4-13-2018

Creating a Textile Museum Exhibit: Conservation and Accessibility

Kelly M. Lorenz
Andrews University, lorenz@andrews.edu

J. N. Andrews Honors Program
Andrews University

HONS 497
Honors Thesis

Creating a Textile Museum Exhibit: Conservation and Accessibility

Kelly M. Lorenz

April 13, 2018

Advisors: Stefanie Elkins
Constance Gane, Ph.D.

Primary Advisor Signature: Stefanie Elkins

Secondary Advisor Signature: Constance E Gane

Department of Visual Art, Communication & Design

Abstract

This twofold study engages a collection of early-to-mid-20th century Levantine textiles held by the Institute of Archaeology and Siegfried H. Horn Museum. The first part of the study involves identifying the risks of physical deterioration posed to the collection and then providing a proposal for the storage and display of these artifacts. Keeping the museum's means in mind, the storage plan emphasizes preventive conservation, focusing on minimizing risks wherever possible to keep damage from happening in the first place. The second part provides written interpretive material for the display that informs visitors of the textiles' geographic, physical, and cultural origins.

Introduction

Over the past decade, the Siegfried H. Horn Museum has amassed a collection of contemporary and modern antiquity textile artifacts from the Levant. The museum's recent redesign has left space to highlight some of these artifacts within and alongside the large Bedouin tent, which is set up as an interactive display. Additionally, as the museum's main focus is archaeological artifacts, which are typically made of metals, stone, and other inorganic materials, the facility is not an ideal space for housing and displaying organic textiles, which are affected by different agents of deterioration than inorganic materials. Through discussions with museum director, Dr. Constance Gane and my primary research advisor, Professor Stefanie Elkins, I decided to center my research around two key elements of exhibit design; conservation of artifacts and accessibility to the viewer.

I focused on a sample of the museum's Bedouin textile artifacts from the William G. Dever Collection. Based on these selected textiles, I provide the museum with a proposal for storage and display protocol for them with the intent that it can also be applied to the other textile artifacts in the museum's collections. The proposal outlines the main agents of deterioration posing a risk to artifacts, discusses the textiles' condition and viability for display, and suggests solutions for safer storage and display that are within reason considering the size, staff, and resources available at the Horn Museum.

These findings are based off of a range of works on textile conservation written for conservators, curators, and hobbyists. Describing the agents of deterioration at play for the Horn Museum's textiles is not a presentation of new information, but is instead evaluating which factors are threats specific to the location and artifacts in question. The same principles apply to the storage and display proposals: there is a vast scale of possibility for safe storage and display,

but being familiar with the specific risk factors for the selected textiles changes the approach, as does becoming familiar with the textiles themselves. For example, through my reading of Hilden's *Bedouin Weaving of Saudi Arabia and its Neighbours*, I learned about the terminology and processes of weaving used in the textiles that the Horn Museum has. Based off of this, I can propose with confidence which direction an artifact should be rolled in storage so as to place the least strain on its weakest parts.

The concerns of conservation are held in direct tension with exhibit's role in allowing these artifacts to educate and broaden the museum visitor's understanding of the cultures from which they originate. To broaden my understanding of museum exhibitions, as well as provide a useful finished product for the Horn Museum, I have taken on the role of mediator between the educational and conservational responsibilities of the museum by also writing interpretive material for the display. Presented here as selected examples, this information will take the form of signage, artifact descriptions, or other literature accompanying the Bedouin tent and other textiles on display.

The project gives Horn Museum the materials for presenting a completed exhibit, as well as a written reference guide for the proper handling and appropriate use of the textile collection that outlines changes that can be made to current practice. Research on Bedouin textiles is limited, especially in terms of conservation. As an exception, an article by Omar Abdel-Kareem and Raghad Alfaisal published in the journal *Mediterranean Archaeology and Archaeometry* highlights treatment and restoration of two selected Bedouin textiles for the Museum of Jordanian Heritage. This article focuses on wet cleaning methods with surfactants (detergents) for these artifacts, as well as using Scanning Electron Microscopy for x-ray microanalysis (Abdel-Kareema and Alfaisal, 28). While Abdel-Kareem and Alfaisal's study is useful for

isolated artifacts, their methodology cannot be applied to the Horn Museum's collection because it requires access to professional conservators to perform these procedures and evaluate the type of surfactants that are necessary. It also requires a considerable time and resource commitment that a small museum like the Horn could not make. My aim with this project is provide a specific example within the means of the Horn Museum for applying preventive conservation to their collections whose format could be adapted and re-applied to the textiles within the care of other small museums and historical societies in similar situations.

The textiles in the Horn Museum collection are made of organic fibers: sheep and goat wool and hair. While there may not be significant information regarding their particular histories, textile conservation industry standards can still be applied for all aspects of care in storage and display. Textile conservation encompasses aspects of collections care from assessment of condition and storage plans to restorative work. Textile restoration requires specialized training, but preventive conservation can be enacted in any setting to various degrees. This project focuses on preventive conservation, which seeks to minimize potential damage and stabilize current conditions while taking into consideration the resources available at the Horn Museum.

In order to propose a plan for storage and display, the textiles' state must be evaluated. Following are examples of condition reports conducted for a selected sample of textiles that represent three broad categories of overall condition into which the rest of the Horn Museum's textiles can be grouped. In this report, they provide the Horn Museum staff with general information about the textiles in their care, a starting place for moving forward with display and storage. In the professional world, a conservator conducts these condition reports to be used as a reference point in the future. If an artifact's condition has deteriorated, the conservator will be able to find a time range for the development and extent of new damage. Because many

museums cannot hire a full-time conservator, many conservators perform contract-based work, so a universally readable condition reporting system is highly desirable.

Methodology

Condition Reports

In my reports, I am following the Los Angeles County Museum of Art (LACMA) condition report protocol for textile and costume collections (Lennard and Ewer, 156-162). These are prescribed to achieve the highest readability and usefulness for future conservators. The artifact is examined systematically by area—for flat textiles, first overall observations are stated, followed by an examination of the front and back of the artifact, broken into quadrants when the size of the artifact necessitates it[1]. These quadrants are standardized as upper proper right quadrant (UPR), upper proper left quadrant (UPL), lower proper right quadrant (LPR), and lower proper left quadrant (LPL) (Lennard and Ewer, 157).

