is most often used to describe a formal finishing operation where hot (boiling) water or steam is passed through such a fabric after the fabric has been rolled on a perforated cylinder. A full, soft hand is produced; the set is cohesive, semi-permanent and may be removed during garment make-up. Autoclave or kier decatising at 0.6-0.7 atm with steam heat produces a permanent set (See Shaw and White).

Durable Press The use of the term "durable press resins" is a misnomer in the sense that the chemical treatment produces internal cross-links, bonds inside the cotton fiber. There is no external resin coating or adhesive. The cross-linking occurs between hydroxyl groups on adjacent cellulose chains; as a result, the cotton fabric is rendered crease-resistant.

Felting Shrinkage The interaction of heat, agitation (movement) and conditions (pH, moisture content, additives) to produce an irreversible entanglement of fibers and an irreversible contraction in fabric dimensions.

Gabardine A warp-faced twill weave fabric, generally 2/1. A Z-direction twill with S twist warp and weft produces a prominently warp-faced twill. Often fabricated with a fine dense sett; used for rainwear [?!]

Glass transition temperature (aka second order transition temperature) Viscoelastic polymers, like fibers, have a temperature point called the glass transition temperature beyond which prior straining, annealing, hardening, and set are erased. Amorphous polymers move from a glass-like state to a rubbery one, when their T_g is reached. Wool has two glass transition states: the lower one is associated with the rearrangement of hydrogen bonds, the second T_g relates to the rearrangement of cystine bonds. These glass transition temperatures are lowered by an increase in moisture content. See Table III for the effect of moisture on Glass Transition Temperature of other Fibers.

Hygral Expansion A change in fabric dimension when moisture is absorbed or desorbed. Reversible. The level of hygral expansion depends upon the weave structure of the cloth and the prior history of the cloth. Hygral expansion is not easily reduced. Technically, hygral expansion is a percentage indicating the change in length measurement:

$$\text{HE (\%)} = \frac{\text{wet length} - \text{dry length}}{\text{dry length}} \times 100$$

Permanent Set A setting or particular configuration of a structure is made irreversible. It can only be superseded or overcome by additional treatments which may be temporary or semi-permanent.

Relaxation Shrinkage The contractive recovery of fibers strained (extended) during fabric manufacture and other operations. Fundamentally irreversible. Note: "A [wool] fabric does not have a unique or absolute value of relaxation shrinkage"(see Shaw).

Semi-permanent Set A level of set that resists the effects of ordinary use or exposure, but one which can be obliterated by deliberate, comparatively severe treatments. For wool materials, the term corresponds to temporary set.

Set The stabilization of a textile material in a certain form or shape.

Sett The number of warp (i.e. ends) per inch; British terminology.

Shrink-resist Processing Wool fabrics are susceptible to felting because of the directional frictional effect (DFE) of the wool scales, especially those on highly crimped fibers. Two types of treatments minimize this problem: either *oxidation* with cold, acidified sodium hypochlorite or with gaseous chlorine or *resin deposition* to coat and mask the surface scales.

Supercontraction A decrease in length of wool fiber due to a molecular reorganization (α-keratin is transformed into β-keratin); the new molecular arrangement is described as "more disorderly." The result of prolonged treatment in boiling water. A negative set. (See Anon. Wool Science Review, vol. 21 (1962):14-26.)

Temporary Set For wool fibers and fabric, the term temporary set refers to a semi-permanent set which is stable in water at 20°C. but is released at 100°C. For other fibers and fabrics, temporary set is reversed by slight changes in temperature, in humidity, or even by slight mechanical action. Note: Temporary set in non-wool fibers and fabrics corresponds to cohesive set in wool products.

Weave crimp The deflection from plane of the warp and weft yarns due to the character of the weave structure. Weave crimp can be expressed as a percentage: $\frac{(1-p)}{p} \times 100$

where p is the yarn length in the fabric and 1, the straightened length of yarn.

Woolen A type of wool processing in which that fibers are carded, formed into a uniform mat, before spinning. Woolen fabrics are often finished by milling, fulling, and other processes that raise a nap on the fabric surface that obscures the weave structure. In medieval and Renaissance Europe, a very expensive (labor intensive) type of fabric.

Worsted A type of wool processing in which the fibers are laid parallel–combed–before spinning. Worsted fabrics are characterized by the weave structure apparent on their surface. Tapestries, wool buntings, and gabardines are examples of worsted fabrics.

Wrinkle An unintended, accidental crease. (see Postle et al. for a full discussion about wrinkles on wool fabric).

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TCN

Textile Conservation Discussion List

An electronic discussion list, TexCons, has been developed to expedite communication among textile conservators within the textile community worldwide. The primary purpose of TexCons is to serve as a discussion forum to help colleagues with questions/answers on specific problems, treatment materials, techniques, methods, and other specific problems or queries relating to textile conservation. For example, some subjects appropriate to the TexCons discussion and exchange are:

1. Health and safety information, especially product hazards and sources for information on containing/handling hazards.
2. Suppliers/products, but not advertisements. Suppliers should post only if they are answering an inquiry about a particular product.
3. Literature citations that are of interest to textile conservators, particularly those in non-conservation journals.
4. Exhibition announcements with dates, museum hours, catalogues (with price and currencies, shipping/handling).
5. Courses, symposia, and seminar announcements. Pertinent information should include: dates, location, topics, sponsoring organization, address, telephone and FAX numbers, whom to contact.
6. Hotels (with room rates), travel bargains, and other travel services, preferably vetted by course/symposia /seminar announcers. Roommate searches to defray costs of attending such a conference or seminar.
7. Position and intern announcements, related to the Textile Conservation profession.
8. Other topics that affect communication among textile conservators and the textile conservation profession i.e. address and position changes, deaths, relocation, etc.
   Matters of a personal nature should not be distributed through this forum.

To SUBSCRIBE to the TexCons discussion list: send a message to: majordomo@simsc.si.edu : in the body of the message enter: subscribe TEXCONS your-real-name your-email-address

TexCons is an open un-moderated discussion list. The list co-owners are Mary W. Ballard in Washington, D.C.(mwb@cal.si.edu) and S. Gail Niinimaa in Calgary, Alberta (niinimaa@nucleus.com). This list was developed and is being provided with the thoughtful, competent technical support of David Bridge (David@simsc.si.edu) and Jason Young (YoungJ@simsc.si.edu) at the Museum Support Center of the Smithsonian Institution, Washington, D.C.

To READ the Archives of messages sent to the Textile Conservation discussion list: All messages posted to TexCons will be automatically archived at Conservation OnLine and made available for browsing and searching on the World-wide Web at:
http://palimpsest.stanford.edu/byform/mailing-lists/texcons/
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To SEND a message to the TexCons discussion list: address it to: TEXCONS@simsc.si.edu and your message will automatically be sent to all members of the list.

