

A Survey of
**American
Tapestry
Conservation
Techniques**

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PREFACE

This report is for all tapestry conservators who have wondered whether the answers to their questions are buried somewhere on the shelves of a library and whether other conservators are at that very moment facing the same challenges. My hope is that the survey helps you better understand what techniques our colleagues in the United States are using and, to some degree, to whom we can attribute some of the major technical developments that have occurred here over the past fifty years.

I conducted this research project during my tenure as an Andrew R. Mellon Foundation Fellow at the Textile Conservation Center, American Textile History Museum, from January 1998 to August 1999. In addition to all the conservators who took part in the survey, many people need to be thanked for their help during the research and preparation of this project. They include: Deirdre Windsor, Director/Chief Conservator, Textile Conservation Center, American Textile History Museum, Lowell, MA; Tess Fretette, Assistant Conservator, Textile Conservation Center, American Textile History Museum; Clare Sheridan, Librarian, American Textile History Museum; Anne Cadrette, Assistant Librarian, American Textile History Museum; Cristin Lind, Office Manager, Textile Conservation Center, American Textile History Museum; Dr. Judith H. Hofenk de Graaff, Coordinator, Conservation Science Research and Consultancy, Netherlands Institute for Cultural Heritage, Amsterdam, Netherlands; Foekje Boersma, Textile Conservator, Haarlem, Netherlands; Robert Allen, Textile Conservator, Historic Royal Palaces, Hampton Court Palace, Surrey, England; Marlene Eidelheit, Director, Textile Conservation Laboratory, Cathedral of St. John the Divine, New York, NY; Julia Burke, Head of Textile Conservation, National Gallery of Art, Washington, DC; Margaret Fikioris, Conservation Consultant, Kennett Square, PA; Gwen Spicer, Textile Conservator, Delmar, NY; and Christa C. Mayer-Thurman, Curator of Textiles and Textile Conservator, The Art Institute of Chicago, Chicago, IL.

INTRODUCTION

The Research Project

My research as a Mellon Fellow dealt with the development and evolution of tapestry-conservation techniques in the United States. It came at the very end of the 1990s, at a time when many regional conservation centers and tapestry conservation programs had been in practice for twenty to twenty-five years and had found themselves analyzing their techniques and material choices. The history of tapestry restoration and conservation in Europe has been thoroughly documented (Hefford 1979, Finch 1995, Fiette 1997) but little has been written about the evolution of tapestry conservation methods in the United States. Although the principles of tapestry restoration no doubt originated in the European tapestry weaving ateliers themselves, significant differences can be found today between conservation and restoration methods developed in France, Belgium, Italy, England, and America.

The terms “restoration” and “conservation” are synonymous in many parts of the world. In the United States, conservation is generally distinguished from restoration by the assumption that stabilization of the artifact is of foremost concern and that to make it look new again is optional or, in extreme cases, unethical. Many tapestry conservators employ restoration procedures as part of a conservation treatment, such as removing discolored repair yarn around a nail hole and warping and replacing the weft in the same density as the surrounding area. Conservation is essentially a twentieth-century term, however, and “restoration” as used in older sources does not imply that the repair was always intended to imitate the original. In this report, I use “restoration” and “conservation” as they appeared in their original written source, and no assumption should be made about their practices based solely on syntax.

I performed an exhaustive search of the professional literature related to tapestry conservation in Europe and America, gathering and analyzing more than 100 articles. The bibliography contains many of the works written on the subject of tapestry conservation in the last twenty-five years.¹ For the purpose of this project, I defined “tapestry” as any weft-faced, plain-weave textile with discontinuous wefts that was originally intended as a decorative hanging. Tapestries of any age, size, or provenance were included. Tapestry-woven upholstery, garments, accessories, archaeological fragments, and carpets that are displayed on the floor were excluded.

The Early History of Tapestry Conservation

From the moment a tapestry is created it begins to deteriorate. Because every tapestry represents an enormous outpouring of money, time, and skill, it is reasonable to assume that care of tapestries is as old as tapestry weaving. Cleaning and mending go only so far in stabilizing a worn tapestry, so auxiliary support materials have often been employed. All too frequently one tapestry was cut up to patch another. Straps of fabric, sometimes sewn in a checkerboard or lattice pattern across the back, or complete fabric linings, were common ways to add resistance to gravitational pull (Adelson 1994).

In 1912 H. C. Marillier authored *The Preservation and Care of Tapestry*, which was privately printed for Morris and Company, Ltd., tapestry weavers, of London. In this publication Marillier complained that in France one could easily find female tapestry repairers, or *tisseuses*, but that they had no counterpart in England. Instead, it was traditionally seamstresses who handled the job of restoration, frequently cutting tapestries up or stitching to patches “as if they were mending stockings.” Encountering this kind of repair left no choice, in Marillier’s mind, but to remove the old repairs and reweave the tapestry “until the whole surface is once more strong and complete; and the test of good work is that when finished it is

¹ For a more comprehensive listing of English-language articles please refer to my annotated bibliography in the Supplement of the Spring 2000 Textile Conservation Newsletter, number 38.

hard even for an expert to find where the repairs exist.” But a good worker would not destroy original material if there were a way to save it, Marillier conceded, in which case a method called *piquage*, which closely resembles the modern method of darning, or tabby mending, would be employed (Marillier 1912, 7, 10).

The distinction between restoration (the repair of damaged areas so they appear nearly new again) and conservation (or the preservation by stabilization and auxiliary support, which is easily identified by a trained eye) appears, therefore, to have been a familiar one as far back as the early twentieth century. In 1937 a publication by John Böttiger appeared. For fifty years Böttiger was chief conservator of the *Garde-Meuble Royal*, working with the state collections of the Royal Castles of Sweden. One of the premier conservators of his time, he documented the state in which he found the Swedish Royal collection, the methods that had been used in the past to restore and clean the tapestries, and how he went about selecting the best methods and materials using the resources of his time.

Böttiger did not approve of washing historic tapestries because of the changes in appearance and the inherent risks that washing created. Although a tapestry is usually washed today if conditions warrant it and there are signs that it has been washed before, Böttiger’s reaction is a familiar example of what we would now consider conservative decision making in the face of insufficient information. He also concluded that the former method of cleaning by beating was not appropriate, and he set about testing whether a new invention called the vacuum cleaner was safe for use on tapestries. He employed a scientist, John Kohler, who published his findings that vacuuming was safe for both wool and silk fibers.² Böttiger recommended that the vacuum not be applied directly to the tapestry, but that a piece of gauze of about 18 threads per cubic centimeter first be laid over it. In addition to surface cleaning long-neglected tapestries, he recommended that the entire collection be vacuumed biannually (Böttiger 1937).

Areas of extensive damage, such as where iron-mordanted weft yarns fell out leaving bare warps, were stitched to patches with a couching technique. If there was a hole, the edges were sewn tightly to a fabric patch. Böttiger used 100 percent linen fabric dyed with light-fast Sirius direct dyes for the patch material. Mercerized German cotton thread was used for all stitching and was dyed with Indathren dyes in forty-four shades. Where large expanses of silk weft had been lost, he used a reweaving method whereby the silk weft was replaced with linen threads in the same spacing as the original. The luster of the linen was not equal, but the linen was stronger than silk, and the visual difference, Böttiger stated, was minimal.

Examination of the Royal Swedish collection showed that tapestries which had been lined or strapped fared better altogether and showed almost no signs of damage from wall plaster, dust, or grime. Due to this observation, Böttiger recommended that following repairs, tapestries should be lined with 100 percent linen strips 36 cm wide and 60–70 cm apart, plus a 3.5-cm strip around all four sides. No mention was made of any additional dust cover. Tapestries were hung using a row of tin hooks sewn 15 cm down from the top border, which met another row of forks mounted on a metal bar (Böttiger 1937).

² collaborating with scientists, Böttiger conducted additional studies, which are outlined in the appendices of his book. Appendix A deals with the study of vacuum screening materials and the number of times an area must be vacuumed in order to cease removal of unwanted material. Appendix B has to do with research into the use of a psychrometer to measure RH. Appendix C discusses the strength of wool fibers after conservation in different humidity levels. Appendix D discusses the same study using silk. Appendix E shows the effect of light on fibers, concluding that silk loses tensile strength after 200 hours exposed to sunlight and rain, jute after 400, cotton after 940, undyed wool after 1120 hours, and dyed wool after 1900 hours. Appendix F is about the effect of heat on wool. Appendix G calculates the temperature in the gallery of Charles X in the Drottingholm Castle from September 1932 to November 1933. Appendix H is about the effect of moisture on bacterial outbreaks in wool.

The benefits of his conservation techniques, as Böttiger saw them, were that nothing original was changed and that the tapestries were safeguarded as much as possible. He also believed that even though his approach may have been seen as extreme, it was necessary if he were to call his work conservation. Although Böttiger's philosophy may not have been at all unusual for this time period, but it is rare to find in print such detailed reliance on scientific research and evaluation of past treatments in a field so entrenched in the practices of the past. It is not only his choice of techniques but his methodology and conclusions that make Böttiger appear to be such a modern conservator.

As recently as the 1970s, reweaving was the standard practice in tapestry conservation throughout most of Europe, with the possible exception of England and parts of Germany (Marko 1995). Constance V. Pow of the Victoria and Albert Museum in London confirmed in her 1970 article that reweaving was both the oldest and the most common method of repair for tapestries. However, she considered stitching to a support fabric the best way of upholding the principles of conservation rather than restoration. Pow described in detail all three of the methods that were in use at the time: reweaving, stitching to patches, and consolidation with adhesives. In choosing which method to employ, readers were warned to consider what would best allow both an aesthetic and an historically accurate outcome that would convey the original intent of the artists.

In her 1984 article entitled "Evolution of Tapestry Repairs: A Personal Experience" Karen Finch summarized a patching method for tapestries that she developed when she was at the Victoria and Albert Museum in the 1950s. After removing old, distorted repairs to the sky of a tapestry, she would couch each warp thread down to a supporting patch so that it was equidistant from its neighbor, preserving any original weft thread she came upon. The result was a cohesive whole that, when seen from normal viewing distance, was once again legible. Finch continued to develop the patching procedure, eventually coming up with a method of all-over support using a full lining of linen scrim, known by many today simply as "the English method." In 1968 she and Danielle Bosworth also found that one solution to a tapestry whose figures needed redefining was to reweave their dark outlines (Finch 1984). This compromise between the introduction of new repair materials and the overall support and affordability of a conservation approach is similar to Böttiger's approach of fifty years earlier.

The comparative cost and time frame of a full restoration versus a full stabilization treatment cannot be underestimated as a factor in the evolution of tapestry conservation techniques (Masschelein-Kleiner and De boeck 1984, Maes 1989, Clark and Hartog 1995). A full restoration, depending on the condition of the tapestry, can take many thousands of hours. Stabilizing the same tapestry to fabric can be accomplished in mere hundreds of hours. Commercially, restoration was long considered the only way to retain the market value of a tapestry, in which case the cost of the repair was offset by the price the tapestry would fetch (Pow 1970). Stitching to fabric was quicker but was seen as temporary and less skillful because it could be easily detected. For a museum, however, the historical value of the tapestry often outweighs its aesthetic worth, and the decision as to which conservation method best allows the tapestry to tell the story that was intended must always be taken into consideration.