Following the LACMA procedures provides the advantage of simplicity, as well as a standardized vocabulary within textile conservation[2]. As the reports are written mainly as a reference for future conservators, ease of use is crucial in order to not bog down the working process. The systematic evaluation, use of bullet points for observations, listing damage first by location before describing it, and use of phrases instead of sentences are four strategies used to achieve maximum readability (Lennard and Ewer, 156).

Methodology: Integrated Pest Management

Integrated Pest Management (IPM) is the conservational procedure of avoiding and monitoring any pest-damage to textiles through maintenance of their storage and display environments. This

---

[1] Depending on the condition of an artifact, it may only be necessary to designate quadrants in one section, so an artifact could be examined, for example, in terms of "front: upper and lower halves" and "back: upper proper left quadrant, upper proper right quadrant, and lower half" or any combination of these, as long as they are clearly labeled in the report (Lennard and Ewer, 161-162).

[2] For example, common types textile damage are categorized into terms of "abrasion, break/split/crack, crease/wrinkle/fold, bulge, and brittle." While in condition reports of paper, brittle's equivalent is "embrittlement" (Lennard and Ewer, 160).

includes possible insect infestations, fungal growth, and rodents. These are often related with other, broader threats known as the agents of deterioration (any environmental source of damage to artifacts) and can be closely linked, causing chain reactions of damage if left undetected and untreated (Boersma, 69-72). In order to prevent these forms of damage to textile collections, instead of using toxic pesticides and other measures that can cause damage to textile fibers, since the 1990s museums have turned to integrated pest management (IPM). This is typically a plan to manage deterioration, focused on prevention and careful monitoring. As outlined by Boersma, an IPM has five steps: avoid, block, detect, confine, and treat (Boersma, 69-70).

Methodology: Agents of Deterioration

The next step in creating a storage and display proposal for the Horn Museum involved identifying the agents of deterioration at work and in potentia with this specific group of Levantine textiles transplanted in the vastly different climate of Berrien Springs, MI. The organic nature of the textiles is highly relevant in determining which agents of deterioration are of primary importance. For wool and cotton textiles, control of light, heat, water[3], and mechanical action is critical to extending longevity (Cardamone, 118). This is not to say that the rest are not important, but instead that these four often link closely with other agents, and maintaining ideal levels of light, heat, and humidity, as well as preventing strain, friction, and movement can drastically reduce the likelihood of other secondary agents.

Methodology: Raw Materials, Dyes, and Process

Because these textiles were donated by William G. Dever, who collected them throughout his career in multiple locations, little exact evidence is known about their provenance. For many

[3] In the absence of direct water damage caused by leaking, humidity is still a formidable force for a wool textile, which can support up to 16% moisture regain (Cardamone, 5).

artifacts, the general location may be known, as well as a generalized time period, but the exact group that produced them is unknown. Though Bedouin weaving is an unfortunately under-researched area in textile history, there are notable studies on the topic, including that conducted by Joy Totah Hilden, as published in her book *Bedouin Weaving of Saudi Arabia and Its Neighbors*.

I have focused on the process of creating the textiles, beginning with the raw materials and dyes, as well as the weaving traditions when writing interpretive material. This gives the visitor an understanding of the environment in which they were created, the importance of the textiles relative to the amount of work required to make them, and insight into the lives of Bedouin, as well as how they have changed throughout recent history. This information is drawn from sources about natural dyes, the history of synthetic dyes worldwide and in the region, a history of trade relations and cross-cultural influences on material culture in the Levant, and weaving techniques.

Results

Condition Report Artifact #23
Object: Part 2 of Runner, (likely) Jordan, Mid-20th Century **Dimensions:** 8 ft. by 33-35 in. **Reason for report:** assessment for display viability
Overall, good structural condition, very good appearance • General: at color boundaries, small gaps, loose ends • General: purple and green dye fading highly evident, other colors uneven, bright orange most resilient
Front Upper half • Scattered, at boundaries of colors, small gaps and loose thread ends • 2 in. from left side, 4 in. down from top, dark stain, 0.5 in. diameter • upper right corner, 2 in. of fraying, warp threads missing, weft threads unraveled (note: warp is different, darker yarn for four inches of this edge, the lighter yarn has not frayed) • at boundary between upper and lower halves, one foot from PR edge, two orange stains, 0.5 in. diameter, one small brown stain
Front Lower half • 8 in. from PL edge, 2 in. from lower edge, 1.5 in piece of tape: still attached, adhesive residue • PR edge, 1 ft. from lower corner, 1 in. fraying: broken warp and weft • PR edge, 4 in. from corner, 0.5 in of thin weft: possible insect grazing, mechanical damage, or just weakness • 1 ft. from PR edge, at boundary of LPR and UPR, 0.5 in green-brown stain on white area
Back Upper half • at boundary of UPL and LPL, 1 ft. from left edge, 0.5 in. faint orange stain

- upper left corner, fraying

Back

Lower half

- at boundary of UPL and LPL, 1 ft. 3 in. from edge, two small brown-green stains, 0.5 in. diameter
- 6 in. up from bottom edge, 1 ft. 17 in. from PR edge, 0.25 in. inverse-cone shaped hole, hardly appears on reverse side: puncture or insect grazing possible

Summary

Artifact #23 is representative of the artifacts in the Horn Museum's collection that are in the best condition. This kilim (flat-woven textile) has no holes that are not inherent byproducts of its production.[4] The fibers are also resilient, and it is structurally sound. This artifact is an excellent candidate for museum display, and is also incredibly visually interesting.

Condition Report Artifact #3

Object: Saddle Bag, Persia/Iran, Early 20th Century

Dimensions: 4 ft. 4 in. (52 in.) by 21-23 in.

Reason for report: assessment for display viability

Overall, split into two square halves, each with fair structural condition, poor condition as a continuous piece.

- General: fading
- General: dirt and stains
- General: border: more faded/whitish stain
- General: scattered 0.25 in. holes, abrasion or insect grazing
- General: brittle hairs in fringes break off when moved

Front

Upper half

[4] The gaps mentioned in the condition report are at the boundaries of small segments of color. In this flat-woven rug, the weft threads are added into the warp only where the weaver wants the color to appear on the finished product. Because the threads do not extend all the way to each end of the loom, small gaps are left behind, which can become more or less pronounced depending when the fabric is stretched or wears over time (Hilden, 143).