TCN

News from the ROM

In March 1996, Petra Kress, a student in textile conservation at the Fachhochschule Köln started a six month internship at the the Royal Ontario Museum (ROM), which was co-supervised by Esther Méthé in Conservation and Shannon Elliott in the Textile and Costume section. Among the tasks with which she was involved was an ongoing project related to a new method for accession tagging.

Denis Larouche's fabrication method was used to construct the mannequin.

The goal of the project was to find methods to make the accession number tags possessing the qualities of readability and permanence without stiffness or yellowing. Various typewriter ribbons on different materials (twill tape, Reemay and cotton fabrics) were tested and compared. The preferred material was black ink nylon ribbon on a tight weave cotton fabric. The method consists of typewriting a series of accession numbers on a sheet (about 15 x 20cm) of cotton fabric. The sheet is ironed and then boiled for one hour with a change of water after 45 minutes. After boiling the piece is ironed dry. Using this method it is not necessary to spray with Krylon fixative as the ink will not rub off, or run if wet. The fabric remains soft and easy to sew and there is no sharp edge which might endanger the artifact to be labelled.

One project of the preventative conservation component of Petra's internship was the storage upgrade of a portion of rolled storage.

From May to September 1996, Roxanne Shaughnessy completed an internship with Shannon Elliott. Funding from the Training Initiatives Program enabled Roxanne to receive training in preventative conservation and collections management while working on a project to upgrade both the storage and the accessibility of the Peruvian collection.

Since September 3, 1996, Anne Marie Guchardi has been participating in a co-supervised internship. Her time is shared between both the Textile Laboratory of the Conservation Department and the Textile and Costume section, NEAC. Throughout the year, Anne Marie has been involved with an ongoing project related to the improvement of storage facilities as well as working on the mounts for textiles to be displayed. The central project was the making and dressing of mannequins for the rotation of the costume display in the European Gallery which was installed in February 1997.

Denis Larouche's fabrication method was used to construct the mannequin. The initial tracing was modified slightly in order to adapt the model body proportions to the particular dress to be mounted. This method has the advantages of quickly providing an approximate silhouette, which can be easily modified as required. *(See TCN Spring Supplement, 1995. ed.)*

Thanks to a grant from the ROM Foundation and one from the Museum Assistance Program of the Canadian Heritage Department, spanning September to March, a special project involving the Textile Lab and the Textile and Costume Section was conducted. The goals of the project were to improve accessibility and increase the visibility of the Chinese Textile collection by upgrading the storage and documentation of the Chinese robes and conducting conservation treatment on two significant textiles: a 17th century dragon robe and a very large mid 18th century floor covering. Bonnie Halvorson was hired on a contract to implement the storage upgrade and conduct the conservation treatment.

In January 1997, Evelyn Bosch, a student at the University of Alberta textiles program began a four month internship, which is also co-supervised. Evelyn assisted with the implementation of the Chinese dragon robe storage upgrade project and has been busy working on preventative conservation projects in storage. In addition, she will assist with the preparation of objects for display in the Mughal Exhibit.

Since early March, Elke Mürau has been working in the textile laboratory. Also a student from the conservation program in Cologne, she is doing a 5 month internship at the ROM. Presently, her project entails the preparation of textiles for the Mughal Exhibition which is opening in the summer, 1997.

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TCN

An Innovative Approach for Mounting the Sixteenth Century Doublet and Trunk Hose Worn By Don Garzia de'Medici

By Janet Arnold *and* Mary Westerman Bulgarella

The editors of the Textile Conservation Newsletter are grateful to the Costume Society for permission to publish this article, which appeared in Costume, the Journal of the Costume Society, Number 30, 1996. Information about the Costume Society may be obtained from Ms. Pat Poppy, 56 Wareham Rd., Wychett Matravers, Poole, Dorset BH16 6DS, England

During the conservation of the sixteenth-century doublet and paned trunk-hose (Fig. 1) belonging to Don Garzia de'Medici,[1] eleventh child of Cosimo I and Eleonora di Toledo, a new and innovative method of supporting this conserved historic dress had to be devised. It was understood at the onset of the conservation project that what had survived of the three-dimensional shape had to be retained, as much as the textiles from which the suit was made. Even after the conservation of the textile parts was completed, the suit remained in a very precarious state and it required full support in order to prolong its future life. 'Dressing' the costume on any type of traditional mannequin or dress stand was unthinkable, so a careful study was carried out to construct a specific mount and this became an integral part of the conservation process.

FIG. 1. Crimson satin doublet and paned velvet trunk-hose with codpiece, still tied together, with satin lining revealed on the left side. The sleeves had come away from the doublet

Since the sleeves had already been detached from the doublet before it arrived at the Pitti Palace, and the doublet was separated from the trunk-hose during conservation, each of the four parts of the suit were individually supported before reuniting them as one complete outfit. This article describes the method and manner in which this was done.

As conservation proceeded, close collaboration with dress historian Janet Arnold was essential for her practical approach in taking an accurate pattern of the costume parts (Fig. 3). The trunk-hose once had an interlining of linen which served to keep the satin lining and the velvet panes rounded out. None of this interlining had survived but Janet Arnold conjectured its shape by drawing round the pattern of the velvet panes. Once this was done she made an exact copy of the costume in unbleached calico. Using this toile as a guide, a shape had to be made on to which it could be fitted precisely. Polyethylene sheeting (ethafoam)[2] was cut slightly smaller than the original sleeve and torso patterns with seam allowances. These were then hand and machine sewn into three-dimensional shapes. Ethafoam sheeting proved ideal for the mannequin for several reasons. Due to its light weight and flexible nature, it could be readily moulded into shape once it was sewn together. It was also resistant enough to withstand stitching and did not tear under tension. It was essential to use a material into which pins could be pressed easily, especially very fine entomological pins. The material is also chemically inert, a most important quality when choosing a suitable material for historic textile preservation.[3]

The inner structure of the mannequin was also made in sections.[4] For the hip

FIG. 2A. Detail of front of stand with mounted suit worn by Don Garzia de'Medici. Galleria del Costume, Palazzo Pitti, Florence