Tapestry Conservation in the United States before 1950

The history of tapestry conservation in the United States can be traced alongside the growth of the moneyed classes. Until the mid- to late-nineteenth century, the number of European tapestries found in America was insignificant. With the rise of *nouveau riche* during the Industrial Revolution and the simultaneous selling off of valuable treasures by cash-poor aristocrats all over Europe, tapestries began to migrate westward. As the number of foreign-trained tapestry restorers became insufficient and Americans began to learn the skills of their European counterparts, a tiny industry was born.

Bruce Hutchison discusses this phenomenon in his 1991 article "From Restoration to Conservation." The American tapestry-weaving ateliers of William Baumgarten & Company in 1890s and of Herter Looms in the 1910s depended on income from repairs that their European tapestry weavers and their wives would perform between tapestry-weaving commissions (Zrebiec in Hutchison 1991). Needleworkers and "church ladies" also were called upon to use their skills as tapestries that had arrived in the United States in good condition began to decay. Tapestry dealers and importers similarly were known for their restoration services. French & Company, Ltd., located in New York, was a major provider of tapestry repairs in the early and middle-twentieth century. Archives show that by 1926 they could be called upon to "thoroughly clean by special process" and "strap and line with linen and repair tapestries where necessary" (Breeze 1996).

Museums were also restoring their own tapestries, as well as those that arrived on loan. A 1907 treatment report from the Metropolitan Museum of Art in New York describes tapestries as being "repaired here and there" and "repaired with patches." One of the people who worked for the Metropolitan Museum and other institutions in the early- to mid-twentieth century was the Baroness Wilhelmine von Godin, a lace maker turned tapestry restorer, trained in Munich. A *New York Times* article from 1940 describes one tapestry she worked on as being totally restored in just a few weeks, whereas another from the series took more than a year. Although no mention is made of auxiliary support materials and although the level of damage could have been substantially higher in the second tapestry, a logical conclusion is that not all of the baroness's work was as thorough as the "fine shading of the wings [which was] being reproduced with exactitude" (Breeze 1996, 15). Much as a tapestry conservator does today, the Baroness and her contemporaries, it appears, were used to evaluating each tapestry individually, choosing the finest repair materials available (she was known to have used plants grown at the Cloisters, Metropolitan Museum of Art, to produce natural dyes for her tapestry wool), and selecting the appropriate repair method for the job at hand.

Rising Professionalism and Dialogue, 1950–1979

The application of analytical principles to the conservation of works of art underwent a massive expansion during the third quarter of the twentieth century, ushering in what could be called the "modern era" of art conservation. The increase in publications and conferences is evidence of a shift toward professionalism and open dialogue. The first conference of international textile conservators was held in Delft, Netherlands in 1964, resulting in the publication in 1972 of a general textbook edited by Dr. Jentina E. Leene. The chapter on tapestries written by Johanna M. Diehl and F. Visser lists patching with linen and impregnation with adhesive, followed by a dust cover, as being conservation treatments. Total restoration is given its own section. The rationale and methods differ very little from those published by Pow only two years earlier. In the same year—1972—the American Institute for Conservation was incorporated as an entity independent of the International Institute for Conservation.

In 1976, the exhibit catalog *Five Centuries of Tapestry: The Fine Arts Museums of San Francisco* was published, followed three years later by *Acts of the Tapestry Symposium*, which contains papers given at a conference held in San Francisco in November 1976. The later includes the results of recent research on both tapestry history and conservation. Nobuko Kajitani's "The Preservation of Medieval Tapestries" is a comprehensive study that "emphasizes objective information based on practical scientific and technical work" (Kajitani 1979, 45). Given the relative lack of published material on tapestry conservation in the United States, it is no surprise that none of the articles in Kajitani's bibliography deals specifically with hands-on tapestry-conservation techniques. Three citations concern analysis and dyes, but all were published in Europe. Another important article from *Acts*, entitled "Bread, Brushes, and Brooms: Aspects of Tapestry Restoration in England, 1660–1760" by Wendy Hefford, provides fascinating insights into the history of tapestry-conservation techniques with an emphasis on "don'ts," not "dos."

Following the San Francisco publications, tapestry conservation continued to grow at a rapid pace. Anna Gray Bennett, author of *Five Centuries of Tapestry: The Fine Arts Museums of San Francisco*, stated in the preface to the 1992 second edition that since the 1976 exhibit “the tapestry field has shown almost frenetic activity. The most prestigious art museums in the country have published collection catalogs of their vast holdings. Exhibitions have been presented and symposiums held all over the world” (Bennett 1992, ix). One of the museums inspired by the activities at San Francisco was the Minneapolis Institute of Arts (MIA). In 1979 the MIA began a campaign to conserve and exhibit its important collection of forty-one European tapestries. Based on a program developed by Anna and Ralph Bennett, the MIA decided to fully conserve each tapestry one at a time with the help of highly trained volunteer weavers and needleworkers. Conservation began in July 1981 in the form of a gallery exhibit entitled *A Look Behind Closed Doors: Conserving the Tapestry Collection* and continued in view of the public until late 1982. A comprehensive book about the MIA’s collection, *European Tapestry in the Minneapolis Institute of Arts* edited by Candace J. Adelson, came out in 1994. Conservation of the collection is still going strong (Hark personal communication).

In Adelson’s book (p. xvi) Lotus Stack, curator of textiles, and Mary Ann Butterfield, conservator of textiles, described the research that went into the development of the MIA tapestry conservation program in 1979 and the priorities that were set:

After thoroughly researching conservation principles and practices throughout Europe and the United States, the textile curator and the professional conservator made the following decisions governing tapestry conservation at the Institute:

1. The purpose of conservation is to arrest deterioration by supporting the structures of the tapestry and to restore the visual aspect by replacing losses.
2. The methods include warp insertion as required and weft replacement by means of a darning technique rather than reweaving. Repairs are easily distinguishable upon close examination but invisible from normal viewing distance.
3. Restoration—that is, an effort to bring the tapestry back to the original woven structure—will not be attempted.
4. Trained volunteers, closely supervised by a professional conservator, will do the work.

The selection of conservation techniques such as darning and selective warp replacement, together with a concern for arresting deterioration without necessarily repairing the original woven structure, are consistent with textile conservation treatment standards of the day. The concepts of reversibility, minimum intervention, and rigorous training were all outgrowths of the recent applications of science and theory, which can be seen in the conservation literature of the 1980s (Bullock 1981, Smith 1984, Ward and Ewer 1988).

At the time of these major changes in the late 1970s, not much had been published about tapestry conservation techniques in the United States. Francina S. Green’s 1955 article “The Cleaning and Mounting of a Large Wool Tapestry” addresses the cleaning, assembly, and mounting of several fragments of a once-large archaeological tapestry owned by the Textile Museum in Washington, DC. Although this textile does not qualify as a tapestry for the purposes of this report, Green made two interesting points in her article. The first is that the “archaeological laundress” in charge of cleaning the fragments was already using Orvus WA Paste (sodium lauryl sulfate), the detergent of choice today for many American textile conservators. The second is that wool was chosen as the support fabric for the roughly 11' × 6' mount. Generally disregarded as a support fabric for tapestries due to its reactions to humidity and temperature

fluctuations, as well as its poor elastic recovery, wool was chosen in this case because of its sympathetic appearance and “tooth” which would help bear the weight of the fragments. Cotton and linen, the two standard choices for tapestry-support materials today, were both discounted—linen because it is slick, forcing the tapestry to bear its own weight, and cotton because it was deemed unaesthetic and, in these dimensions, would tend to sag.

Joseph V. Columbus, thought by many to be the father of modern tapestry conservation in the United States, published a most insightful article in 1973 entitled “Tapestry Restoration in the National Gallery.” Columbus stated that tapestry restoration at the National Gallery began with the *Triumph of Christ* sometime around 1970. Columbus’s methods consisted of removal of old lining materials, vacuuming through a fiberglass screen, examination and removal of harmful old repairs, testing yarns for colorfastness, preparation for washing, washing, drying, repairs in the form of reweaving, replacement of galons, strapping, lining (dust cover), and a Velcro hanging system. These techniques differ little from those employed by most tapestry conservators in the United States today, with one exception: Columbus chose to fully restore areas of loss rather than to stabilize the weak areas using conservation stitching. He made no mention of why he chose full restoration over spaced darning or stabilization to patches, both of which were known from the earlier writings of Böttiger (1937) and of Diehl and Visser (1972). In my survey only two participants consider repairs which simulate the original weave structure to be the standard approach to stabilizing areas of weft loss. The remainder usually employ the technique of spaced darning within the structure of the tapestry, or couching the tapestry to fabric patches or a full lining. It is this stage of tapestry conservation that distinguishes American techniques from those used most frequently in other parts of the world.

In 1974 Margaret Fikioris published the results of a survey of mounting techniques used by textile conservators in the United States and Europe (see Appendix 1). As the textile conservator at the H. F. du Pont Winterthur Museum, Fikioris was responding to the need for teaching institutions to gather information on current techniques, and the results of her survey were presented to the museum’s Scientific Advisory Committee. Her report showed a greater range of methods than are currently in use in the United States. Since 1974, for example, mounting tapestries by sewing them to a fabric-covered strainer that is then framed has been generally dismissed unless the tapestry is at the limit of its physical capabilities and is no longer able to bear its own weight. None of the participants in my survey mentioned this technique. Similarly, suspending tapestries by a pole or rings is almost unheard of today.³

Comparative Study and Publications, 1980–1995

The 1980s and early 1990s were characterized by an increase in the comparative study and publication of tapestry-conservation techniques. The 1980 volume *Conservazione e Restauro dei Tessili*, a collection of papers given at the International Conference on the Conservation and Restoration of Textiles held in Como, Italy, contains at least six articles about tapestry conservation. Of these, three shed light on the

³ Of the twelve responses to Margaret Fikioris’s 1974 survey, four mentioned having sewn Velcro to a support which was hand sewn to the reverse of the tapestry and hung from a wooden slat to which the opposing Velcro was stapled or nailed. Two recommended suspending the tapestry from a pole that was passed through a sleeve that was hand sewn to the reverse of the tapestry. Three reported using rings sewn to webbing that had been hand sewn to the tapestry. Four suggested that tapestries be stretched and mounted into frames. Two combined the use of Velcro within a stretcher mount. Several participants said that if a tapestry was in good condition no support was needed. Four suggested the use of vertical straps of varying widths and materials for supporting tapestries. One preferred a grid of strapping, and another used a combination of vertical straps and zigzag straps. Three mentioned attaching a dust cover after strapping. Three would attach a full-support lining which was stitched to the perimeter of the tapestry as well as in vertical rows through the center.

workings of major American museum laboratories: "Conservation Practices at the Museum of Fine Arts, Boston," by Leslie B. Smith; "A Textile Conservation Laboratory in an Active Working American Museum," by Ferdinand Jones of the Los Angeles County Museum of Art; and "Treating a Tapestry Containing Tarnished Silver," by Joseph V. Columbus and Barbara A. Miller of the National Gallery of Art, Washington, DC. Jones respected the fact that the best approach in some cases was to leave difficult choices up to future generations, whereas Columbus and Miller used scientific principles to improve upon older methods.