UPR

- PR edge, at top corner, 2.5 in. frayed (apparent insect damage)
- PR edge, 7 in. down, 0.5 in to the left, 3 small (2-4 mm.) holes
- upper edge, cord frayed across entire top edge, most still connects two layers
- 7 inches from left boundary, 3 in. L-shaped significant fraying and splitting, disconnected from lower layer, possibly combined mechanical and insect damage.
- 4 in. from left boundary, 4 in. frayed at edge
- left boundary: split from other half and fraying, fraying only extends inward into the fabric a few mm.

UPL

- PL edge, upper corner: 2 in. fraying and splitting of material, torn threads and worn down
- upper edge, left corner, stitching of two layers together unraveled, a single stitch loops around, unraveled completely for 2 in., loose for next 4 in.
- upper edge, 5 in. from right corner, 0.5 in. diameter hole
- upper edge, 2 in. from right edge, frayed

Front

Lower half

LPR

- PR edge, lower corner, 2.5 inches to the left, four inches up from lower edge, 2 in. hole
- 1.5 in. line of small, 0.25 in holes, combined with fraying
- 2 in. from lower right corner, 1 small 2 mm diameter hole, next to 1.5 inch split.
- lower edge, at right corner, 2 in. hole and fraying
- 3 in. from PR edge: 1 in. line of white residue, potentially from previous insect infestation and cleanup: small line of residue intermittent in crease along lower edge
- center of lower edge, one inch hole
- from left corner, 6 in. of heavy fraying and tearing extends up to 3 in. upwards
- 2.5 in. up from lower edge at connection between center panel and border: intermittent splitting
- left edge split and fraying
- 1 ft. up, 4 in. to the right: 4 bright red stains, 0.75 in. diameter

LPL

- lower edge, PL side, seam split 5 in. from corner
- lower edge, PL corner, 1 in., some fraying
- lower edge, PL corner, 5 in. to the right, very frayed seam for 1.5 in., and then complete
- right boundary: split and fraying all the way down, some cord and braiding sticking out intermittently, small strip of fabric at lower right corner (3 in. long) connects to other half of textile.
- scattered: varied fading/staining

Back

Upper half

UPR

- PR edge, at upper corner, 1 square in. fraying
- upper edge: at left, 3 in. of fraying and a 1 in. hole
- left edge: frayed, split from left half

UPL

- PL edge, scattered, less than 0.5 in. holes
- upper left corner, 4 in. square of scattered holes and fraying: causes split between layers
- upper edge: 8 in. from left, 4 in. split, previous repair attempt holding warp fibers together
- upper edge, scattered small holes and splits
- 8 in. from top edge, 5 in. from PL edge, scattered residue: grayish-green/solid
- right edge, connecting segment of fabric worn down and abraded
- right edge: split
- 8 in. down from top, 2 in. from left, 0.75 in. hole
- scattered: many small 0.5 in. diameter or less

Back

Lower half

LPR:

- PR edge, at lower corner, some fraying and splitting
- bottom edge, at right corner, 4.5 in. split and fraying

- left edge, frayed and split from left half of artifact
- overall: scattered dirt, fading, discoloration, abrasion or insect grazing

LPL:

- PL edge: scattered abrasion and fraying
- lower corner, 2 in. hole, splits from other half of fabric
- lower edge: scattered fraying and splitting, small holes line edge
- overall: fading, dirt, stains, scattered holes

Summary

This saddle bag represents a large majority of the Horn Museum's textiles which are in overall fair condition, but do have areas of significant damage that diminish their structural integrity. These have the potential to be used in display, but require special care and support. The fibers of these textiles are weaker and more brittle than those in better condition.

Condition Report Artifact #4

Object: Bukhara Double Bag, Turkmenistan, Early 20th Century

Dimensions: 3 ft. 11 in. by 21-23 in.

Reason for report: assessment for display viability

Overall, poor condition, significant wear and large segments missing

- General: pile worn down and brittle
- General: liquid stains on back side
- General: fraying

Front

Upper half

UPR

- scattered: grazing, abrasion
- upper edge, fraying along border, varying intensities.
- PR edge pile, worn down intermittently

UPL

- upper edge: fraying along border
- PL edge pile, worn down intermittently, warp visible in patches up to 2 in.

Front

Lower half

LPR

- lower corner, 0.5 in. fraying
- scattered: white stains, various sizes
- scattered, grazing, abrasion
- PR edge pile, worn down intermittently
- center panel: 4 in. split open, seam missing at lower edge

LPL

- lower edge, split and fraying inward up to 1.5 in all the way to boundary with LPR
- lower edge, holes through to next layer intermittently, up to 4 in.
- dyed weft threads removed more than un-dyed warp threads, possible insect damage
- PL edge pile border, worn down intermittently, especially along the edge boundary
- intermittent, holes up to 1.5 in., splits and tears along edge

Back

Upper half

- PR edge pile: worn down and missing intermittently
- 6 in. from top edge and 6 in. from right edge, 1 in. circular patch, previous patch/repair, forms bulge
- upper edge: fraying
- upper edge, scattered, small less than 0.5 in holes

Back

Lower half

LPR

- lower edge, fraying
- lower edge, scattered holes, up to 0.5 in.
- 3 in. from PR edge: large section of material missing via abrasion, tearing, fraying, or insect damage, one foot long, forms three separate inlets upwards up to 6 inches. backing material and front layer worn through, small segments of warp threads cover about one fourth of this area, not attached on both ends
- lower right corner, split detaching layers of fabric
- right edge pile: worn down to weft and missing intermittently
- 3 in. from right edge, 10 in. up from lower edge, small dark brown line of stain, 2 in.

LPL

- lower PL corner: 2 in. fraying, pile worn away
- left edge, pile worn away significantly, especially red and blue-dyed pile
- scattered, small 0.25 in holes in backing material
- scattered, white residue, 0.25 in. diameter spots
- lower edge: split and fraying intermittently

Results: Identifying Agents of Deterioration

Textiles are affected by a wide array of agents of deterioration, and in order to prevent and control them, they must be identified. Protein-based fibers (wool, fur) are decayed (oxidized) by the presence of light; appearing yellow (Cardamone, 6). This also causes them to lose strength, and become brittle and stiff (Boersma, 23). Humidity changes cause fibers to absorb and release moisture, expanding and contracting, which causes friction eventually leading to breakage (AIC, 2018). Degradation of textiles can be noted in fading, yellowing and browning of undyed textiles, loss of strength or flexibility, acidity (musty smells) (Boersma, 28-29).