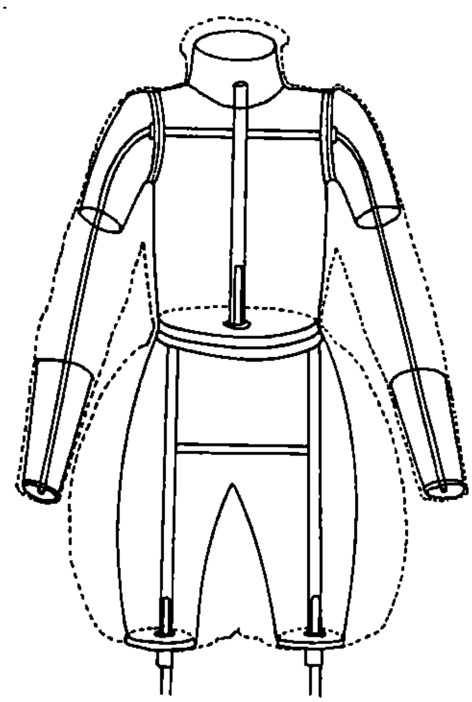


FIG. 2B. Diagram of the metal framework of the mannequin, inside the ethafoam form padded with dacron and leg portion a metal frame was made which terminated with wooden discs at the waist and at the bottom of the legs. A metal dowel was welded on to the waist disc which corresponds to the round tube inside the core of the torso's frame. The torso has a wooden disc at the waist identical to that of the lower portion. Each armhole has a disc which was cut to the exact shape of the shoulder area of the doublet. The ethafoam shapes were filled with dacron fibre fill and secured to the wooden disc with a staple gun. The armhole discs were fitted with thin magnetic sheets and holes which would receive the pegs and metal plates of the corresponding sleeve shoulder supports. A flexible aluminum rod was secured to the shoulder disc and connected at the wrist to a lightweight cardboard disc. An ethafoam shape was made to simulate the slight puff of the shoulder of each sleeve, and the same time cut away under the armpit to allow for the bulkiness of the fabric in this area. The lower arms also had ethafoam shapes made for supports but the middle sections of each sleeve were filled in with a soft nylon mesh fabric (mailine). Thus, once each portion of the doublet was secured on its support, they could be fitted together by simply aligning the wooden discs and pressing them together (Figs. 2A and 2B).

The fullness of the trunk-hose was supported by attaching gathered strips of soft netting fixed to the waist and the bottom of the legs which were then filled out with more net. Again, the crotch area was left unfilled in order to allow for the fullness of the fabric here. The satin lining was then gathered together and secured to the ethafoam support at the base, as were the velvet panes. The bottom of each leg was then finished with a thin strip of satin fabric in a colour similar to the original. The openings at the neck and wrists were filled in with pieces of felt in a suitable shade of brown.[5]

The conserved costume was now totally supported and secure on its own mannequin and the entire figure could be moved into a display case by simply lifting it up from its base structure. Thus the costume can be safely transported and displayed (Figs. 2 and 4).

M. W. B.

In October 1991 a calico toile of Don Garzia's trunk-hose was made to help in discovering the shape of the linen interlining, which had completely disintegrated, and the shape of the satin lining beneath the legs, where the original had rotted away.[6] The shape of the linen interlining was conjectured by placing the pattern shapes of the paned velvet trunk-hose closely together and drawing round them. The interlining of the right leg of the toile was made slightly shorter than the left leg (Fig. 5) to pull the trunk-hose up and provide a choice for the fullness of the panes. After discussion with Kirsten Aschengreen Piacenti and Mary Westerman Bulgarella, the longer interlining was selected, as being closer to the trunk-hose seen in contemporary Italian paintings.

The pattern of this calico toile was invaluable as a guide to shaping the mannequin to its final size. The mannequin had to be fractional smaller than the suit, to support the fragile silk so that it would not be subject to too much pressure.

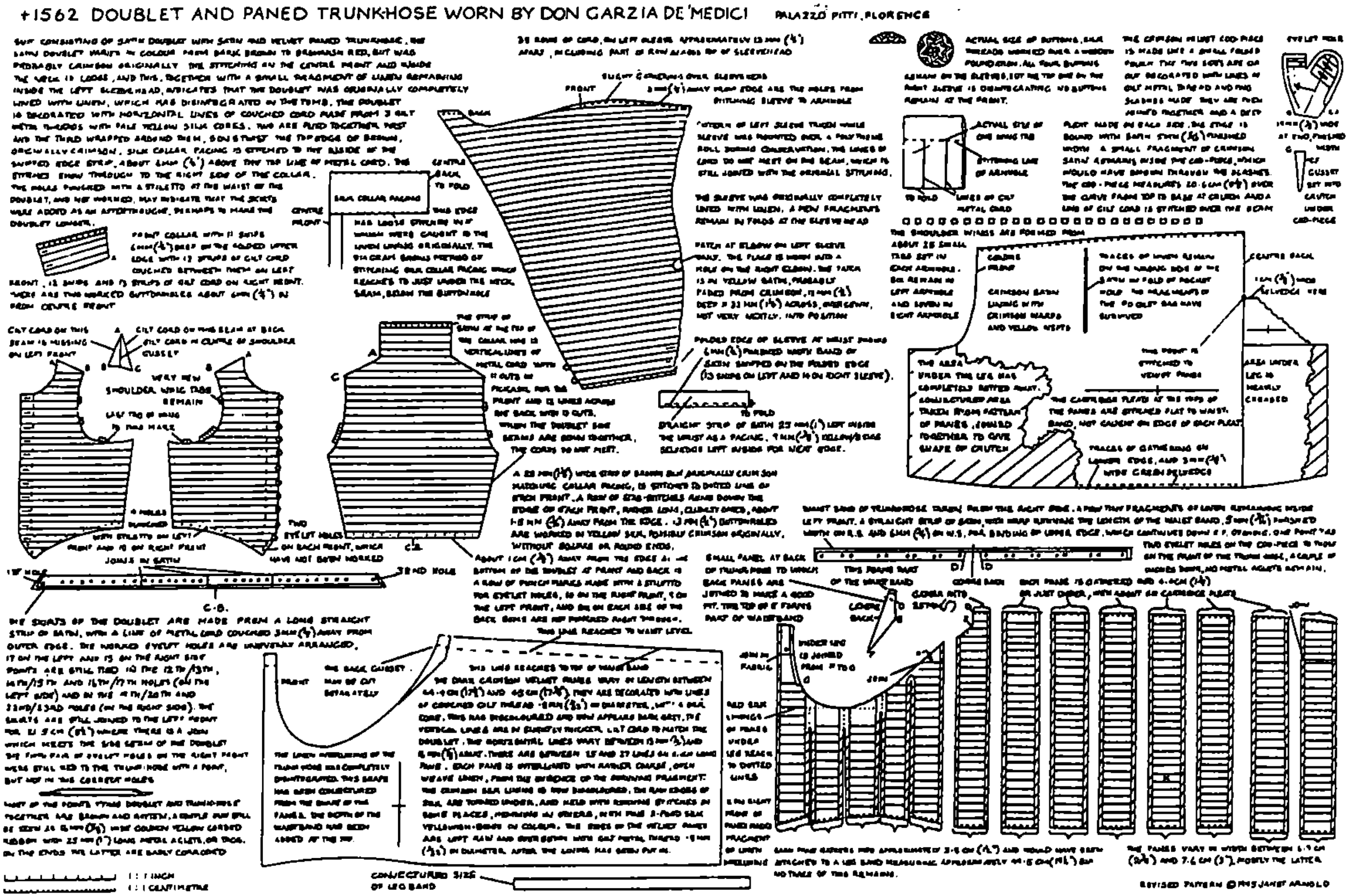
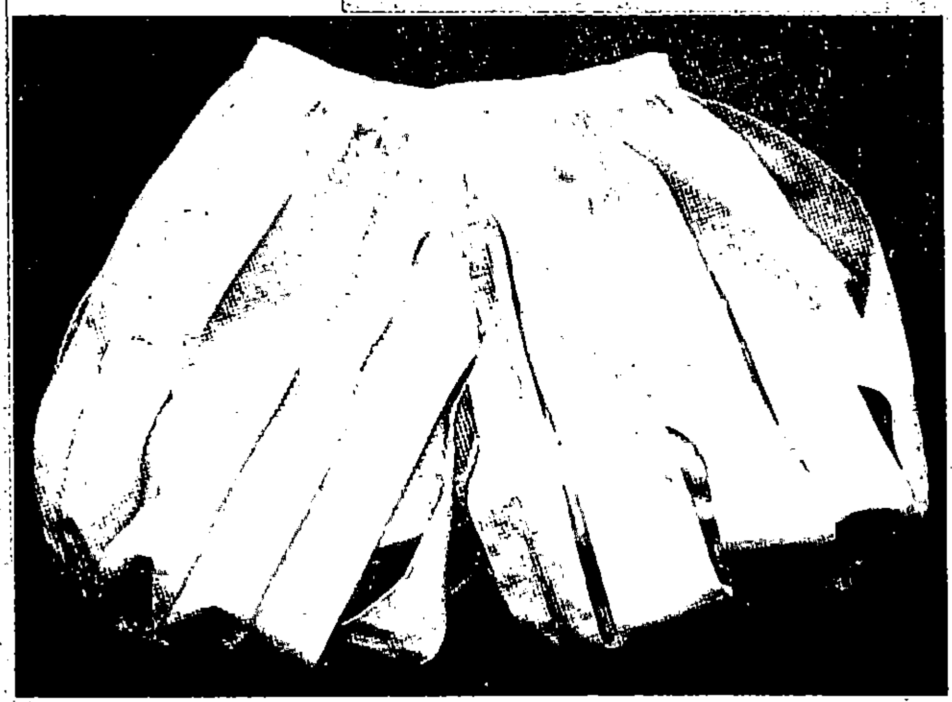