In her 1980 paper, Smith stated that tapestries were rewarped and rewoven in a neutral color if losses were small and stable but that larger losses were usually reinforced with ribbed fabric. If the tapestry was severely damaged it was backed with fabric and sewn down without compensation of losses. Four years later in "The Exception to the Rule: Conservation of a Tapestry Fragment" she clarified the policy at the Museum of Fine Arts, Boston: "The parts of the fabric that are replaced are those structurally necessary to ensure dimensional stability" (Smith 1984, 209). However, Smith explained, this policy was less formalized for tapestries than for other textiles because, among other reasons, all parts of a tapestry are structural. The exception Smith alludes to in the title of her article is the choice of replacing a small but visually disturbing old repair in a Fifteenth-century fragment called *Penelope at Her Loom* with a woven inlay instead of couching the area to fabric. Another tapestry provided an image to copy, and rather than stress the surrounding area with a hard-to-reverse reweave, a plug was woven separately and then inserted. The infill is easily removed and cannot be mistaken for the original.

In the past twenty years no fewer than six conferences have been held in which tapestry conservation has played a major role. In 1981 *Tecniche di Conservazione degli Arazzi* was held in Florence, and the proceedings were published in 1986. The 1984 *Internacional la Restauration et la Conservation des Tapisseries* held in Paris spawned a publication of the same name. The 1989 book *The Conservation of Tapestries and Embroideries* contains the proceedings of meetings at the Institute Royal du Patrimoine Artistique, Belgium, held in September 1987. *Conservation Research: Studies of Fifteenth- to Nineteenth-Century Tapestry* is a collection of papers given in 1993 at a conference in honor of Joseph Columbus, former textile conservator at the National Gallery of Art, Washington, D.C. In 1994 *The Misled Eye... Reconstruction and camouflage techniques in tapestry conservation* was published. It contains papers given at the TRON Symposium in Amsterdam in October 1994. Most recently published was *Textiles in Trust*, the proceedings of the symposium held at Blickling Hall, Norfolk, England, in September 1995, containing papers about tapestries and other textiles in the care of Great Britain's National Trust.

All of these publications contain case studies and research by both American and European tapestry conservators. From them emerge indications of which repair and support methods were favored in different countries. For example, stitching weak areas to localized fabric patches was mentioned by people working in the United States and continental European, but not England. All of the English authors favored a full-support lining, a technique which had been used in rare cases by authors from the United States and the Netherlands. Reweaving was specified as the method of choice for only one United States institution but was also performed in Italy and, in certain circumstances, Belgium. A method of inserting spaced lines of stitching into the weave of the tapestry, rather than reweaving in the same gauge as the original, was only mentioned by one conservator in the United States. Finally, in all of the conference papers listed above, the only conservators to mention the use of vertical straps were from the United States. The many pros and cons of each method that can be gleaned from these proceedings provide useful material for any debate about the merits of one conservation method versus another. In addition, the publications lead researchers to conservators who can answer methodological and technical questions.

Science and Strategy since 1995

The last five years have been marked by an increase in the study of materials for the support of tapestries. In 1995 and 1996 Mary Ballard of the Smithsonian Museum Center for Research and Education published and spoke widely on the physical properties of backing fabrics. In her articles she explained that a backing fabric is traditionally chosen to be stronger and less stretchy than the original textile, which prevents the textile's fibers from reaching a breaking point. She drew no conclusions, however, as to which material is best for supporting tapestries. In 1996 David Howell of Historic Royal Palaces, Hampton Court Palace, wrote about the effect of inappropriate humidity on textiles and whether damage will occur as a result of humidity fluctuations if a tapestry is tightly lined with all four sides attached. The following year he coauthored "Mechanical Aspects of Lining 'Loose Hung' Textiles" with Thomas Bilson and Bill Cooke, in which the function of tapestry linings is questioned—"Does the tapestry need to be strengthened to such an extent? Will the support stitching really be invisible? Is the life span of the tapestry greatly increased?" (Bilson, Cooke and Howell 1997).

In 1996 a comprehensive report of a study of tapestry conservation entitled *Support Methods and Fabrics for Tapestries* was begun by the former Central Research Laboratory, now merged into the Netherlands Institute for Cultural Heritage in Amsterdam. Researchers Dr. Judith H. Hofenk de Graaff and Foekje Boersma began by distributing a questionnaire to seventy-six textile or tapestry conservators, with the aim of investigating tapestry support using a practical and scientific approach. Twenty-eight questionnaires were returned from all over the world (only two from the United States). Analysis of the responses showed that tapestry conservation techniques vary widely and that conservators can still be grouped into restoration and conservation categories, with the majority employing conservation approaches (Hofenk de Graaff and Boersma 1996). Within the conservation group there were further divisions depending on the preferred support fabric.⁴ No mention was made of conservation approaches using darning or tabby repairs within the structure of the tapestry, currently the preferred method in the United States.

A second, two-part publication by de Graaff and Boersma, entitled "Part I—Tapestries: General Background Information" and "Part II—Chemistry and Physics of Flax (linen) and Cotton" does, however, discuss this technique. It contains excellent background information on tapestry conservation history, techniques, and types of damage found. The development of conservation and its divergence from restoration is thoroughly documented, with a brief mention of the unique practice of spaced repairs within the structure of the tapestry. Hutchison (1991) and Ward and Ewer (1988) are cited as doing this kind of repair, but the only European example of spaced reweaving is from the Kunsthistorischen Museum in Vienna (de Graaff and Boersma 1997, 4.3.3). The technique of strapping, which my survey reveals is also more popular in the United States than elsewhere, is also discussed.

According to de Graaff and Boersma, the fabric preferences expressed in their 1996 questionnaires were generally based on experience and tradition, not on scientific investigation. Therefore they, along with W. G. Th. Roelofs, undertook additional research, the results of which appear in a third publication *Tapestry Conservation: Scientific Research 'Linen Verses Cotton'*. Their report presents the methodology and results of testing for tensile strength and elongation at break that was done on fabrics being used for

⁴ Some of de Graaff and Boersma's respondents felt that the goal of supporting a tapestry was to prevent the tapestry from moving during environmental fluctuations, while others believed the role of a support lining was to move along with the tapestry. Some incorporated considerable ease into their support systems to allow the tapestry to respond, and some relied on the choice of support fabric to determine how their lining would react. A linen support lining followed by a cotton dust cover was the most popular fabric combination—the linen scrim gave support while a tightly woven, light-weight cotton dust cover offered the best dust filtration. Very few used synthetic fabric for support and lining, and none used a support fabric without following it with a secondary dust cover.

tapestry conservation. It is by far the most comprehensive study of materials intended specifically for tapestry conservators; however, the authors were hesitant to say which fabric is best:

Because of the many factors contributing to the final behaviour of the fabric, it is very difficult to give a 'verdict' about cotton and linen. The [tensile strength] tests carried out show a similar aging pattern for linen and cotton, which is not surprising as both cotton and linen are made of cellulose. Unfortunately, the question of which material is better as a support fabric for tapestries cannot be answered. When using good quality materials, both linen and cotton are strong enough to carry the weight of a tapestry and are both relatively long lasting. In order to assess if cellulosic materials are functional and successful in supporting tapestries, other issues have to be addressed (de Graaff, Boersma, and Roelofs 1998,4.2).

One of the other issues that the authors addressed was the behavior of cotton and linen in environmental fluctuations. Their results are compelling, especially in regard to the behavior of prepared (machine washed and dried) and unprepared fabrics. Weave structure and manufacturing appear to be more responsible for whether a fabric is suitable for supporting a tapestry than how the fabric is washed or dried. They call for further research on this aspect, as well as on the behavior of tapestries themselves during climatic changes.

Perhaps the most revolutionary approach to the support of tapestries in recent years is Sheila Landi's "A Fresh approach to the Problem of Support for Tapestries." In this article she summarized a paper given in Amsterdam at the 1994 Interim Working Party meeting on the subject of using synthetic fabric to support tapestries. She pointed out that "reweaving is now out of the question from most points of view [therefore] the aim of conservation must be to transfer the weight of the object to a support so that the inherent weakness of the weave structure is prevented from deteriorating further" (Landi 1997). Although she conceded that her approach was not suitable in every situation, Landi had noted success with stitching tapestries to a leno-weave polypropylene fabric while the tapestry was suspended sideways on a custom-made apparatus. The structure of the support fabric was joined as closely as possible to the structure of the tapestry, which provided the vertical warp strength that the tapestry lacked. Areas of loss were filled in using the support fabric as a base, and additional repairs could be made in the future as necessary. Although Landi's approach is yet another version of a full-support lining, it attempts to answer some of the objections to full linings, such as washability and access to the reverse.

The above comparison of techniques used in different countries during several time periods, suggests that American and European tapestry conservators followed the same set of guidelines until approximately the late 1970s, at which time the influence of individual authors and institutions led them in different directions. For example, the trend toward conservation stitching and away from full restoration became stronger in the United States than in continental Europe; similarly, American conservators have not been advocates of the full-support linings favored by British conservators. For a more detailed investigation into current and past techniques used by American tapestry conservators, as well as who their influences have been, I developed a survey.

THE SURVEY

The Methodology Utilized

Sixteen textile conservators currently or formerly involved in tapestry conservation in the United States were surveyed between May 1998 and August 1999. I sent each participant a list of more than 100 questions and subsequently interviewed most of the participants in person. In some cases conservators replied in writing. I asked participants to consider not only how they go about each procedure today but also how their current methods differ from those they used in the past. Not all participants answered every question, and some gave multiple responses. In the end I analyzed only 95 questions.

Participants in the Survey

The following individuals gave graciously of their time and insights.

Deborah Bede, Stillwater Textile Conservation Studio, Bradford, NH
Alice Blohm, New York, NY
Marjorie Bullock, Monterey, CA
Stan Derelian, Salt Spring, BC, Canada
Marlene Eidelheit, Textile Conservation Laboratory, Cathedral of St. John the Divine, New York, NY
Patricia Ewer, Biltmore House, Asheville, NC
Kathy Francis, Isabella Stewart Gardner Museum, Boston, MA
Betsy Gould, Boston Art Conservation, Brookline, MA
Maureen Hark, Minneapolis Institute of Arts, Minneapolis, MN
Jane Hutchins, Sooke, BC, Canada
Nobuko Kajitani and staff, Antonio Ratti Textile Center, Metropolitan Museum of Art, New York, NY
Rita Kauneckas, Helena, MT
Meredith Montague, Museum of Fine Arts, Boston, MA
Patsy Orlofsky, Karen Clark, Rebecca Johnson-Dibbs, and staff, Textile Conservation Workshop, South Salem, NY
Deborah Trupin, New York State Bureau of Historic Sites, Peebles Island, NY
Deirdre Windsor, Textile Conservation Center, American Textile History Museum, Lowell, MA

Survey Questions and Answers

To assist in the gathering of information I grouped the questions into categories that reflect the stages of tapestry conservation. Responses to each question are summarized below. Numbers in parentheses after each question indicate how many of the sixteen participants responded.