Improper attempts at storage can also cause damage. Storing a textile in a form that causes tension or uneven tension, stretching due to weight of the material, as well as any folds and creases, will damage the fibers as well, causing deformation, stretching, and possibly breakage at points of tension, creases, and seams (Bittner, 11). Additionally, textiles that are held in tension will respond more quickly and drastically to other agents of deterioration (Boersma, 25). Considered to be the greatest cause of damage, improper handling and treatment of textiles by caretakers can have a detrimental impact (Bittner, 10). The textile itself can be the source of damage. In some cases, the way that a textile is made and chemicals used in the dyeing process will cause completely inevitable degradation, called intrinsic decay (Fabbri, 351)

Environmental factors are critical, as they have a universal impact on the artifact. The temperature at which a textile is stored and displayed will affect the rate of degradation, higher temperatures accelerate these processes (AIC, 2018). Wool also becomes stiff and brittle due to hydrolysis: alkaline and acidic conditions break down fibers at a molecular level (Barr, 8). The presence and accumulation of dust and dirt on a textile can damage fibers, but also increases the risk of damage from microorganisms and insects (Boersma, 28).

Materials found in the exhibit and storage environments can also be hazardous, emitting vapors (off-gassing) that affects the chemical composition of fibers. Formaldehyde, found in plywood, chipboard, formica, Masonite, fiberglass, cardboard, paper, polyester, insulation foam, and wood, creates formic acid, which is detrimental to textile collections (Boersma, 85). Another cause for alarm is acetic acid, which can be found in wood, plastic, polyester, and Scotch tape. Sulfur, which causes a loss of tensile strength in organic fibers can be released by some types of paint, adhesives, leather, and even wool itself. Though difficult if not impossible

to avoid, organic materials can release ammonia as they age, damaging other artifacts around them (Selwyn, 2017).

Insects cause damage to textiles primarily through feeding off of them, inhabiting them, or leaving debris behind in them. Webbing clothes moths (Tineola bisselliella) lay eggs in collections that are usually not detected by visual inspection. The bugs often lay more than 100 eggs at once in a protected area of the textile. When these eggs hatch, the small larvae eat the textile fiber, leaving holes in the fabric and excreting droppings, further soiling the material. They form cocoons and reach adult moth stage. In this stage, they do not eat, but will lay more eggs, repeating the cycle (Choe, 2013). The case-bearing clothes moth (Tinea pellionella) has a similar life cycle to the webbing clothes moth, but the larvae camouflage themselves by forming a case of the textile's fibers around themselves as they eat the surface of the material (Choe, 2013).

Carpet beetles feed on the animal matter in textiles as larvae and any dead animal matter available (Choe, 2012). Cockroaches pose a similar threat to textiles, and eat at all stages of development (Merritt and Reilly, 113) Bristletails, a group of insects including silverfish and fibrebrats, eat cellulose and carbohydrates. They can cause damage to the storage materials of textiles as well as textiles themselves. One way to prevent this is to control the humidity of the collections, as they only survive in a relative humidity of 70% or more (Merritt and Reilly, 112-113).

Fungi can grow on textiles, causing discoloration and deterioration of fibers. They typically require a relative humidity of 65% to grow, but it is recommended to maintain a relative humidity of 60% as a preventative measure (Strang and Dawson, 2).

Results: Integrated Pest Management

In order to prevent these forms of damage to textile collections, instead of using toxic pesticides and other measures that can cause damage to textile fibers, since the 1990s museums have turned to integrated pest management (IPM). This is typically a five-step plan to manage deterioration, focused on prevention and careful monitoring. As outlined by Boersma, and the IPM's five steps are: avoid, block, detect, confine, and treat (Boersma, 69-70).

Avoid: the first way to minimize pest damage is to make the museum environment unfriendly to insects and fungi. A relative humidity (RH) below 60% discourages growth of fungi and mold, as well as insects that may feed on it. Air circulation and ventilation, as well as climate control, can be used to avoid condensation in the storage and display areas (Boersma 69-70). While it may seem baseline, keeping dirt away from collections (including dirt from food) minimizes the collections attractiveness to insects. Because many insects inhabit birds' nests or enter the museum with visitors, even maintenance of the outside of the building plays a role in the step of avoidance: cleaning and repairing gutters, removing birds' nests, trash, plants, and fungi are all important to protecting the textile collection (Pinniger and Winsor, 5).

Block: The next step in IPM is to block agents of deterioration from entering the museum. Simple steps, such as making sure screens are on all windows, and cracks and openings in the walls are sealed, can keep insects outside. As buildings can shift in response to weather, they should be inspected in spring and autumn to make sure that there are no new gaps in the construction. Additionally, filters of vents and air-conditioning should be cleaned and replaced when necessary. Even with a perfectly maintained structure, the museum still functions to educate visitors, who can track in pollutants and insects on their clothing. Coat racks and storage

lockers can minimize the amount of outside agents of deterioration entering display areas, and museum employees should be prohibited from wearing outside coats into the collections storage. Beyond this, the artifacts themselves are often the cause of insects and fungi entering the collections. This occurred at the Horn Museum with the Dever collection, which arrived infested with moths. To prevent spreading of these infestations, new acquisitions should be quarantined until they are stable (Pinniger and Winsor, 7-9).

Detect: artifacts should be inspected for damage regularly, so that any insect infestation or mold growth can be stopped before spreading too greatly (Boersma, 70). Additional signs to look out for include excrement from insects, living or dead insects, shed skins, surface growth or colored stains (Pinniger and Winsor, 15).

Confine: As with new acquisitions, when insects or fungi are found, the artifacts affected should be isolated to prevent further spreading. The use of refrigeration can aid in this process (Boersma, 70).

Treat: IPM focuses on prevention, seeking to avoid the necessity for treatment, as this only occurs once damage has been observed. Modern museum theory emphasizes the use of non-toxic cleaning methods whenever possible, although with insect infestations, toxic chemicals may be required (Boersma, 71).