FIG. 3. Pattern diagram of doublet and trunk-hose worn by Don Garzia de'Medici, 1562

FIG. 4 (*left*). Back of stand with mounted suit worn by Don Garzia de'Medici. Galleria del Costume, Palazzo Pitti, Florence

FIG. 5 (*below*). Calico toile of trunk-hose, showing back gusset below the waist, made with different lengths of lining for each leg. The longest side, as shown for the left leg, was chosen



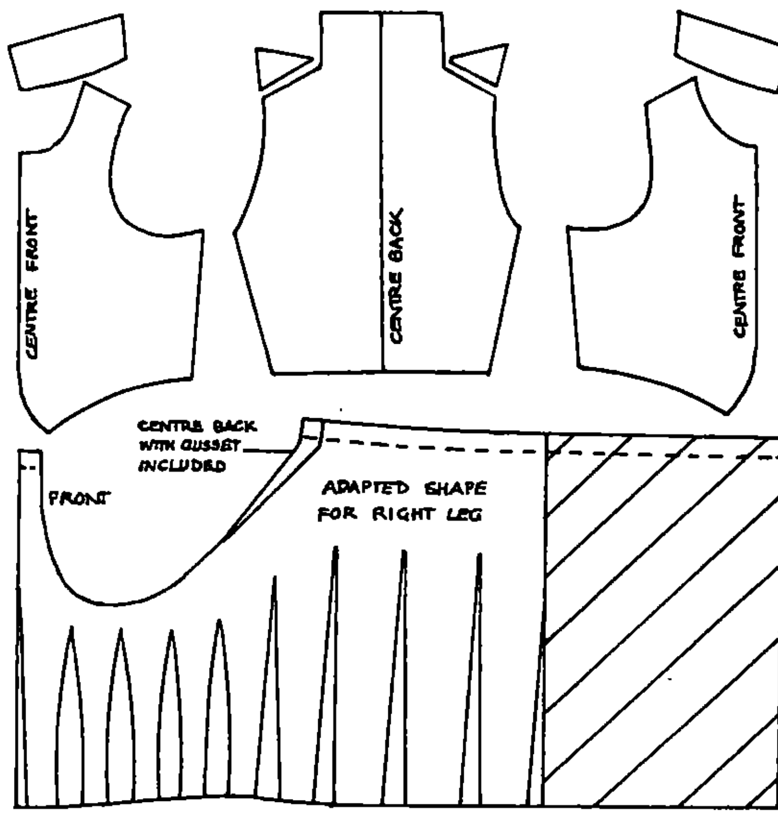


FIG. 6. Pattern for the ethafoam legs and torso adapted from the pattern diagram of doublet and trunk-hose worn by Don Garzia de'Medici

The legs were the most difficult part to make and to fit, when creating a three-dimensional figure from ethafoam sheeting. I decided to start with them, and if they had proved to be unsuccessful, no time would have been wasted attempting to shape the torso. It was decided that the legs should end exactly at the bottom of the trunk-hose.

The shape of the flat pattern for the legs was adapted from a pattern diagram taken from the velvet areas of Don Garzia's trunk-hose (Fig. 3). The width of the full-size paper pattern was reduced to match the measurement of the waistband. Long darts were pinned to shape the legs, and then four curving darts were added under the crotch to give a curved inside leg (Figs. 6 and 7). This was to prevent the panes of Don Garzia's fragile silk and velvet trunk-hose from being pressed too closely together between the legs.

The joins and darts were laid flat, one side overlapping the other so that there were no bulky seams, and stitched together by machine on the fitting lines. The excess ethafoam was trimmed away afterwards. The legs were padded tightly with dacron fibre fill and the calico trunk-hose were eased on (Fig. 8). The result was sufficiently encouraging to continue cutting out the torso in ethafoam sheeting. The pattern of Don Garzia's doublet was used, making the mannequin slightly smaller by machine stitching inside the fitting lines. The torso was again padded with dacron fibre fill. A calico toile of the doublet was tried on for size, and to make sure that the neck was adjusted to the correct angle.