Documentation

Have you adopted any new technology to aid you in documentation, such as digital cameras, video, or computer programs? (16)

Half of the participants responded yes; half no. One of the participants mentioned using infrared photography when there is original drawing on the tapestry. Another has two spectrometers and a video still camera but did not mention how often they are used. Two use a digital camera, two would like to use a digital camera in the future, and two mentioned using Adobe Photoshop software. One pointed out that a laptop computer has been useful when examining tapestries on site.

Testing

What testing do you do to further determine the course of treatment? (13)

Few respondents mentioned testing for fiber identification. All of those who answered either blot or take fiber samples to tests for dye fastness and soil removal, some more thoroughly than others.

Does this differ from tests you performed earlier in your career? (14)

Only two of the participants have changed their methods over the years.

If you are relying on more scientific testing methods now, are they changing your treatment decisions, or confirming the decisions you would have made previously? (2)

Neither of the respondents who has changed their testing methods believed that the changes have affected their treatment decisions.

Surface cleaning

At what stage do you vacuum a tapestry? (13)

Vacuuming before treatment is more common than vacuuming after treatment, but most respondents would do both, depending on the degree of soiling.

What type of vacuum and vacuum attachment do you use? (12)

Three respondents have a choice of a dry-type (Nilfisk) or wet-type (Rainbow) vacuum. An advantage of a wet-type vacuum, one respondent pointed out, is that you can see the dirt you have removed even if you did not think the tapestry was very dirty. Six participants have a Nilfisk vacuum with a HEPA filter, and one has a Fantom with a HEPA filter. Two use a household vacuum and one uses a small portable Hoover.

All of the participants use a round, soft-bristled upholstery attachment. One also uses a flat curtain attachment, and one mentioned occasionally using micro attachments.

Do you vacuum through a screen? (14)

Three respondents said they always use a screen, but all later said that they do so only in silk areas. The condition of the tapestry is foremost in determining whether to use a screen. Most believe that vacuuming through a screen simply does not work well and that it is unnecessary when using a vacuum with a rheostat, which allows for controlled suction.

Is your current vacuum a significant improvement over older models you have used? (10)

Six participants said that their current vacuum is an improvement; four said that it is not. Those who have HEPA filters now generally used small portable Hoovers in the past. The main improvement mentioned was the addition of a rheostat, which has allowed conservators to feel safer vacuuming without a screen. Also of importance is the fact that Nilfisk vacuums are quieter than traditional household models.

What other methods of surface cleaning do you use? (11)

Two of the participants had not used other methods of surface cleaning. Three mentioned that they had used vulcanized rubber sponges or flannel to gently rub away sooty soils. Five have used tweezers or brushes to surface clean. One other had used a spatula, a scalpel, or a brush.

Temporary stabilization

How do you stabilize weak areas prior to handling, hanging, or wet cleaning? (12)

Eight respondents mentioned the use of nylon net, or tulle, to sandwich weak areas, or applied to one side only. This is time consuming and tends to hold soap, so they use it sparingly. Three participants use cotton net, which adheres to the area during drying and acts as a wicking cloth but is heavier and stretches in one direction. One did not mention which kind of net is preferred.

When does a weak area require temporary stabilization? (9)

All who answered this question stated that netting is necessary if handling during washing or hanging will cause damage. If the structure of the tapestry has deteriorated—in other words, if there are broken warps, areas of missing weft, and/or large open slits—it should be netted. Many agree, however, that netting does not prevent brittle wool or silk from falling out if it is in very bad shape.

Do you ever do permanent stabilization prior to wetcleaning? (14)

Half of the participants who answered this question do; half do not.

What have you done differently in the past? (5)

No one mentioned having done anything different in the past.

Wetcleaning

How often do you wetclean a tapestry prior to stabilization? (12)

Eight participants almost always wash a tapestry before stabilization, assuming it is warranted. Three wetclean less frequently, but as needed. One wetcleans “as infrequently as possible.”

If tests show that the tapestry is giving off soils, but it was wetcleaned in the last ten years or so, do you clean it again (condition not being a factor)? (11)

Four respondents usually do; seven prefer not to.

What surfactants do you use? (13)

Ten of the participants use Orvus WA Paste in concentrations ranging from 0.25 percent to 2 percent. Three use Igepal as well, either in combination with Orvus or separately. One person prefers Triton X-100 because of its effectiveness and easy rinsing.

Describe your wetcleaning setup and water system? (13)

Only two of the participants have permanent wash tanks large enough for most full-sized tapestries. Ten others wash tapestries in temporary tanks set up on the floor, either because they do not have a wetcleaning table or because it is too small. One respondent has tapestries washed at other facilities.

Of the twelve respondents who specified water type, eight use deionized water, the most common system being mixed-bed deionizing tanks with one or two filters. Four respondents use tap water or distilled water.

Have you made any changes or improvements in the last twenty-five years? (12)

Some improvements mentioned were to the water system and some were to the physical setup. Three participants have improved their wetcleaning facilities. One has raised her concentration of Orvus and deionized water from 0.25 percent to 0.6 or 0.7 percent. One explained the use of

Glycerin as a lubricant in the 1960s, which has been abandoned because of the residue it leaves. Two have changed their final rinse, one moving from tap water to distilled water, and another from deionized water to filtered water. One participant's museum had decided not to wetclean any more tapestries because they were being over-handled and not fully rinsed.

Have you encountered areas of *potomage*, or painting? (13)

Of the thirteen participants who responded, seven had come across painting and six had not.

How have you dealt with it? (6)

Four participants explained that the first step in determining treatment is to test whether the paint is water soluble. Four also use spotcleaning to remove as much of the matter as possible. If bleeding is minimal, one respondent goes ahead and washes the tapestry. Another respondent may decide not to wash a tapestry with paint on it.

Three responses provide details on specific paint-removal techniques. One participant uses FTIR to determine how best to solublize the paint; when no successful solvent is found, the paint residue is removed with a sharp scalpel. Another participant was in the process of removing paint that has both solvent-based and water-based components to it. The water-based paint was being removed with a Triamonium citrate gel, rinsed with a detergent solution with a chelating agent, and then flushed with water. The solvent-based paint was removed with methanol gel left on for fifteen minutes and then swabbed off with liquid methanol. A third participant may consider contact cleaning, a method consisting of sandwiching the area being treated between layers of dry flannel and dampening the area with deionized water, so that capillary action draws the soil or paint down into the flannel.

Have you ever suction cleaned a tapestry? (13)

Of the thirteen participants who responded, ten have not used suction on a tapestry. One has used a suction disk to locally reduce paint. Another has adapted a commercial suction vacuum for use on an extremely dirty tapestry. One uses a suction table.

Why did you choose suction cleaning? (13)

One respondent attempted suction cleaning because a new piece of equipment (a 16" x 16" suction platen) seemed like a promising technical approach. It was not very successful, so the respondent used local wetting and blotters instead. Extreme dirtiness lead another participant to use suction, but contact cleaning would probably be used now. The third respondent used suction cleaning because the tapestry was not a candidate for full immersion, owing to the presence of fugitive dyes.

Drying and blocking

How do you dry tapestries? (14)

Seven respondents specified a preference for drying a tapestry on some kind of screening, and three preferred a flat surface such as plastic. Four respondents did not state a preference.

Most participants would remove excess moisture with white terry towels but two use sponges, or sponges then cotton mattress pads, in addition to towels.

When do you dry them face up and when do you dry them face down? (13)

Seven participants usually dry tapestries face up. Of the three respondents who usually dry tapestries face down, two dry them face up if fugitive dyes are present. Another usually dries them face up, unless there is a chance of discoloration, in which case she dries them face down. One said only that it depends on the circumstances.

How often do you use a drying or wicking cloth? (14)

Four respondents always use a wicking cloth, and three never do. Four others rarely do, one usually does, and two do only if there is a sign of bleeding dyes.

What kind of cloth do you use? (9)

Four respondents use cotton sheeting or some other cotton fabric, three use cotton cheesecloth or cotton net, and one uses cotton toweling. Another usually uses cheesecloth, but in the case of fugitive dyes, may lay down a sheet followed by cheesecloth.

If the tapestry needs blocking do you use pins or weights? (14)

Eight participants never block a tapestry. Two block with weights and two with pins. Two use both pins and weights.

Installing on a tensioner

What kind of tensioner/s do you use? (11)

Although the ages and materials of tapestry tensioners used by the participants vary, all are similar in that they employ two parallel sets of rollers. Some have center pinning boards and some do not. Only one respondent mentioned having a frame with a third center beam or any similar device to raise the working surface of the tapestry to a 45° or 90° angle, as some European models do (Diehl and Visser 1972, 161); however, use of this feature was optional.

At the Isabella Stewart Gardner Museum during the 1980s, repair work was also done flat on tables using wooden beams to provide localized tension. One participant still uses this method.

How old are the tensioner/s? (7)

The oldest tensioners mentioned were from the early part of the twentieth century and were made of wood, some with metal ratcheting devices. Most tensioners, however, were made in the past twenty years. Newer models use aluminum poles, and the newest one has four sets of aluminum poles so that the width of the tensioner can be changed.

How is the tapestry attached to the tensioner beams? (9)

Most respondents attach their tapestries by stitching them to muslin or canvas aprons, or leaders. In some cases the apron is taped to the poles, or attached to self-adhesive Velcro that is on the poles, so that the apron tension can be adjusted without changing the stitching. In other cases the apron is stapled or sewn to the poles, which requires that any tension adjustments be made either while the tapestry is pinned but not yet sewn or by restitching it.

Slits

Which stitch do you use to close slits? (16)

Seven participants use a whip, or overcast, stitch to close slits. Three use a buttonhole or faggotting stitch, which is stronger due to the locking action and has no diagonal elements. Five use a

combination of both, depending on the strength of the surrounding area or the length of the slit (longer slits receiving a locking stitch). One participant favors a ladder stitch, again because there is no diagonal element. See Appendix 2.

Does the length or location of the slit determine your stitch? (16)

Four participants cited the length of the slit as a determinant of which stitch they use; twelve participants said length does not determine stitch choice.

What is your preferred thread brand or fiber? (15)

Thirteen participants use DMC cotton embroidery floss all or some of the time to close slits. One has moved to using another type of three-cord mercerized cotton thread, and three others also prefer another cotton thread. Other variations include occasionally using silk or linen.

When do you remove old and weakened slit stitching prior to replacement, and when do you stitch over existing threads? (13)

All who answered this question leave any stitching they suspect is original. When dealing with nonoriginal stitching, eleven pick out anything that is no longer functioning or is extremely distorted. Three said that the curator has a role in making this decision. Most also acknowledge that economics and time are a factor in which slits are picked. Two said that it depends, or they have no set rule.

If there is going to be a fabric patch or scrim/lining behind the area, do you close the slits before the patch goes on, or do you close the slit to the fabric? (13)

Twelve participants prefer to close a slit prior to attaching a support patch to the area, with condition being a factor in most people's choice. One participant does not use patches.

Missing weft

How do you stabilize a small area of missing weft? (16)

The most common method of weft replacement is a tabby repair, in which rows of varying density are used to stabilize the structure of the tapestry without attempting to replicate the original weave. Two to four strands of cotton thread are normally used, depending on the gauge of the original tapestry. A variation on tabby, which is preferred by four of the participants, is warp twining, or twined darning. In this method, a row of tabby is placed using a single strand of cotton thread. The thread then returns on the alternate set of warps immediately adjacent to the first row, resulting in a two-strand line. The twining is achieved by passing the return row of thread above and then below the first line. See Appendix 2. Three of the participants usually use restoration methods to replace missing weft; and three routinely use couching to secure the weak area to a patch.