Results: Storage Plan

The Horn Museum is situated in a building that was originally designed for use as a bank, and has now been converted into storage, gallery, classroom, archaeology laboratory, and office space. The old bank vault comprises the most specialized storage space available. It uses large, metal cabinets with fully-closable doors, sliding shelves, and additional storage racks above this.

In addition to this, several extra rooms house artifacts and research-subjects in open shelving, stored in cardboard boxes, open plastic crates, and closed bins. At this time, the textile artifacts are stored folded and stacked on open shelving units. While wool is stronger and less likely to be wrinkled than other natural fibers, like silk, this does not mean wool textiles are not damaged by being folded (Cardamone, 4). In short, when it comes to museum textiles, folding must "be stopped" (Bisht, 41). Folding textiles will almost always cause greater mechanical damage than other storage methods, and should only be practiced when there is no other option[5].

The museum's open shelving units are not ideal for textile storage, as they allow the entrance of dust (which attracts insects, which attract rodents…) and light, provide no buffer for humidity and temperature changes, and also leave high potential for accidental abrasive human contact. However, measures can be taken to modify these into better storage space. By attaching a special dustcover or curtain over a shelving unit, light and dust can to some extent be blocked out. Boersma recommends a cover made of unbleached cotton calico (a material often used in other aspects of textile care as well) as it will also serve as a buffer to relative humidity in the storage environment (Boersma, 84). If the museum is able, large textiles are best stored hanging in rolls to decrease tensile force and stretching, as well as keeping them off of the ground where they are more likely to accumulate dust, insects, and other pests (Bittner, 10).

Wood, metal, and cardboard, commonly used in storage, provide particular advantages and disadvantages in conservation. Wood acts as a buffer for climate shifts by absorbing moisture, which also causes it to warp, which can affect textile artifacts stored on wooden shelving. Wood can also release formic and acetic acid, so direct contact with artifacts should be avoided. Instead, a barrier, such as polyester film or another seal can be applied to the wood.

[5] Even when this is the case, special precautions should be observed for folded textiles, taking care to pad all overlaps, avoiding creases, and trying not to stack too much weight over any particular fold. It is additionally critical to never fold a textile on a seam, as these areas are already weaker and predisposed to breakage (Bisht, 41).

Additionally, if an insect infestation occurs, it will be more difficult to spot insect droppings or casings on the brown surface of wood (Boersma, 85-86).

Metal, like stainless steel or enameled metal, does not release harmful chemicals or warp, but it does not serve as a buffer for humidity changes, and can even form condensation (Bittner, 9). As with wood, a barrier is recommended, such as acid-free cardboard boxes to hold the artifacts. Acid-free cardboard boxes or acid-free buffered boxes are one of the easiest accessible means of safe storage for a smaller museum setting. The organic fibers of the cardboard serve as a buffer for climate and keep out dust (Bittner, 11). Caution should be taken when choosing the correct cardboard boxes or buffering materials[6]: neutral pH is ideal for wool textiles, but some products advertised as "acid-free[7]" are not neutral. Some acid-free products are buffered further to an alkaline pH, which is harmful for wool fibers (Smithsonian, 2018).

Wherever possible, the Horn Museum should utilize the shelving facilities they already have, modifying them for textile collections by providing barriers for dust and climate, such as the cotton calico and pH neutral cardboard products described above.

Storage Proposal: Artifact #23

Because of the length of this tent runner (eight feet), it should be stored rolled around a tube[8] with an acid free buffer[9]. The tube should have about six inches of extra space left over on the

---

[6] The Smithsonian Museum Conservation Institute provides a list of conservation materials suppliers at *https://www.si.edu/mci/english/learn_more/taking_care/acidfree.html*

[7] "Acid free" cardboard and paper products are products which have had lignin, the acid-producing component, removed (North Carolina Museum of History, 2018).

[8] The tube's diameter should be wide enough that the textile can be rolled around it easily, if it is in any way a strain to bend it around the tube, it is too small (Frisina, 2009).

[9] The tube can be metal or even cardboard, as long as a buffer is provided for the pH of the tube, and to prevent condensation if it is metal. While acid-free cardboard is highly recommended, it is also a very expensive

ends so that it can be hung up without putting additional pressure on the artifact. Before rolling, the textile needs to be placed completely flat to avoid any wrinkles or creases. "As it is often not possible to obtain tables of similar height, the rolling of large textiles may be done on the floor" (Boersma, 90). The floor of course needs to be cleaned, and then a clean barrier placed over the entire area underneath the textile. To prevent friction and mechanical damage, acid free tissue paper or unbleached cotton calico can be placed on top of the textile before rolling it[10]. This will keep the fabric from rubbing against itself, stretching, and snagging. Though this appears feasible as a one person job since the runner is only 35 inches at its widest, there should really be one person at each side of the roll to prevent uneven stretching, which will cause significant strain over time (Boersma, 89).

Once rolled, the tube should not be placed directly on the ground, as this will put uneven pressure on the lower half, crushing the fibers over time. Instead, the extra ends of the tube can be propped up on a "cradle[11]" in the shelving unit. The complete rolled textile should be placed in a protective and non-corrosive covering to keep out unnecessary light and dust. For easy identification, a photo of the textile and all registration data should be attached to the outside so that it will be easy to find, and will not have to be moved or unrolled unnecessarily (Newberry, 2017).

Storage Proposal: Artifact #3

---

option, so alternative methods are often desirable and more applicable, especially to a small museum. In a visit to the Science Museum of Minnesota, I learned that many of their collections' textiles are rolled around cardboard tubes repurposed from other shipments to the museum, such as exhibit construction materials and long fluorescent light bulbs (Newberry, 2017).

[10] This is described as an "interleaving layer", and is not always critical, but can be useful as extra protection, especially for more fragile textiles (Boersma, 91).

[11] These can be easily constructed out of materials already on hand at the museum, or again out of materials constructed with an acid-free buffer. The Minnesota Historical Society's YouTube channel shares a helpful source with detailed instructions and demonstrations of how to roll a textile, as well as how to create these cradles when additional storage racks are not available (Frisina, 2009).