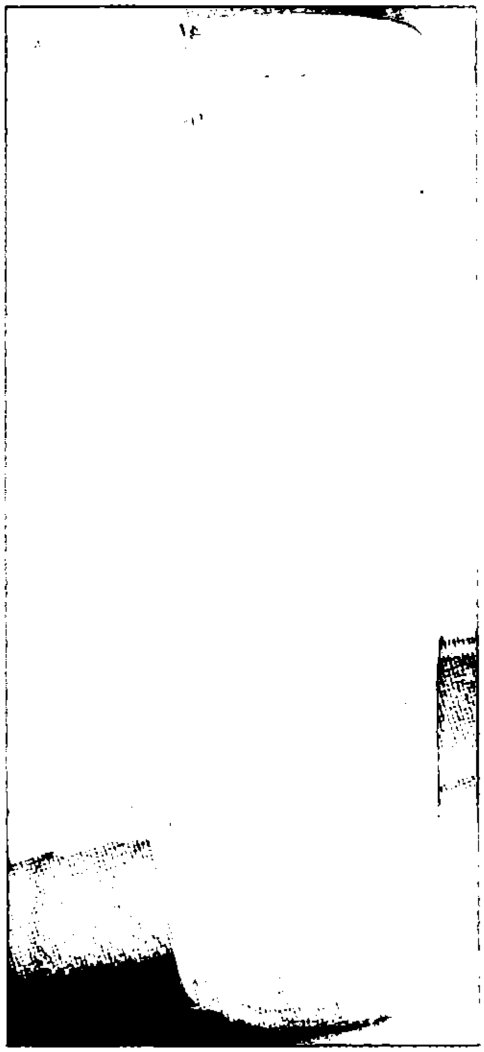


FIG. 7. Right leg formed from ethafoam sheeting, darted to shape

FIG. 8. Calico toile of doublet and trunk-hose mounted on the ethafoam form padded with dacron

An attempt to make arms out of ethafoam was made by cutting the sheeting the same shape as the sleeve pattern. However, this proved unsatisfactory, as they were insufficiently pliable at the elbow. The sleeves were thus supported in the way described above by Mary Bulgarella, using the ethafoam sheeting in segments and running a flexible aluminum rod to join the shoulder and wrist areas.

The padded ethafoam torso and legs were pinned together at the waist, with the calico doublet and trunk-hose fitted on top, to make sure that the waist size was correct. When this had been adjusted, stiff card ovals were cut to suit the waist shape of both torso and the ends of the legs. These later provided the templates for cutting the ovals in wood for a firm support. Excess ethafoam was pared away and the calico toile mounted again, with the trunk-hose attached to the doublet. At this point the figure would stand independently (Fig. 8).

J. A.

Acknowledgment

The Society is deeply grateful to an anonymous benefactor for a most generous donation towards the cost of printing this article.

REFERENCES

[1] This costume is one of a set of Medici clothes exhumed in 1949, property of the Soprintendenza per I Beni Artistici e Storici, Florence, Italy. They were conserved between 1983 and 1993 by Mary Westerman Bulgarella in the Conservation Laboratory of the Galleria del Costume at the Palazzo Pitti under the direction of Dr. Kirsten Aschengreen Piacenti. A full account of the conservation of the clothes in which Don Garzia, Eleonora di Toledo and Cosimo I de'Medici were buried is given in the catalogue *Moda alla Corte dei Medici: gli abiti retaurati di Cosimo, Eleonora e don Garzia* (Centro Di Florence, Italy, 1993). These costumes are on display at the Galleria del Costume at the Palazzo Pitti, Florence.

[2] Ethafoam 220 (3.2 mm[1/8 in.] thickness), The Dow Chemical Company Packaging and Industrial Foams, supplied by Foamcraft Incorporated, Chicago, Illinois.

[3] For further characteristics and information on the use of ethafoam for museum mounts and supports see: Carl Schlichting, 'Working with Polyethylene Foam and Fluted Plastic Sheet', *Technical Bulletin 14* (Canadian Conservation Institute), Ottawa, Canada, 1994); Denis Larouche, 'Intersecting Silhouette Mannequins', *Textile Conservation Newsletter*, Spring Supplement (1995).

[4] The metal and wooden parts were constructed with the help of Stefano Ruggeri for STF (Scenografia Teatrale Fiorentina), Florence, Italy.

[5] A colour photograph is printed in *Moda alla Corte dei Medici*, op. cit. on p. 61.

[6] I am grateful to Dr. Kirsten Aschengreen Piacenti and Dr. Mary Westerman Bulgarella for the opportunity in 1991 of taking a revised pattern with far more information than envisaged when the first pattern diagram was printed in *Patterns of Fashion c 1560-1620* (1985). I was also able to carry out further checking in 1992, during conservation, for the revised pattern diagram given here.

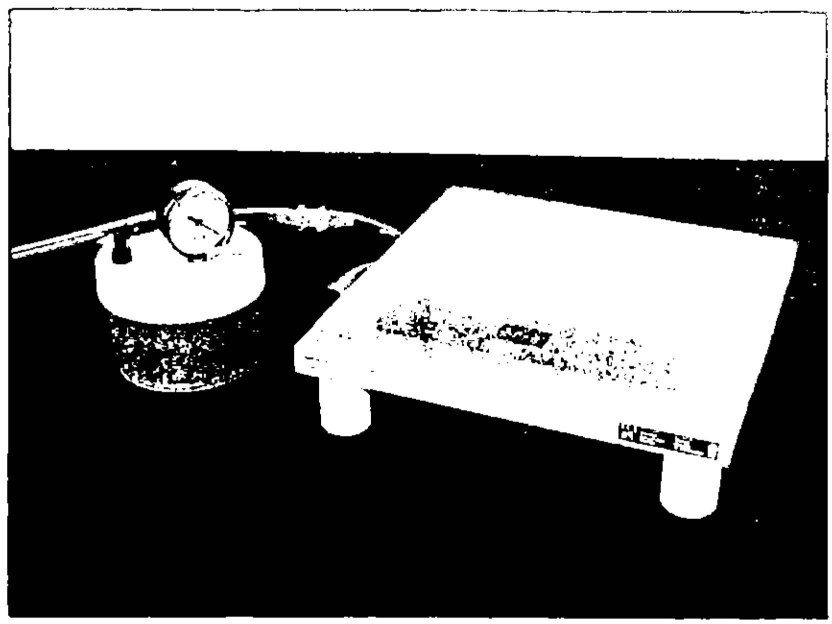
Illustrations

Figure 2B diagram by Mary Westerman Bulgarella, Figure 2B photograph by Marcello Bertoni. All other diagrams and photographs by Janet Arnold.