How close do you place your lines of stitching? (10)

Of the participants who do tabby or twined repairs, the average space between rows is 1/8 inch. Rows may be made more or less frequently, depending on the gauge of the original tapestry, the strength of the area, the aesthetic result, or how much time and money are available.

What yarn/thread do you use for missing silk and wool? (15)

All but two of the participants use DMC cotton embroidery floss; five use it exclusively for all repairs. Eight respondents use wool to replace missing wool, three use silk to replace silk in all or some situations, and one uses another cotton thread.

Do you dye your own tapestry yarns? (14)

Three participants routinely dye their own tapestry yarns. Three have occasionally done so, and one has another laboratory dye the yarn. Seven participants do not dye their own yarn.

Do you use a fabric patch behind areas of loss for additional stabilization and color compensation? (16)

All but two participants have utilized fabric patches; some of these either no longer use them or prefer not to.

If there is degraded original material remaining but it is sparse and interferes with an aesthetic stabilization, do you pick it out? (14)

It was widely acknowledged that some loss of original material is inevitable during cleaning and repairs. Nine of the participants do not intentionally clean out an area of degraded material prior to repair. Five do.

If the area of weft loss is adjacent to a slit do you replace the lost weft and then treat the slit as any other slit? (15)

Thirteen respondents repair the weft loss and close the slit separately. Two incorporate the closure of the slit with the weft repair.

Broken Warps

When do you rewarped a broken warp and when do you stabilize around it? (13)

Nine of the participants take into account the stability of the surrounding area and whether a fabric patch will be used. Four always replace broken warps.

What thread do you use for rewarping? (11)

Five of the participants use wool to rewarped, and four use either wool or cotton. Two always use DCM cotton embroidery floss.

Describe your method for rewarping? (11)

All respondents use sistering, or tunneling, to replace missing warp. More than half leave the ends of the new warp on the surface of the tapestry so that tension can be adjusted before passing the ends to the back. One mentioned that new warps can also be sewn to a support patch.

Restoration

How often does your repair take on the appearance of a restoration? (14)

Four participants often do restoration-type repairs; two always do. Six rarely do, and two never do.

Have you ever woven an infill, or plug? (11)

Six respondents have woven an infill or plug. Five have not.

Have you ever made an embroidered patch to use as an infill? (10)

Four participants have used an embroidered infill. One of the four said that embroidering onto fabric patches secured behind weak areas was their primary method of repair in the late 1970s. Although I did not ask about painted infills, one respondent mentioned having painted over old repairs to camouflage them, and one may consider making a painted infill. Six participants have never made an embroidered patch to use as an infill.

How do you get rid of the fuzzy appearance of new wool? (7)

Two participants trim the area with scissors or a razor, and one singes the new wool after it is woven. One avoids the problem by plying the yarn and then steaming it under tension before using it as weft, at which point the area may be shaved. One respondent seldom works with wool, one never considered fuzziness a big problem, and one leaves it alone unless it is visually disturbing.

Have you ever used modern metal thread to replace lost metal threads? (12)

Two participants have used metal thread and a third has not found anything on the market to be satisfactory.

Galons (gallons, galoons, border-guards)

How often do you replace a missing or nonoriginal galon? (14)

The participants stressed that they never remove an original galon. All but five have replaced a nonoriginal one. Two usually leave the decision to the curator.

What material do you use? (14)

Most of the participants use both hand-woven galons and fabric replicas. The most common fabric for replica galons is a rep fabric by Designtex. A consistent source for high-quality handmade galons has not been found.

How do you attach it? (7)

All participants use stitching to attach a new galon. Sometimes a new galon is superimposed over an old one; sometimes a support fabric is used to bridge the gap between the tapestry and the new galon. If the galon is applied directly over an existing galon, one respondent couches the edges and secures the center with a herringbone stitch. That respondent uses the same technique if the old galons are removed and if there is a backing fabric underneath to bridge the join. Another participant uses a whip or buttonhole stitch to connect a new galon when the old one is not present, as if it were a large slit. See Appendix 2.

If there is original galon in poor condition, how would you stabilize it? (11)

Eight of the respondents use support patches or netting to stabilize original galons, and three reweave them or repair them as they have the rest of the tapestry.

Cuts and fragments

How do you stabilize weak joins around cuts, or where fragments have been used to patch the tapestry? (9)

Those who answered this question both support cuts with patches and rewrap them.

Patches

How often do you use fabric patches to stabilize behind weak areas? (13)

Nine participants always patch if the area is large or needs additional stabilization, three rarely use patches, and one never does.

Do you do your repairs to the patch, or patch after the area is stabilized? (12)

Five participants prefer to put the patch on after they have completed the repairs, six do the repairs to the patch, and one does it both ways.

What is your preferred fabric? (11)

Four participants use cotton duck, and four use firm, lighter-weight cottons like Philips-Boyne brand Oxford or shirting cloth. Two also use light-weight, dimensionally stable Butterfly polyester. Only one might also use linen.

How do you wash it and how do you treat the edges? (12)

Methods for treating patching fabric vary widely. Nine respondents machine wash their fabric once, twice, or three times, and seven of the nine machine dry it. Only five iron their fabric. Five participants pink the edges of patches, five machine zigzag them, and two feather them.

Do you attach it to the back of the tapestry under tension, or not? (11)

Five participants use a frame of some type, usually cut from Fome-Cor or board, to tension the patches to the back of the tapestry. Six tension the patches by hand and eye.

Adhesives

Have you encountered old adhesive treatments? (14)

Nine participants have encountered old adhesive treatments; five have not.

How have you removed them? (7)

Seven respondents have removed adhesives from tapestries. Three of the seven have used solvents in combination with mechanical action. Four have used mechanical action alone.

Have you ever used adhesives to consolidate a tapestry? (15)

Only one participant has used adhesives on a tapestry, and that was not a European tapestry of the type addressed in this study.

Strapping

Do you always strap tapestries regardless of size, age, or condition? (14)

Four participants always use straps. Eight others normally strap but may eliminate the step, depending on the condition and size of the tapestry. One seldom straps, and one never does.

What material do you use for straps? (12)

Twelve respondents expressed a preference for strapping materials. Eight use cotton duck strips, and other cotton fabrics were mentioned four times. Three always use cotton tape, of whom two specified twill tape. Four have stopped using cotton tape for straps.

How do you prepare the straps? (13).

All respondents wash their strapping material. Eight expressed a preference for machine drying, and one prefers air drying. Five iron the material if needed.

How far do you space your straps and how wide are they? (14)

The answers fell into three categories, with the majority of respondents favoring narrow straps that cover less than 30 percent of the total width of the tapestry:

Minimal coverage—Seven participants use straps 2"–4" wide with gaps of between 10"–24", resulting in less than 30 percent coverage.

Moderate coverage—Three participants use straps 3"–8" wide with gaps of 3"–16", resulting 30–50 percent coverage.

Maximum coverage—Three participants use straps 4"–7" wide with gaps of 5"–14" inches, resulting in more than 50 percent coverage.

Do you attach the straps while the tapestry is hanging or lying flat? (15)

Seven participants attach their straps while the tapestry is flat, and four attach them while it is hanging. Two do it both ways. One attaches straps while the tapestry is on the tensioner.

What stitch do you use to sew the straps to the tapestry? (12)

Nine respondents use a variation on a herringbone stitch that either attaches each side of the strap to the tapestry or travels across the width of the strap in a series of stitches. Three use running stitches down the sides. See Appendix 2.

What thread do you use? (11)

Five of the participants use DCM cotton embroidery floss, and seven use other cotton thread, such as Mettler brand, either instead of or in addition to DMC.

Have you changed strapping materials or techniques during your career? (14)

Ten participants have changed strapping materials, with the trend being away from commercial tapes and toward wider strips of fabric. Four have not changed materials.

Lining and dust cover

How often do you do full linings? (15)

Nine respondents have done a full lining. The frequency ranged from "once" to "more often than most people, but only occasionally." One has "only done one in 16 years but would choose it if over 40 percent of the tapestry were being patched." Six participants have not done a full lining.

What are your full lining techniques? (6)

One of the six respondents attaches full linings while the tapestry is partially hanging, two attach the lining while the tapestry is flat on a table, and three attach the lining while the tapestry is on the tensioner. In some cases all or most of the repairs were being done to the support lining, and in others the lining was tacked on with rows of stitching after stabilization was complete.

How often do you do dust covers? (14)

Half of the participants always use a dust cover and half sometimes do. Of those who sometimes use dust covers, two said that their decision depends on who owns the tapestry and on where it will be displayed and stored. A third generally does not attach a dust cover because of the short length of display and the difficulty a dust cover poses in rolling the tapestry for storage. One participant uses liners behind the tapestries that are attached to the hanging system, not to the tapestry. Another said that although she does not always choose a dust cover, she does always use a header and footer to improve stability and hang. The only comment made by a participant who stated she always uses a dust cover was that she also always uses a header and footer, with the footer, or dust band, being about 5" wide.

What is your preferred fabric for the dust cover? (11)

Five participants specified a light-weight but tightly woven, plain-weave cotton. Five others use a heavier-weight soft cotton sateen. One uses cotton for lighter tapestries and linen for heavier ones.

How do you prepare the fabric? (12)

All but one respondent wash their fabric before using it. Six expressed a preference for machine drying, and one expressed a preference for air drying. Only four specified that they iron their fabric.

What thread and stitch to you use to attach your dust cover? (12)

Expressed preferences in both thread and stitch varied widely. Seven participants specified cotton sewing thread such as Mettler, one specified polyester, and another specified linen.

Seven respondents use a blind or slip stitch on the top edge, and seven use a blind or slip stitch on the sides. One uses a whip stitch on the top, and two use it on the sides. One uses a herringbone stitch on the top. One uses a running stitch on the sides that passes through to the front of the tapestry and back. Seven use the same stitch for both the sides and back, and three use different stitches for each. See Appendix 2.

Do you attach it hanging or flat? (13)

Eight participants attach their dust covers flat and two attach them hanging. Two do either or use a combination of the two, and one does it while the tapestry is on the tensioner.

How many sides are attached to the tapestry and how many are hemmed to themselves? (15)

Fourteen participants attach three sides of the dust cover to the tapestry. One attaches the dust cover to the Velcro slat and not to the tapestry at all.

How deep are your side turnbacks and your bottom hem? (13)

Side turnbacks range from ½" to 6" deep. Bottom hems are between 3" and 10" deep, and two respondents mentioned a double turn back. In general, those who leave more fabric at the sides also do deeper bottom hems, and no one does a larger side turn back than bottom turn back.

Hanging

What setup do you have for hanging tapestries? (12)

Three of the participants have electric hoists and batten systems, and six have pulley and batten systems. Of these, five mention having pants hangers on one side of the batten in addition to the Velcro on the other side. One has Velcro on a wall. Two had no setup at the time of my survey.