The primary concerns with storing this saddlebag are the fragile connection between the two halves where the artifact is split[12] and the brittleness of fibers, especially the dark brown hair in the fringes. This artifact could reasonably be stored in a box or rolled. A box carries the advantage of being able to fit multiple smaller textiles inside, and the ability to stack multiple boxes high on shelving can be desirable in certain storage conditions. If this textile were to be stored in a box, special care would need to be taken to ensure that it was not folded along any areas of major damage. Folding weakens fibers by causing extra strain on a small area, but padding each fold evades this issue (Bisht, 41). The artifact should be folded only as many times as is necessary to fit into the box, with each fold padded by a roll of an acid-free tissue paper. Before folding the saddlebag, a large piece of unbleached cotton calico must be placed underneath it. This will act as a sling for lifting it into and out of the box with the least amount of unnecessary jostling or strain[13]. The entire assembly with a sling can then be picked up and placed into the box for storage, and gently set on a shelf. Box storage is effective for smaller textiles, of which the Horn Museum only has a few. If boxes will not be accessible[14], even a fragile textile can be rolled (Frisina, 2009). Since most of the textiles at the Horn Museum are too large to practically be stored in boxes, it may be easier to store this artifact rolled. In this case, the same procedure will be followed as was used for artifact #23.

---

[12] The separation between layers is also a concern, though more so for display.

[13] Frisina provides a demonstration of this procedure at the following link: https://www.youtube.com/watch?v=OYI5ExSdUHs

[14] Acid-free cardboard boxes large enough to house this artifact cost between $25 USD and $40 USD when purchased individually. They can cost somewhat less (closer to $18-20 USD) if purchased in a group of five, the most the Horn Museum would need, since most of its textiles are much too large to fit into a box. See the below listed suppliers of conservation materials for more information.
http://www.conservationresources.com/Main/section_9/section9_01.htm
http://www.museumservicescorporation.com/scat/st.html
https://www.universityproducts.com/corrugated-textile-storage-boxes.html

Storage Proposal: Artifact #4

This artifact represents the most heavily damaged grouping of textiles in the Horn Museum's collection. The large sections of wear and missing warp and weft threads present a significant challenge for storage, and will become increasingly more important when it comes to finding a display method. The pile border along the right and left edges of the artifact makes it especially difficult to store as well, as it cannot be rolled quite as easily as a textile that is completely flat woven. Due to its size (three feet eleven inches by twenty-one to twenty-two inches) it may not be possible to store flat. Boersma states, "If the size of pile fabrics permits, they are best stored flat (e.g. in boxes or drawers). They should not be stacked, as this will crush the pile" (Boersma, 93). If the shelving permits it, the artifact can be stored flat on a buffered board, some even recommend gently stitching the artifact to the board (Landi, 161). Instead of placing it directly on the shelf, the board will allow the artifact to be picked up and transported. This keeps the textile secure, and can even be repurposed fairly easily into a flat display option.

As with artifact #3, it can be stored in a box when a sling is used, but special care needs to be taken to pad the areas of pile, and the large, greatly damaged section needs additional support as well. One way that this support can be provided is by attaching a supportive backing to the material in the weakest areas. This lining should be made of unbleached, un-dyed cotton, and "should never…add to the burden of the original structure" (Landi, 148). This should be very gently and carefully stitched to the original material, "always inserting the needle between, and not into, the threads of the material" (Finch, 123). This is important, as sewing into the original threads causes punctures and damages them, which is counterproductive to the entire purpose of preservation. Since the pile border is so brittle and jostling it can cause breakage, a very fine net can be placed over it for added protection against abrasion. This can gently be

stitched onto the textile, avoiding placing extra stitches in the weakest and most fragile areas (Finch, 123). These alterations begin to cross the line towards restoration, and should usually be conducted by a professional, or at least in consultation with a professional to prevent accidental damage, since "a primary principle [holds] that restoration methods be reversible" (Cardamone, 3). Because of the pile border, it is not ideal to store this artifact rolled, as the uneven depth of material will cause irregular stretching when wrapped around a tube unless an interleaving layer is able to support it evenly.

Results: Handling Instructions

In general, the best way to handle a textile artifact is not to. Any time that a textile is moved or picked up, pressure is applied, and the possibility for mechanical damage is of course implied. However, it is of course necessary at times to move textile artifacts within collections. Whenever possible, museum storage should remain constant, and not be re-arranged. There are going to be times when textile artifacts need to be moved to different areas of the museum, or moved from collections up to the exhibit area. Additionally, researchers consult museum textiles from time to time, so having a clear set of instructions ahead of time is helpful for the museum staff to apply protocol without having to necessarily remember a long set of additional rules. Anyone who handles any of the museum's textile artifacts should only do so with washed, dried hands, no jewelry or perfume, and if possible, clean cotton gloves (Bachmann, 8). Sweat as well as oils from the hands, and especially those from lotions and perfumes, will inevitably transfer to the textile, and can corrode it (Boersma, 127). Supporting a textile artifact is always important whenever it is to be moved. If proper storage procedures are already in place, this is easier to do, as slings from storage double as slings for transport. If a sling is not used, artifacts should be

carried with two outstretched arms or on padded tray or cart (Bachmann, 8). In summary, the most important aspects of handling are limiting contact and using caution[15].

Results: Disaster Response

Due to the climate of Berrien Springs, Michigan, the museum's collections potentially face hazards of flooding, burst pipes, leaks, fires, etc. While in an extreme situation, damage to the artifacts can't be prevented, some simple steps can be taken to minimize unnecessary destruction and make the recovery process easier. First, textiles should not be stored on the ground or near pipes whenever possible (Boersma, 84). Second, the museum staff should have a list of nearby conservators on hand, so that they can easily consult a conservation professional about how to move forward after widespread collections damage (Bachmann, 12).

The following table provides a list of textile conservators closest to the Horn Museum, obtained from the American Institute for Conservation of Historic and Artistic Work.