TCN

Mini-Suction Table

The mini-suction table, which was developed by the Canadian Conservation Institute, is used primarily by conservators for the removal of pressure-sensitive tapes and stains from a variety of paper artifacts. The table is constructed of 2 cm thick ultra-high molecular weight polyethylene (UHMWPE), approx. 30 cm x 30 cm. A stainless steel mesh and waffle material is set into the table surface for tape and stain removal. As solvents are flushed through the suction table mesh, they are drawn through a vacuum pump housed in a sound-absorbing box, then exhausted back into a fume hood. A solvent trap and pressure gauge are attached to the exhaust tubing to catch any excess solvent and to measure the air pressure on the table surface. Small extension tables (not shown) can be placed around the mini-suction table to increase the surface area and support larger paper artifacts during treatment.



The Canadian Conservation Institute has licensed a local company, C.C.R.S. (Canadian Conservation and Restoration Services) to manufacture and distribute this mini-suction table. For information on this product and a complete range of options, please contact

C.C.R.S.

Canadian Conservation & Restoration Services

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Canada K0A 2M0
Telephone: (613) 443-1178
(Ottawa area) 1-800-281-5932
Internet: au328@freenet.carleton.ca

STAIN REMOVAL FOR TEXTILE CONSERVATORS: THEORY and PRACTICE #C9710

This course is designed for conservators with a particular interest in removal of accidental soiling and staining of porous materials, principally fabrics. A review of the chemistry, history and selection of surfactants, solvent systems, and reagents will be followed by a discussion of the most common adventitious stains. Toxicity, MSDS sheets, and the advantages/disadvantages of proprietary mixtures will be discussed. Topics of particular interest are: the interrelationship of fibre type to detergent systems and stain adsorption, the chemistry of colorants (dyes, pigments, food and fungal colorants) and the chemistry of their removal; and the limitation of cleaning systems as a function of the condition or previous history of the object. Lectures in the morning will be followed by practical laboratory sessions in the afternoon. Dr. Heasoon Rhee will join CAL staff in teaching and working with the participants. Unaccessioned, personal stained items of apparel may be brought to the course *with prior approval*, although samples will be provided.

Who should attend: Textile and other conservators who deal with treatment of museum specimens or graffiti on porous surfaces.
Dates: July 23-25, 1997 (Wednesday - Friday).
Registration Fee: $250.00 (US)
Registration Deadline: **May 1, 1997** or as filled.
Number of Participants: Ten (10)
Location: Conservation Analytical Laboratory, Museum Support Center
For further information: Mary Ballad, Senior Textiles Conservator (301-238-3700 x145) or Francine Lewis, Program Training Assistant (301-238-3700 x102).

Please send course application and fee to Francine Lewis, Program Training Assistant, CAL/MSC MRC 534, Smithsonian Institution, Washington, D.C. 20560. Check should be made payable to the Smithsonian Institution.

CAC Annual Conference and Workshop

Ottawa, Ontario
May 30 - June 3, 1997

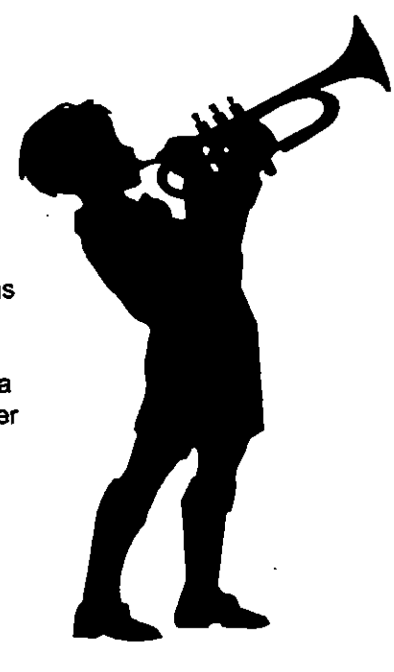
The Ottawa '97 Organizing Team has been hard at work during the last few months laying the groundwork for the annual conference and workshop.

Conference

We have reserved facilities at the Canadian Museum of Nature for the conference on May 30th, 31st and June 1st. The 4th floor of the west wing of the Victoria Memorial Building provides a large lecture hall and an adjacent hall for the posters, trade fair and coffee. The building is well situated for lunch at a restaurant on trendy Elgin Street or a picnic in the small park next door.

Greg Hill reports an excellent response to our call for papers and posters. It will be a challenge to fit in all of the interesting abstracts which have been submitted. The (very) preliminary schedule shows the first day, May 30th, featuring the Per Guldbeck Lecture as the keynote presentation, followed by a session of papers and an afternoon devoted to tours of new conservation facilities. May 31st will have papers in the morning and the AGM in the afternoon. June 1st will be a full day of presentations.

Other events will include registration and a reception on the evening of May 29th at the Museum of Nature, a reception at the National Archives of Canada Gatineau Preservation Center after the tours on the 30th, and the banquet on Saturday night, May 31st. We are particularly excited about holding the banquet in the splendid new Casino de Hull! The food is reported to be excellent, the decor is exotic and the entertainment is free (if you're lucky).



Workshop

This year the CAC is teaming up with the Association of Canadian Archivists (ACA) to present a workshop on The Preservation of Digital Media. This is a unique opportunity to explore the issues and concerns presented by the flood of digital media records and objects into the holdings of archives, libraries and museums. Brian Thurgood has put together a comprehensive program with presentations by Dr. Franziska Frey and Peter Edelstein of the Image Permanence Institute, Jim Lidner of Vidipax Inc., Stefan Michalski and Joe Iraci of CCI, Brian Lesser of Ryerson Polytechnical Institute, and Jacques Grimard of the National Archives. The ACA will soon confirm the content of sessions directed to their membership. We hope to present a plenary session in the mornings for all delegates, then concurrent topical sessions in the afternoons specific to the interests of conservators or archivists.

Registration

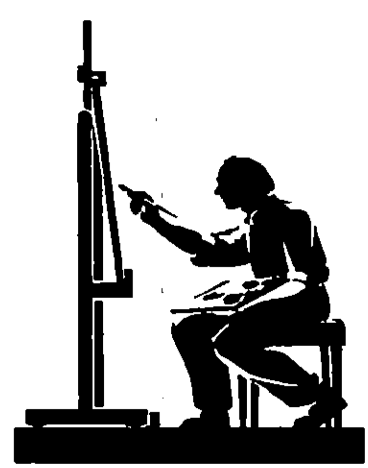
Registration packages will be sent out to CAC members in late February.

www.archives.ca/cac/index.htm

The CAC hits the Internet! Above is the address of the official CAC Ottawa '97 web site! Webmaster Brian Thurgood will keep all current information related to the conference and workshop posted. Have a look around for lots of interesting information and links to useful sites.