How often do you hang tapestries for analysis before you begin your treatment? (11)

Six participants always hang a tapestry for evaluation when condition allows it, and five do not.

How often do you opt for a Velcro hanging system for tapestries? (16)

All but four respondents always use Velcro to hang tapestries. Two sometimes find tapestries with ring systems that they are not able to replace. One participant usually uses Velcro, and another "almost always" does, "except for a curved situation when a sleeve might be better."

What support do you sew the textile side of the Velcro to? (14)

Nine participants sew their Velcro to narrow cotton webbing. Two of the nine occasionally use synthetic webbing. Four use cotton duck, and one who uses webbing also uses duck for tapestries with irregular tops. One sews the Velcro directly to the top galon (which is often a replacement).

How many rows do you use? (12)

All of the respondents use one row of Velcro. Three of these use two rows if the piece is extremely heavy. Three use 2" Velcro, and one uses a row of 4" Velcro for most tapestries but 2" Velcro for lighter pieces. One person has also used a 3" strip of Velcro-compatible fabric.

Do you put Velcro on the sides or bottom corners? (12)

Seven participants have used Velcro on the sides or bottom of a tapestry; five have not.

What stitch do you use to attach your Velcro? (13)

Four respondents use a herringbone stitch to attach Velcro. Nine use a buttonhole or running-stitch variation with a lock or knot at a certain interval. Of the nine, one uses it on the bottom only and uses a blanket stitch on the top, and one uses a herringbone stitch on top. See Appendix 2.

What support do you use for the wall side of the Velcro? (14)

Eleven participants use a sealed wooden slat. Three prefer SmallCorp aluminum slats, and two of the three have used wood in the past. Two respondents also put Velcro directly on the wall.

Maintenance

Do you suggest a maintenance plan to your tapestry clients? (11)

All respondents recommend periodic vacuuming, about once or twice a year.

Do you ever get called back to perform maintenance on tapestries you have conserved? (9)

All but two respondents have treated the same tapestry more than once. Most repeat visits involve routine maintenance, but one participant mentioned that the tapestry had “too tight straps and lining—needed more vertical ease”.

Project administration

How often are you consulted during the decision-making or grant-writing phases of project administration? (6)

Only five participants have been consulted before grants were written. Three have been consulted occasionally, one often, and one always. One respondent has never been consulted.

Do you work closely with the curator in making final decisions on cost and treatment? (8)

Five participants sometimes work closely with curators, two often do, and one never does.

Do you see the roll of the conservator in administrative decision making as having changed in the last twenty-five years? (8)

Half of the eight respondents believe that the role of conservators has not changed, and half believe that it has. Of the latter, three think that it has changed for the better. One participant believes that conservators are being divided into bench conservators and administrative conservators, to the detriment of the former.

Personal Information

How long have you been a practicing conservator? (16)

The experience of the participants in this survey ranges from ten years to more than thirty-five years. Three have between ten and fifteen years of experience; five, between fifteen and twenty years; four, between twenty and twenty-five years of experience; two, between twenty-five and thirty years of experience, and two, more than thirty-five years of experience.

Only one respondent learned textile conservation as an undergraduate in college. Of those respondents with a graduate degree, two completed the NYU conservation program, one completed the Fashion Institute of Technology conservation program, one holds a master's degree in textile physics and chemistry from North Carolina State University, and one holds a master's degree in microbiology.

How long have you been conserving tapestries? (16)

Every participant has working with tapestries throughout the majority of his or her career.

Who have you learned tapestry conservation from, and where? (16)

One of the participants trained with Joseph Columbus and James W. Rice at the Textile Museum in the 1960s and one trained with Joseph Columbus at the National Gallery of Art in the 1970s. Four participants were trained in tapestry conservation at the Metropolitan Museum of Art by Nobuko Kajitani, Alice Blohm, and Tina Kane. Three participants worked under Bruce Hutchison at the Cathedral of St. John the Divine. Two learned from Yvonne Cox, a Belgian conservator who worked at the Isabella Stewart Gardner Museum, and two learned from Marjorie Bullock, also at the Gardner Museum. One participant trained with Jane Hutchins at the Museum of American Textile History (now called the American Textile History Museum), one trained with Kathy Francis, also at the Museum of American Textile History, and one participant trained under both Jane Hutchins and Katy Francis while at the Museum of American Textile History. Two worked with Deborah Bede at the Museum of Fine Arts, Boston. Two participants have done tapestry conservation abroad—one in England and one in Belgium. Other teachers mentioned were Mary Ann Butterfield in Minneapolis, Angela Lakwete in Detroit, and Patricia Ewer at Biltmore House. One participant learned as a child in a family business. See Appendix 3.

Who have you trained that has gone on to specialize in tapestry conservation? (16)

Seven participants have trained conservators who have gone on to specialize in tapestry conservation. See Appendix 3.

DISCUSSION OF THE SURVEY RESULTS

The answers given by the survey participants offer a point of comparison for practicing conservators who are interested in the origin of their techniques and materials or are exploring alternative ways of doing things. Several topics warrant discussion here because they touch on subjects frequently discussed by conservators or the results of my survey differ from previously published trends.

Testing

In the 1991 article by Wolf et al., "Evaluating Textile Treatments: Discussing the State of the Art," Patricia Ewer and Jane Hutchins discussed the results of a survey of testing methods. They reported that when testing for soil, "visual exam is the most common [method]. Little effort to quantify the type and amount of soil has been reported, prompting the question of how we determine that we're cleaning what we wet clean." Regarding dye testing, the authors found that it was generally done for reasons ranging from identifying the historic dye itself to determining whether the dye would bleed during wetcleaning. These results, they stated, "have a great deal to tell us about the assumptions we make individually and as a group" (Wolf et al., 20).

My survey revealed that all but one of the conservators who answered the question about testing perform either blotting or fiber-sample tests for dye fastness and soil removal. In the words of one participant:

I test at different stages of treatment, going from least rigorous to more rigorous. In the examination stage I look carefully to see if the piece has been cleaned before, and I look for bleeding in original and repair yarns. I test the colors that I think are the most suspicious, in small areas on both front and back. I use blotter underneath and a Q-tip with surfactant on top. Usually I don't do clipping of yarns or soaking at this stage. Later if the piece is released I test more rigorously, often the same day as the wash. I do the same tests for soiling.

Only one of the participants in my survey uses visual assessment, and it should be noted that her museum no longer wetcleans tapestries. These results suggest that conservators are testing more thoroughly for dye fastness and soil removal and making fewer assumptions than in the past.

On the subject of testing for fiber identification, however, the results are different. Ewer and Hutchins wrote that "some conservators relied on experience and used visual identification. Some used microscopy to identify every fiber in every piece, while others relied on microscopy for identification of particular fibers distinguished in visual examination" (1991, 20). In my survey only two people mentioned fiber-identification tests, and neither specified using a microscope. This may be because, as conservators learn to recognize tapestry fibers by eye, they eventually stop testing, so that this stage of documentation takes place almost subconsciously as they write reports. In this case we appear to be comfortable making assumptions.

Vacuuming

The old adage "always vacuum through a screen" does not seem to apply to tapestries, for the three survey participants who always use a screen later explained that they only use one in silk areas. Tapestries are an anomaly among textiles in that they are structurally one of the strongest weaves; however, continual display and handling often compromises this structural integrity and accelerates the degradation of silk. Their thick dimensionality, the presence of yarn ends on the reverse, and the tendency to roll tapestries upon themselves means that dust, fibers, and loose yarns are often present all over the tapestry. In

order to successfully remove these one must rely on more than indirect suction while still protecting friable silk. My survey showed that conservators, rather than constantly moving and replacing a screen on a tapestry, use suction control to allow them to treat each area of the tapestry as needed.

Temporary stabilization

Most respondents agreed that although netting helps provide temporary structural stability for a weak area, it does not prevent the loss of deteriorated fibers during wetcleaning. As one participant explained:

Generally, I work on the assumption that if the silk weft (it is usually the silk that is the problem) is so weak that it can't support itself and the tapestry's weight, then it should be expected to come out with cleaning. I use the analogy of a physician debriding a wound; getting rid of the damaged tissue to be able to secure a good wound repair. It does no good to try to preserve silk that is so rotted that it can no longer hold together and carry out its structural function.

Despite what we know to be true, it is still difficult for many conservators to feel comfortable about starting out with more intact silk than one ends up with after cleaning. For some, the answer is to not wetclean the tapestry. However, silk will generally fall out during repairs as well, so avoiding washing will not always prevent the loss of silk. Impregnation with adhesives was tried in the past to preserve this kind of silk, but adhesives, as we have found out, are not the answer. Until a solution is found to strengthen disintegrating silk we must either come to grips with the fact that silk replacement has been a cornerstone of tapestry conservation since its very beginning or leave the tapestry in protective storage for future conservators to address.

Drying

In the past, a large tapestry was often dried in a smaller space by draping it over a wooden rod with both ends resting on a table (Pow 1970). Conservators today dry tapestries flat in all cases but what surface we dry them on is open for discussion. Eleven of the participants in my survey specified the surface on which they prefer to dry tapestries. Seven prefer some kind of screening; and perhaps they, like Pow, believe that tapestries are thick enough to warrant drying from both sides. Three dry tapestries on a solid surface such as polyethylene. One advantage of this preference is that plastic can be put down on almost any floor large enough to accommodate the tapestry, without the expense and storage requirements of large screens. Pow stated that "tapestries must not be left on polythene [*sic*] as it is a breeding ground for mould" (1970, 137–138); however, in most laboratory environments a tapestry will be dry in twenty-four to thirty-six hours with no mould growth.

Drying from one side on a solid surface also allows careful monitoring of dye and soil migration using a wicking cloth. When asked whether they use wicking cloth and whether they dry tapestries face up or face down, the survey participants gave every possible combination of answers. Perhaps this comes from our knowledge that soils and dyes travel along with moisture from wet areas to dry areas or, in the case of drying on a solid surface, toward the side that is up. Therefore, some conservators are inclined to place the face of the tapestry down so that soils and dyes will travel to the back where they are not seen. On the other hand, if the degree of soiling or dye bleeding is significant and a wicking cloth is being used in the hope of carrying the products away from the textile, it also makes sense to place the cloth in direct contact with the face for maximum benefit. In this case soils and dyes do not have to travel from the face through the thickness of the tapestry in order to reach the wicking cloth. The variety of opinions expressed about drying tapestries points up the need for further research into the physics of drying fibers and wicking cloths.

Paint Removal and Use

At the time of my survey one participant was in the process of removing thick paint from a tapestry that had been upholstered onto a wall. It had been hanging since about the 1890s. The paint had both solvent-based and water-based components. The later was removed with a triammonium citrate gel that was rinsed with a detergent solution with a chelating agent and then flushed with water. The solvent-based paint was removed with methanol gel that was left on for fifteen minutes and then swabbed off with liquid methanol. This treatment did not remove all the paint because that would have required too much abrasion in an area with cotton repair warps that tended to break.