[15] How to remove accumulated surface dust becomes a common question in dealing with textiles. Even if a textile is in good condition, it should never be treated directly with a household vacuum, as a carpet would be. Instead, special consideration should be given and extra care taken when addressing this issue. The National Parks Service Conserve-O-Gram series provides a useful guide for small facility staff to follow when faced with the question of how and whether or not to vacuum a textile artifact: https://www.nps.gov/museum/publications/conserveogram/01-06.pdf

Name[16]	Holly Lundberg	Alison Whyte	Kathleen Kiefer
Email	hollylundberg@comcast.net	whyteaw@gmail.com	materialculturecons@gmail.com
Phone	(312) 799-2069	(773) 330-6887	(312) 443-3310
Specialties	Archeological Textiles, Ethnographic Textiles, Flat Textiles	Archeological Textiles, Ethnographic Textiles	Flat Textiles (collection samples)
Services	Treatment, Examination, Conservation Planning	Treatment, Consultation, Pest Control, Collections Management	Materials testing
Materials	Fibers, Leather, Papyrus, Textiles	Fibers, Leather, Papyrus, Textiles	Textiles
Website	https://www.chicagohistory.org	https://oi.uchicago.edu	n/a

[16] Information in tables by a search for textile conservators within 100 miles. (AIC, accessed March 21, 2018 http://www.conservation-us.org/membership/find-a-conservator/results/?specialty=08&travel=False&zipcode=49104&radius=100#.WrLynZPwbOS)

Results: Display Recommendations

The same temperature and humidity regulations that apply to textiles in storage[17] also apply when they are on display in an exhibit. While in permanent storage, textiles can be completely hidden from light, reducing this form of damage, but light is a necessary factor of a display. Control is incredibly important to display lighting: proximity to windows and doors can be difficult to negotiate if not addressed early in the process of designing and creating an exhibition. The exhibit area of the Horn Museum does not have any windows allowing direct sunlight to enter. But on one end of the tent, part of the wall is a glass window to the entryway. Two panes of glass separate it from the outside, and the tent is of course made for use outside in direct sun.

Nevertheless, covering this window would prevent unnecessary degradation to the tent and any other textile artifacts displayed alongside it. At this time, an embroidered dress stands in front of the window on a mannequin. This thinner material and fine embroidery is more greatly threatened by light than the sturdy walls of the tent. Once sunlight has been addressed, artificial lighting becomes the next culprit of degradation. Bachmann recommends light levels of five footcandles (50 lux), and at most ten (100 lux) (Bachmann 80).

Display Guide Artifact #23

This artifact is in very good condition, making it a prime candidate for display. Because the goal of the museum is to showcase these woven artifacts in context, I am including a proposal for how

---

[17] Bachmann recommends a relative humidity between 40-50%, and temperature ranging from 55-68 degrees Fahrenheit, unless it will be too difficult to maintain these. "Stability of relative humidity and temperature at a set value is more important than the precise figures…if temperature can only be held steady at 70 degrees Fahrenheit, then it is more important to opt for the stable value than risk cycling of temperature or humidity" (Bachmann, 80).

to display this textile as a hanging within the large Bedouin tent exhibit[18]. Attaching this textile directly to the walls of the tent will add strain to the tent, so lessening the tension with supporting materials can keep the tent wall from stretching and weakening over time. Due to its size, this textile would by default hang lengthwise like a tapestry, putting the strain mainly on the weft threads (Finch, 74). Conservation procedures for tapestries are geared mainly towards wool and silk works in much more fragile condition due to age than this artifact, but guides for hanging tapestries can still be applied, the structures are similar. Finch states: "the best and safest way to hang a textile is by the use of Velcro" (Finch, 84). The fastener should not be applied directly to the textile, but instead a barrier should be placed in between. This could, for example, be a durable cotton twill tape that the Velcro is sewn onto, and then is itself attached to the textile with a zig-zag stitch. Because the textile may need to be rolled at a later time, the fuzzy side of the Velcro should be the one attached to it, so that it does not stick to itself when rolled. The same process can be used to attach Velcro to the tent wall, or alternatively, a frame could be made and fitted with Velcro (Finch, 86-87). This isn't the traditional way to attach a hanging to the tent wall, but it prevents prolonged strain to the tent, and also allows for the textile to be rotated out for a different artifact more easily. The frame could then be hung from the ceiling or another supportive structure by sturdy and relatively unobtrusive cables.

---

[18] Jain's article "Museum and its Communities" discusses the role that a museum plays for "museum communities." First, that of the artists and craftsmen, second, the curators and collectors, and finally the public, the consumers of museum information. This article emphasizes a philosophy of the museum as serving all three of these communities, and listening to the concerns of all when choosing what to display and how to do so (Jain, 52). A large woven piece like artifact #23 is often used for multiple purposes throughout its lifetime. Hilden documents a similar sized textile stating "This tent divider…was called a *mafrash* (rug) by its owner, who also used it as a *hawdaj* cover and saddle blanket" (Hilden, 35). It is reasonable to suggest that this artifact could at some point be used as a tent hanging, so displaying it in this setting, with additional consideration given to lessening the load on the tent wall, seems appropriate to serve the museum's communities.

Display Guide Artifact #3

The shape and condition of this artifact present unique challenges to display. Of primary concern, of course, is the large split down the center of the artifact. If it were to be displayed in any way besides completely flat with no incline, this split would need to be reinforced. A backing material the main color of the artifact could be attached behind the split area connecting both sides. It is best to hire a professional textile conservator for this task, or at least someone who is very skilled at hand sewing and familiar with many types of fabric: "If the stitches are too tight they may cut into the old fabric and cause damage…if the stitches are too loose they will not only be ineffective but will also allow movement between the support and the textile" (Finch, 96).

Since this is a saddlebag, it would be used hanging in a u-shaped position with each of the sides sloping down. A slightly altered version of this environment could be created for display, allowing the original purpose of the artifact to be clearer to museum visitors who may not be familiar with interpreting the visual information presented by this artifact. A display that sets the artifact at a 45-degree angle on both sides, with the top curved can be created using polyethylene corrugated sheets, and then covered in un-dyed fabric (Boersma, 120-121). The artifact (with supportive backing) can then be draped over this display, fully supported all the way to the end. To avoid significant strain to any one area, small rows of stitches can be used to couch the artifact to the board as well. This same setup can be used to display the textile along one plane, again with a 45-degree angle, as long as the fraying and split areas are reinforced with a backing material and the supportive framework. If the artifact is displayed on one plane, then a Velcro strip just as instructed for artifact #23 should be added to secure it to the frame.