We welcome your comments and suggestions.

John Grace
Chairperson, Conference '97 Organizing Team
tel.: 613-995-4704
fax: 613-995-0179
jgrace@archives.ca



SFT JUBILEE CONFERENCE SILK

SFT, the Swedish Association for Textile Conservation is celebrating its 30th anniversary in 1997.

You are invited to participate at the SFT jubilee conference

SILK "different aspects".

The conference is being held in Stockholm, Sweden, September 1-4, 1997.
For more information please contact

Annika Castwall af Trolle,
Army Museum,
Box 140 95, 140 94
Stockholm, Sweden,
tel. + 46. 8. 7889572.
Fax + 46. 8. 6626831.

Textile Symposium 97

TEXTILE SYMPOSIUM 97, Fabric of an Exhibition: An Interdisciplinary Approach, will be hosted by the Canadian Conservation Institute, Department of Canadian Heritage, in Ottawa, Canada, September 22-25, 1997. This four day symposium will bring together curators, designers and other museum professionals to discuss issues related to the successful exhibition of textiles.

Three days will be devoted to the formal presentation of papers in the auditorium of the National Gallery of Canada, with simultaneous translation in English or French. The poster sessions will be held in the lobby adjacent to the auditorium. (The National Gallery of Canada is centrally located on Sussex Drive, only minutes away from restaurants and shopping in the Byward Market.) On the last day of the symposium, there will be demonstrations of practical and innovative techniques, equipment and materials used for the conservation and exhibition of textiles, as well as tours of the collections holdings and conservation facilities at the Canadian Museum of Civilization, the treatment and research facilities at the Canadian Conservation Institute, and Laurier House, an historic site operated by Parks Canada. The symposium banquet will be held in the Great Hall of the National Gallery of Canada: an octagonal glass structure with a commanding view of the Ottawa River and the Parliament Buildings.

Preprints of the papers will be included in the symposium package. The papers will be published in the language in which they were to be presented, accompanied by abstracts in both English and French. Abstracts of the posters and demonstrations will also be published in the preprints.

Accommodations are plentiful in the central core of Ottawa-Hull and range from the magnificent Chateau Laurier Hotel to local B&Bs. Block bookings at special conference rates have been arranged at the Chateau Laurier (C$150.00 per room, single or double occupancy) and the Market Square Inn (C$88.00 per room, single or double occupancy). A list of other accommodations, with prices, will be available in the registration package. Participants will be expected to make their own reservations.

Register early for Symposium 97 and pay just US$225.00 or C$275.00 (early bird fee available up to June 30, 1997). Registration fees after June 30 are US$250.00 or C$300.00. Registration at the conference will be US$275.00 or C$325.00. Full time students who register before September 15, 1997, will pay a reduced fee of US$150.00 or C$175.00: all students must supply appropriate identification. There will be no one-day registrations.

The registration package will be available in March 1997. If you are interested in receiving this package, please contact Tara Grant, Registration Coordinator, Symposium 97, at the address below or by E-mail: tara_grant@pch.gc.ca
For enquiries in French please contact Christine Bradley at the address below or by E-mail: christine_bradley@pch.gc.ca

Information concerning the symposium is available from the CCI Web site at: http://www.pch.gc.ca/cci-icc

ANTHRAQUINONE UPDATE

The National Toxicology Program has been studying natural and synthetic anthraquinone dyes and intermediates in an attempt to determine if whole classes of anthraquinones can cause cancer.[1] Four anthraquinones studied previously and found to be carcinogenic are: 1-amino-2, 4-dibromoanthraquinone (CAS No. 81-49-2)[2] , 2-amino-anthraquinone (CAS 117-79-3)[3] and 1-amino-2-methylanthraquinone (CAS 82-28-0)[4], and 1,4,5,8-tetraaminoanthraquinone (CAS 2475-45-8)[5] which is better known as Disperse Blue 1.

Disperse Blue 1 also was one of about 120 dyes banned by the German Government for use in products which are intended for "longer than temporary contact with the human body" such as textiles, bed linens, and eyeglass frames.[6] Other European countries are expected to pass similar laws regarding this an other dyes in the future.[7]

Now a new study on an hydroxy anthraquinone (no amine group) is complete. The dye, 1,8-dihydroxyanthraquinone (CAS 117-10-2), has been proposed for listing in the ninth report as "reasonably anticipated to be a human carcinogen".[8] The data is scheduled to be reviewed again this month before it is included in the report.

Art painters should be aware of this study, because the common pigment called alizarin (1,2-dihydroxyanthraquinone) is almost identical to 1,8-dihydroxyanthraquinone except for one -OH group which is in a different position. Craft dyers also should take note because alizarin is also the dye in madder root or cheroot used by many "natural" dyers. All dyers need to know that anthraquinones are found in every class of dyes they use. They even are used in household products such as Rit and Tintex.

To date, five anthraquinones have been studied and found to be carcinogens. **ACTS wonders what more is needed to convince the art materials industry and suppliers of craft and household dyes like Dharma, Rit and Tintex to stop labelling the untested anthraquinones "non-toxic".** ACTS has prepared a two page data sheet on Änthraquinone Dyes and Pigments" for which a limited number of free copies are available. Call or write for a copy.

1. Bureau of Nat'l Affairs-Occup. Safety and Health Reporter (BNA OSHR), 24(5), June 29, 1994, p. 268.
2. Ibid.
3. Seventh Annual Report on Carcinogens, Summary, 1994. Nat'l Toxicology Program. US DHHS, pp 87-89.
4. Ibid.
5. Federal Register, Vol. 56, No. 151, Tuesday, August 6, 1991, pp 37366-37367.
6. ACTS FACTS May 1996.
7. Consumer Information, Verband der Druckfarbenindustrie, Sept. 1995.
8. BNA-OSHR, 25(49), may 15, 1996, P. 1706-7.

(October 1996)

Laxative Ingredients Demoted

FDA Consumer, October 1996, p. 6-7.

After animal studies indicated a possible link between cancer and two ingredients in over-the-counter laxatives, FDA discussed the problem with the manufacturers and found that safety data on these two ingredients and three similar ones are inadequate.

In a letter dated May 21, 1996, FDA informed the firms it plans to reclassify the five ingredients--phenolphthalein, bisacodyl, senna, aloe, and cascara sagrada--from category I (safe and effective) to category III (more data needed). Studies by the national Toxicology Program (NTP) provided new evidence that phenolphthalein (chemically related to bisacodyl) may cause cancer in rodents and that senna (chemically related to aloe and cascara sagrada) may cause gene or chromosome irregularities. There are no cancer studies of these chemicals in humans.