Another participant stated that she would not consider treating a heavily painted tapestry. This sentiment was echoed by Liliane Masschelein-Kleiner, who said that paint needs to be “preserved as valuable aesthetic and technical evidence” (1993, 73). Most paint found on tapestries is a crude restoration or color compensation, but some is original. Although the use of paint was outlawed in France and Belgium in the seventeenth century (Masschelein-Kleiner 1993), people called *afzetters* sometimes used paint to provide detail, especially in faces and hands (De boeck et al. 1989). None of the participants used paint on a tapestry; however one laboratory would consider a painted patch.

Tensioners

Although tensioners are standard in tapestry conservation, my survey elicited two notable exceptions. At the Isabella Stewart Gardner Museum during the 1980s, repair work was also done flat on tables using wooden beams to provide localized tension. One participant still occasionally uses this method. A second participant explained, “I don’t use a tensioner for the same reason I don’t block the tapestries. I think that it introduces unnatural tensions that can cause problems later. I flatten out and work individually with each area that needs repair. This keeps the tension of the repair in equilibrium with its immediate surroundings.” The question of whether being stretched on a tapestry tensioner introduces unnatural stress to the piece brings to mind “A Fresh Approach to the Problem of Support for Tapestries” in which Sheila Landi describes a method of hanging tapestries sideways for stabilization, in the direction in which they were woven. If little thought has been given to this issue it must be because, after so many decades of repair on tensioners, no harmful results have been identified.

Restoration and Conservation

Replacement of missing weft is one of the most controversial issues in tapestry conservation. The most common method of weft replacement utilized by American tapestry conservators is a tabby repair or warp twining. Although only two of the participants almost always use restoration methods to replace missing weft, an equally small number said they never use restoration. The majority, therefore, use conservation repairs in most cases and restoration when the situation warrants it. In the words of one respondent, “Treatment includes restoration-type repairs when a loss, damage, or old repair is of a type or magnitude that it distracts or confuses the viewer. This also assumes that the museum’s project budget is sufficient to accomplish restoration repairs.”

The flexibility to decide with each tapestry what approach is taken in a given area is allowed in part by the fact that our most common practice is the relatively low-impact approach of localized darns and patches. A tapestry can be put on a tensioner and repairs begun at one level of thoroughness, after which the decision can be made to increase supplementary patches or to attach a full lining with tacking stitches. If a tapestry is begun with restoration-type repairs it is difficult, if not impossible, to scale back the work to conservation repairs without causing a visual and structural interruption. Similarly, if a tapestry has been begun with a full-support lining it is difficult to then go back and decide to remove an old repair and reweave the area in the presence of the lining fabric. Once again, the fact that most tapestry conservators today work for regional centers or in private practice means that, at any given time, the number of tapestries able to receive a full-scale restoration approach is minimal.

Slits

Three participants brought up interesting points about slits that should be investigated further. One suggests that conservators should always use thread of a neutral color, as was originally done, rather than thread of the color that best matches the area in which they are working. Another told how a tapestry that was being conserved to hang in an 1890s period room was returned to the level of restoration it was believed to have had at that time, which included leaving any slit stitching that was thought to have existed then. A third respondent had this to say about slit stitching:

Some repairs to slit stitching can also be classified as restoration-type repairs. Most obviously this would be when the slit stitching repair is structurally sound but unsuitable and distracting—for example slit stitching that is: 1) the wrong color thread; 2) coarse unsuitable thread; or 3) coarse or otherwise unskillful stitching (misaligned etc.). In these cases removing and replacing the slit stitching is an aesthetic repair, and moves toward “restoring” the original appearance (although of course the colors are different due to fading). Depending on the amount of slit replacement this can be expensive, so establishing priorities is important.

Considering what a major role slit stitching plays in tapestry conservation, is it surprising there is not more reference to it in tapestry conservation literature. The above comments suggest that further discussion of the subject is warranted.

Straps

The textile conservation field owes a huge debt of gratitude to Nobuko Kajitani of the Metropolitan Museum of Art for the contributions she has made to the study of tapestry conservation, and nowhere, perhaps, has she been more influential than in the choice of strapping material. In her 1979 article “The Preservation of Medieval Tapestries,” Kajitani states that straps should be “nonstretching and of compatible strength [as the tapestry and] should be attached in a complimentary tension to the tapestry along the weft direction” (1979, 58). Only six years earlier, her former teacher Joseph Columbus had advocated the use of 3" strips of cotton fabric for straps in “Tapestry Restoration in the National Gallery.” This connection to Columbus may have influenced Kajitani to choose 3" cotton twill tape for straps, which continued at the Metropolitan Museum until as recently as the early 1980s (personal communication, Metropolitan Museum staff and Jane Hutchins). To trace the trend of twill-tape strapping one need only examine the movements of Kajitani’s employees.

In the late 1970s and early 1980s four of the participants in my survey worked for Kajitani—Jane Hutchins, Deborah Trupin, Patricia Ewer, and Alice Blohm (see Appendix 3). When surveyed, three of the four said that they use 3" cotton webbing for straps, and one specified twill weave. In the early 1980s Kajitani also had a close professional relationship with fellow New York tapestry conservator Bruce Hutchison, now deceased, who was then the Chief Conservator of the Textile Conservation Laboratory at the Cathedral of St. John the Divine. Hutchison used 3" cotton twill webbing for straps, as do his successor, Marlene Eidelheit, and his former employee Rita Kauneckas, both of whom participated in my survey. Kajitani’s former employee Jane Hutchins went on to become Director of the Textile Conservation Center, then in North Andover, MA, where she and her former employees and survey participants Kathy Francis and Deborah Trupin continued to use 3" cotton webbing for straps. Francis taught her former employee Deirdre Windsor, now Director/Chief Conservator of the Textile Conservation Center in Lowell, MA, to use 3" cotton webbing. Hutchins later worked at the Museum of Fine Arts, Boston, where she and survey participant Deborah Bede continued to use cotton webbing. The Textile Conservation Workshop and Biltmore House both used 3" straps, and the Minneapolis Institute of Arts uses 2" webbing.

By the mid 1990s the MET was already using strips of cotton duck or cotton sateen in place of cotton webbing. In the last five years at least seven conservators and laboratories have also switched to strips of cotton fabric, often duck. Among the complaints users had about the webbing was that it was too stretchy and in some cases too narrow. At some point many of the users of 3" twill strapping switched to a less stretchy plain-weave strap. The reasons given by survey participants for their current preference for fabric strips include the flexibility in width and the fact that cotton duck and other fabrics seem to react less to atmospheric fluctuations. One participant who continues to use the narrow strapping asks why anyone would use a wider strap with stitching at the sides if the goal is to support the tapestry—narrower straps placed closer together equal more support. Several people have solved this problem without increasing strap number by using wider straps and a stitching pattern that crosses the strap instead of just catching the edge (see Appendix 2).

The most surprising fact about straps to emerge from my survey is that very few American conservators always strap. Instead, most said that depending on the size and condition not all tapestries require auxiliary support materials. One respondent believes that straps only add weight to the tapestry. Another believes that it is the stitching, not necessarily the straps, that does the work, and she will do strap stitching on the reverse of her patching or full lining material. It seems, then, that strapping, which has for so long defined American tapestry conservators in the eyes of our European counterparts, is itself under investigation.

Synthetic Materials

Very few references were made throughout my survey to the use of synthetic materials in tapestry conservation, although they are commonly used in England and Europe. Both the Metropolitan Museum and the Cathedral of St. John the Divine have used nylon seatbelt webbing to hold the Velcro strip that is attached to the tapestry. In the case of the Metropolitan Museum, this extra strength may have been needed to withstand the security attachments that are placed on every tapestry that hangs in a galleries. The Cathedral of St. John the Divine now uses 3" plain-weave cotton tape as a Velcro carrier.

The other instance of the use of synthetics was at the Isabella Stewart Gardner Museum in Boston during the 1970s and 1980s. Marjorie Bullock, then the head textile conservator, recalls that Director George Stout was very interested in synthetics and that the idea of using medium-weight Butterfly polyester fabric on tapestries was the result. This material was used for local patching and well as lining and even in a unique method of "strapping," whereby the panels of the lining were overlapped by 6 inches and this double layer of fabric was reinforced with vertical stitching. Bullock tested the polyester patches to determine their dimensional stability and whether they could sustain wetcleaning, and she found them to be stable. In her response to my survey she said that she would still recommend using this material because it is light weight, resistant to biological attach, inexpensive, strong, and inert.

Washing fabrics

Kajitani was the only survey participant who specified air drying fabrics verses machine drying them. Because one of the main complaints about 3" strapping, particularly the twill variety, is that it shrinks and expands rapidly, more research is needed into the role of fabric preparation, especially machine drying, on the behavior of straps. All but one of the survey participants wash their fabric, usually by machine. One uses unwashed linen to line tapestries:

I use it as it comes from the roll. It is flat, smooth, and easy to work. I find that it handles much better than washed material, and since linings are always removed before cleaning there seems little need to preshrink it. I suppose the presence of sizing could be a point of criticism, but I have yet to see any problem, and I have the chance now to look at work that was done almost fifty years ago.

CONCLUSION

Although scrutiny of articles written by Americans on the subject of tapestry conservation may make it seem as though we have our own methods and philosophies, my survey has brought to light the fact that, like all conservators, we are constantly questioning and improving our techniques and materials. Three main influences on how we conservators go about making decisions are described below.

Training

The major factor in determining a conservator's treatment preferences is probably where and by whom he or she was trained. Most choices, from large—whether to consider a full-support lining—to seemingly small—how many times to prewash fabric—are made based on accumulated work and educational experiences. Because of the delicate nature of our work, conservators are more likely to reflect back upon treatments they have done first-hand than attempt those they have read or heard about. Appendix 3 is a list of tapestry conservation centers and the personnel who supervised and/or were trained there.

Institutional Procedures

A laboratory may have a standard approach to conserving tapestries that affects how employees decide what is and is not the right way to do something. A museum laboratory, for example, is more likely to standardize treatment procedures so that its tapestries are consistent in appearance and materials, than a private conservator working for many clients. Art museums are also more likely to stress the role of the tapestry as a narrative pictorial representation that must remain legible to the public, leading to techniques of restoration that go beyond structural stabilization.

The way a laboratory is administered will also have a bearing on how much allowance conservators are given, or how much pressure they are put under, for creative problem solving. Conservators in private practice and at regional centers often need to be flexible in order to meet the requirements of both the tapestry and the client within the budget available. Just as time and cost were driving forces in the original divergence of conservation and restoration, they remain an impetus in the development of more efficient techniques.

Technology

An often-unrecognized factor in the development of regional techniques and preferences are the facilities and technology available to conservators. A laboratory that does not have a microscope to aid in fiber identification will rely on other methods, such as visual examination. Similarly, a laboratory that does not have adequate ceiling height for a hoist or pulley system will probably not explore methods of attaching straps while the tapestry is hanging. A conservator who trains at one facility may move on to another laboratory where there is access to new equipment and yet not explore how that equipment could change his or her methods.



We American tapestry conservators, although possessing a wide array of techniques and preferences, have many goals in common. As professionals we seek to provide stable repairs that respect the history of the tapestry and the needs of the viewer. We all use materials that, in our views and experiences, are not harmful to the tapestries and that can be identified and removed by future conservators (see Appendix 4). Finally, we all strive to expand our knowledge and improve our methods. Several areas for further research have been identified in this report, and I hope we will continue to come together with our international counterparts to investigate what historic tapestries need to ensure their survival.