To determine whether the new evidence may translate into a risk for humans, FDA's Carcinogenicity Assessment Committee met twice with manufacturers and NTP representatives. Finding available safety information to be inadequate for a clear assessment, the agency has requested the additional data from manufacturers.

Products containing the five ingredients may continue to be marketed until FDA publishes final regulations. Psyllium, castor oil, docusate sodium, and 20 other ingredients are still considered safe and effective components of laxative products.

EDITOR'S COMMENT: I thought this story was art related only because phenolphthalein is a dye. Now I find that studies of these five related laxatives may shed light on the cancer-causing potential of the whole class of anthraquinone dyes. Part of phenolphthalein's structure is similar to anthraquinone, cascara contains an hydroxymethylanthraquinone, and aloe is an anthraquinone glycoside that when used as a laxative dyes the urine red.

It is also interesting that another "natural" substance, this one from the highly touted aloe plant may have long-term hazards.

Some Benzidine Dyes Regulated

(November 1996)

61 FR 52287-52296, Oct. 7, 1996

Benzidine, its hydrochloride, and 22 benzidine dyes now are regulated under a "significant new use rule" (SNUR) requiring persons to notify EPA at least 90 days before manufacturing, importing, or processing them. EPA has listed these 24 benzidine-based compounds and intends to propose another SNUR in the near future listing a few more. There are over 100 other benzidine compounds, but these are already regulated under the Toxic Substances Control Act. Anyone intending to make or import these compounds is required to file premanufacture notification.

The SNUR lists dyes that probably are no longer manufactured in the US The SNUR's primary purpose is to keep imported benzidine dues out of the country. But as one of the commenters complained in the rules preamble: *The SNUR will give an unfair advantage to foreign producers of benzidine-based chemical substitutes, and to those who import textile dyes with such chemicals into the US.*

EPA responded that: *...EPA does not presently have a sufficient basis to support a regulatory action related to the import of articles manufactured with benzidine-based chemical substances....*

But as readers of *ACTS FACTS* (May, 1996) know, the German government found "sufficient basis to support regulatory action" and already banned about 120 dyes for dyeing of textiles used next to the skin including 21 of the 22 benzidine dyes in this SNUR! Also banned are dyes that metabolise to other benzidine compounds and to other carcinogens such as o-toluidine.

Another flaw is that the SNUR only lists straight benzidine congener dyes based on o-toluidine and dianisidine. NIOSH concluded that all these dyes should be considered potential human carcinogens based on the evaluation of cancer studies and metabolism of these dyes to release free benzidine and related compounds.

Benzidine dyes were readily available in the 1980's. Many schools, costume shops and studios still have old stocks which should be discarded. ACTS will be watching to see if the rule will expand to include benzidine-based art pigments such as some pyrazolones, arylides, toluidines, etc.

CAS#	C.I. NAME	C.I. #
92-87-5	Benzidine	N/A
531-85-1	Benzidine.2HCl	N/A
573-58-0	Direct Red 28	22120
1937-37-7	Direct Black 38	30235
2302-97-8	Direct Red 44	22500
2429-73-4	Direct Blue 2	22590
2429-79-0	Direct Orange 8	22130
2429-81-4	Direct Brown 31	35660
2429-82-5	Direct Brown 2	22311
2429-83-6	Direct Black4	30245
2429-84-7	Direct Red 1	22310
2586-58-5	Direct Brown 1:2	30110
2602-46-2	Direct Blue 6	22610
2893-80-3	Direct Brown 6	30140
3530-19-6	Direct Red 37	22240
3567-65-5	Acid Red 85	22245
3626-28-6	Direct Green 1	30280
3811-71-0	Direct Brown 1	30045
4335-09-5	Direct Green 6	30295
6358-80-1	Acid Black 94	30336
6360-29-8	Direct Brown 27	31725
6360-54-9	Direct Brown 154	30120
8014-91-3	Direct Brown 74	36300
16071-86-6	Direct Brown 95	30145

REGULATED BENZIDINE COMPOUNDS

Clairol Asks NTP Not to list Cancer Causing Dye

BNA-OSHR, 26(26), Nov. 17, 1996, PP. 864-865

On November 18, Clairol, of Stamford, Conn., asked the NTP Biennial reports on Carcinogens Subcommittee not to include Disperse Blue 1 in its list of anticipated human carcinogens in the *Eighth Biennial Report on Carcinogens*. The panel declined.

C.I. Disperse Blue 1 (CAS 2475-45-8, C.I. 64500, 1,4,5,8-tetraaminoanthraquinone) was reviewed by the peer review panel and recommended for listing in the NTP's report. The dye is an aminoanthraquinone dye for fabrics, plastics, and hair colour formulations. NTP said the dye no longer is made in the States, but cites 1996 data indicating there are three US suppliers.

Disperse Blue 1 was also one of the dyes the German Government banned for use in products intended for "longer than temporary contact with the human body" such as textiles, bed linens, and eyeglass frames. (Ed: And in the US, we put it on our hair? Maybe being a little old blue-haired lady is riskier than I thought.)

(January 1997)

The four preceding articles were reprinted from:

ACTS FACTS, Monona Rossol, Editor
181 Thompson St., #23
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All submissions should be typed or, preferably, forwarded on an IBM compatible 3.5" disc in Wordperfect, Microsoft Word or ASCII formats. The disc will be returned. Inquiries, submissions and address changes should be sent to:

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<u>Mannequins for the Royal Ontario Museum Gallery</u> *Alexandra Palmer, Textile Department, Royal Ontario Museum, 1987*	Spring 1988
<u>Warning! Dichlorovos Resin Strip Fumigation</u> *Sharon Hammick, Conservation Department, Royal British Museum, 1989*	Spring 1989
<u>Recent Trends in Costume and Textile Storage</u> *Jaquelin Beaudoin-Ross, McCord Museum of Canadian History, and Eva Burnham, Canadian Conservation Institute, 1990*	Spring 1990
<u>The Effects of Substrate Variation on Colorimetry Readings</u> *Leslie K. Redman, Canadian Museum of Civilization, 1990*	Spring 1991
<u>Characterization and Preservation of Weighted Silk</u> *Merrill Horswell et al, Department of Environment, Textile and Design, University of Wisconsin, 1992*	Spring 1992
<u>Conservation of an Egyptian Mummy Shroud</u> *Isabella Kravski and Diane McKay, Royal Ontario Museum, 1992*	Spring 1993
<u>Have Suitcase, Will Travel: Techniques for Packing Costume</u> *Irene F. Karsten, McCord Museum of Canadian History, 1994*	Spring 1994
<u>Intersecting Silhouette Mannequins</u> *Denis Larouche, Canadian Museum of Civilization, 1995*	Spring 1995
<u>Humidification of Glazed Cotton Fabrics</u> *Bonnie Halverson, 1996*	Spring 1996

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