Appendix 1. Summary of Margaret Fikioris's 1974 Survey of Mounting Techniques

Name	Institution	Method
Christa C. Mayer-Thurman	The Art Institute of Chicago	2" Velcro was hand-stitched to the tapestry and hung from opposing Velcro stapled onto a wooden slat or the wall.
Irene Popper Rous	Arte Antiga E. Popper	Vertical 10" straps with 12" gaps between were sewn to the back of the tapestry. A lining with a sleeve at the top accepted a wooden bar for hanging.
Elizabeth Ann Coleman	The Brooklyn Museum	A grid of 2-foot-wide linen was sewn to the back of the tapestry leaving 2-foot-square voids. The entire outer border was backed with 1½" Velcro, and the tapestry was displayed on a wooden frame with Velcro stapled to the perimeter.
Karen Finch		The traditional English method would be a brown linen lining that had been washed in hot water, drip dried, and not ironed. The lining was applied loosely with a locking stitch using Clark's button thread in rows approximately 12" apart, closer for weaker tapestries. Velcro was sewn over the lining across the top and a little way down the sides. It was hung from a wooden batten.
Pat Reeves	Los Angeles County Museum of Art	Vertical burlap or cotton strips were sewn to the back 10" apart on a continuous thread so the tapestry could "slide." A cotton lining would be washed, dried, and ironed. Two inch Velcro was sewn to the top and the opposing side was stapled to a wooden board. Had also mounted on cotton in strainers and framed with Plexiglas.
Nobuko Kajitani and Nancy Haller	Metropolitan Museum of Art	Good condition—no support, hung from webbing. Fair condition—either backed with cotton fabric or strapped and then lined with a loose cotton lining and hung from webbing. Bad condition—either backed or strapped and lined, then hung on a permanent frame.
Gertrude W. Markell	Museum of Fine Arts, Boston	Strap lined with linen from Ulster Weaving Company. Webbing was sewn across the top and solid brass rings attached about 6" apart.

Vera B. Craig	National Park Service, Harpers Ferry Center, Branch of Museum Operations	Lined with linen with 1" of ease all around. The lining was tacked in three vertical rows, attached on three sides, and the bottom edge was hemmed. Cotton tape was sewn to the top and brass rings were sewn to it about 6" apart.
Elsie McGarvey	Philadelphia Museum of Art	A frame of wood was attached to the wall and 2" Velcro was nailed around all sides. Velcro was sewn to the tapestry lining. Four-inch Velcro was used for larger tapestries.
James W. Rice	James W. Rice Associates	The support fabric was desized and stretched onto a wooden frame. Linen was chosen for linen-warp tapestries, wool for wool-warp tapestries, cotton for cotton-warp tapestries. The tapestry was pinned onto the fabric as tautly as possible and sewn with sewing thread (beware of nylon and mercerized cotton). A framed, supported tapestry was preferred.
Harold B. Burnham and Mark Burnham	Royal Ontario Museum	No support necessary if in good condition. Otherwise 5"–10" vertical bands of washed cotton or linen webbing spaced 20 cm apart were sewn on with linen or silk thread, followed by zigzag bands in between at 45° angles. A 15" band was sewn across the top, onto which 2" Velcro was sewn. This was hung from Velcro attached to the wall or a lath on the wall.
Katherine Dirks	Smithsonian Institution	One method used rings sewn to the binding on the back of the tapestry. Another was to suspend it by a rod through a casing on the back of carpet stripping sewn onto the back. For hanging in the open, backing with unbleached muslin was preferred. Stitches were done around the perimeter and throughout the center. The hanging device was sewn to the lining only. Periodic vacuuming was recommended. Further suggestions included never using a metal pole or pipe to roll a tapestry, fumigating regularly, and never using tar-lined paper to wrap a tapestry.

Appendix 2. Stitches Used in Tapestry Conservation

Slits

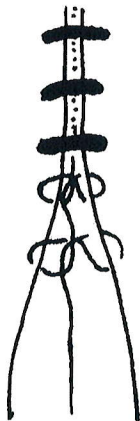
Whip Stitch (overcast stitch, oversewing stitch, overhand stitch, slit stitch, plain stitch)

See Textile Conservation Group, *Directory of Hand Stitches Used in Textile Conservation*, 28 for a diagram.

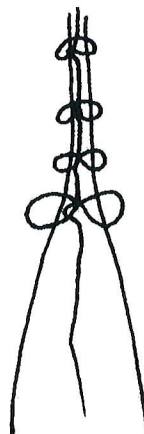
Buttonhole stitch (lock stitch, slit stitch)

See *Directory of Hand Stitches*, 11 for a diagram.

Faggotting stitch (lock stitch)



FRONT

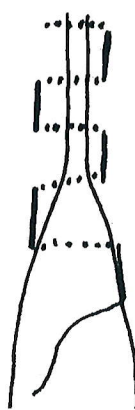


BACK

Ladder stitch (as described by a participant)



FRONT



BACK

Rewarping

Channeling (tunneling, sistering)

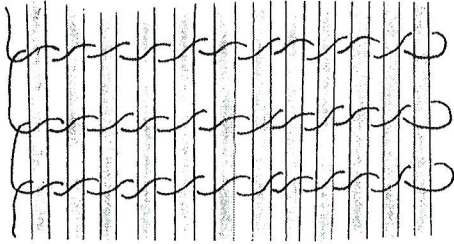
See *Directory of Hand Stitches*, 13, for a diagram.

Repairs

Tabby stitch (horizontal warp couching, darning stitch, weaving stitch)

See *Directory of Hand Stitches*, 15, for a diagram.

Twined darning (warp twining, darning)

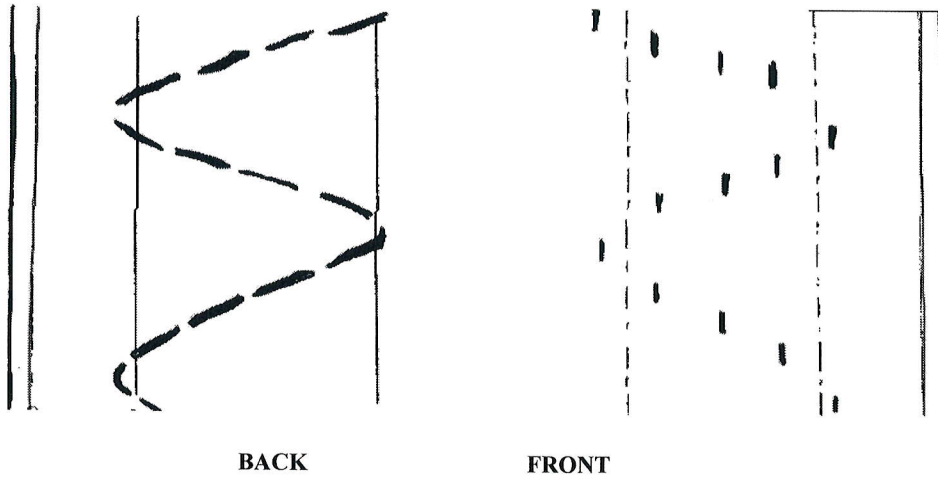


Strapping

Tapestry strap stitch (running hem stitch)

See *Directory of Hand Stitches*, 43, for a diagram.

Diagonal strap stitch



Other

Slip stitch (blind hem stitch, blind stitch)

See *Directory of Hand Stitches*, 36, for a diagram.

Blanket stitch (open buttonhole stitch)

See *Directory of Hand Stitches*, 9, for a diagram.

Herringbone stitch (zigzag stitch)

See *Directory of Hand Stitches*, 22, for a diagram.

Appendix 3. Some American Tapestry Conservators and the Places in which They Were Trained

This list is based entirely on information provided by survey participants and does not include all persons trained, or places providing training, in the United States. Individuals appear under the name of the supervisor at the time of their training. In some cases, people on this list received additional training elsewhere. The following list is in no particular order.

The Isabella Stewart Gardner Museum, Boston, MA

Under Yvonne Cox, from Belgium:
Marjorie Bullock, Marlene Eidelheit
Under Marjorie Bullock:
Betsy Gould, Marlene Eidelheit
Under Kathy Francis:
Kathleen MacKay

The Museum of Fine Arts, Boston, MA

Under Deborah Bede:
Betsy Gould, Meredith Montague

The Textile Conservation Center, American Textile History Museum, Lowell, MA (North Andover, MA)

Under Jane Hutchins:
Deborah Trupin, Kathy Francis, Muffy Austin
Under Kathy Francis:
Deirdre Windsor, Susan Wellnitz, Patricia Silence, Muffy Austin
Under Deirdre Windsor:
Patricia Silence, Tess Fredette, Camille Myers Breeze

The Textile Conservation Workshop, South Salem, NY

Under Karen Clark:
Patricia Ewer, Alice Blohm

The Metropolitan Museum of Art, New York

Under Nobuko Kajitani:
Jane Hutchins, Deborah Trupin, Patricia Ewer, Alice Blohm, Theresa Heady

The Textile Conservation Laboratory of the Cathedral of St. John the Divine, New York

Under Bruce Hutchison:
Rita Kauneckas, Patricia Ewer, Rebecca Johnson-Dibbs, Nadine Stone, Camille Myers Breeze

The Cathedral of St. John the Divine cont.

Under Marlene Eidelheit:
Nadine Stone, Camille Myers Breeze, Valerie Soll, Ann Frisina, Ligia Fernandez, Janina Poskrobko

The National Gallery of Art, Washington, DC

Under Joseph Columbus:
Karen Clark

The Textile Museum, Washington, DC

Under Joseph Columbus and James Rice:
Nobuko Kajitani

Biltmore House, Asheville, NC

Under Patricia Ewer:
Maureen Hark

The Detroit Institute of Arts, Detroit, MI

Under Angela Lakwete:
Meredith Montague

The Minneapolis Institute of Art, Minneapolis, MN

Under Lotus Stack:
Patricia Ewer
Under Mary Ann Butterfield:
Maureen Hark

Europe

Deirdre Windsor—the Victoria and Albert Museum and the Textile Conservation Studio, London
Deborah Trupin—Royal Patrimonium Museum, Brussels

Other

Stanley Derelian—Sarkis Derelian

Appendix 4. Some Suppliers of Products Mentioned in the Survey Results

DMC and Medici yarn: The DMC Corporation, South Hackensack Avenue, Port Kearny, Building 10A, South Kearny, NJ 07032; www.dmc-usa.com.

Mettler thread: www.amefird.com.

Nilfisk vacuum: Nilfisk of America, Inc., 300 Technology Drive, Malvern, PA 19355; 800-NIL-FISK.

Phillips-Boyne fabric: Phillips-Boyne Corporation, 1646 New Highway, Farmingdale, NY 11735; 516-755-1230.

Aluminum slat: SmallCorp, PO Box 948, Greenfield, MA 01302; 800-932-9500.

Polypropylene fabric and cotton sateen: Testfabrics, Inc., 415 Delaware Avenue, PO Box 26, West Pittston, PA 18643; 570-603-0432.

Rainbow Vacuum: Rexair, Inc., 3221 Big Beaver, Suite 200, Troy, MI 48084; 248-643-7222; www.rainbowsystem.com.

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