Display Guide: Artifact #4

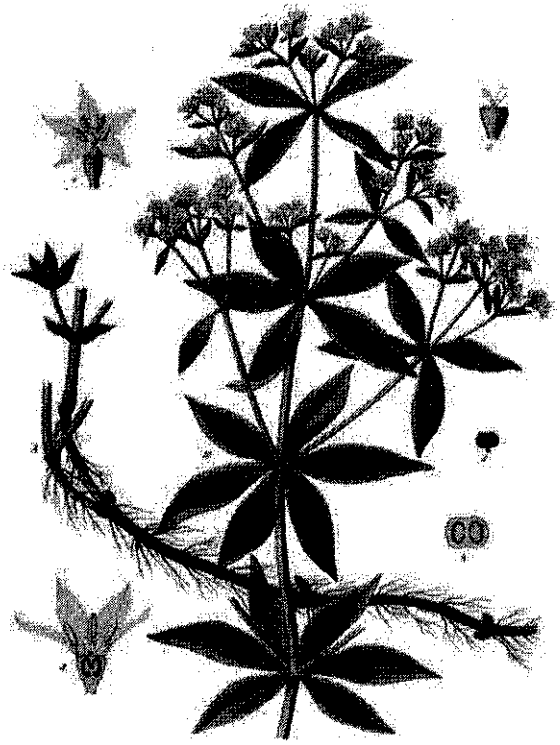
Fragile textiles present the most difficulty for display, but they still hold cultural and educational value. Even the most fragile archaeological textiles can be displayed and conserved[19]. To an even greater degree than with the previous artifacts, supportive backings and stabilizing display conditions are critical in dealing with heavily damaged artifacts. A supportive backing should be attached to this artifact over the large area of fiber loss in the back LPR quadrant. This can follow the same procedure as for artifact #3, with special attention given to stabilizing the fraying edges. If the net mentioned earlier is not already applied, it should be attached to the pile border before display (Finch, 123). This will keep fibers from moving unnecessarily and causing mechanical damage to themselves through friction. The supportive display used for artifact #3 will also be the appropriate size and shape for this double bag, so these two artifacts could be rotated: one being held in storage while the other is displayed. If not, a similar supportive structure should be made for this artifact.

Results: Display Information

Below is an example of how this information could be displayed. It could be printed using the same type design as other signage in the museum and mounted on poster board.

[19]Archaeological textiles are often incredibly brittle, or only remain in fragments due to weathering and age. Because of this, they are often held in protective frames and stored and displayed in the most stable way possible (Boersma, 112).

Madder (Arabic: *fuwwah*)



Source: https://commons.wikimedia.org/wiki/File:Rubia_tinctorum_-_K%C3%B6hler%E2%80%93s_Medizinal-Pflanzen-123.jpg

Location:
Mediterranean and Asia Minor

Color obtained:
Red, orange, yellow, brown

Use:
Madder roots are collected, and can be stored dried. When it is time to use them, they are cut into small pieces and soaked in water. The dyer heats the water (called a dyebath) and then adds wet wool that has already been treated with a mordant. The dyebath and wool are then kept at a simmer for reds, oranges, and yellows. If it is boiled, the madder will dye the wool brown.[20]

What is a mordant?
Mordants are used with additive dyes, like madder, where another chemical is required to help the dye attach to the fibers. A mordant can also be used to change the color that the dye produces. Alum, chrome, copper, tin, and iron are used as mordants.[21]

Yarn
Bedouin weavers spin yarn from wool, cotton, goat and camel hair. However, since the 1980s, spinning yarn by hand has been largely abandoned in favor of synthetic yarns, which carry brighter colors and don't draw moths and bugs.

[20] Van Stralen, 74.

[21] Hardman and Pinhey, 8-10.

Warp and Weft
The yarns running lengthwise on the loom are called the warp. Typically, these are the stronger yarns in the weaving. The horizontal yarns are called the weft. These are usually thinner than the warp yarns, because they are often more pliable so that they can be worked with.[22]

[22] Hilden, 143-144.

Discussion

Through following the methodology of preventive conservation, my project provides the Horn Museum with a specific resource it previously lacked: procedures to store and display their historic textiles. While this information is available, it requires extensive reading to determine which methods are necessary and possible for the specific concerns of the museum. During my interview with Rebecca Newberry at the Science Museum of Minnesota, which has a well-developed conservation program, I learned that the Horn Museum's situation is not unique: many smaller museums and historical societies house artifacts that they do not have the resources or trained staff to maintain (Newberry, 2017). This applies especially to textile artifacts, which are incredibly susceptible to the environmental conditions present in buildings that were not originally designed to be museums.[23] In addition to creating a list of step by step storage, display, and handling instructions, I hope that my research provides the Horn staff with a source to reference when seeking grant funding for conservation efforts, or as a support in discussions with campus authorities that hold dominion over the temperature regulation of campus buildings[24].

My primary accomplishment in this project is assessing the available information about conservation, and finding a reasonable goal for the Horn Museum to follow with an understanding that a full-time conservator cannot be hired by a museum of this size. Many of the ideal practices of conservation are simply impractical and impossible for small museums, but this project shows that smaller changes and intentional care can have a significant effect on the

---

[23] The Horn Museum occupies a building that was originally constructed as a bank, so the climate control system, flooring, and other environmental factors contribute to difficulties in preserving textiles.

[24] Discussions with Dr. Gane revealed that temperature of the Horn Museum is regulated by external sources on campus, and that it can fluctuate wildly. For example, there have been situations during the summer in which the air conditioning was completely shut off for multiple hours, resulting in high heat and humidity within the building. As previously discussed, this damages textile collections.

longevity of textiles in museum collections. These findings are specifically relevant because of the limited examples of Bedouin textiles as ethnographic materials available in museums with Western audiences. The Horn Museum is the only example I have been able to find of a museum that houses a Bedouin tent on permanent exhibit outside of the Levant[25]. Textiles and material culture provide a comfortable zone from which to discover and relate to the Other. Through the process of Orientalism, we as Westerners have produced a demonized view of the Islamic world (which the Bedouin are a part of) (Said, 27). From an ideological perspective, I hope that my work for the Horn Museum will further the purpose of not just presenting information *about* the Bedouin, but also allowing some aspects of culture to speak for themselves through the textiles. Hilden discusses the importance of preserving Bedouin material culture, stating:

> "At this time in history, the Arab nomads may not feel that they need hand-woven items as they did in the past. No one knows what the future will bring, and whether a time will come when they will utilize their weaving skills again on a larger scale…Weaving skills have been with us since humankind first began to make tools and shape its environment. It would be a shame knowingly to let them disappear, and still worse to let them pass unrecorded" (Hilden, 17).

Though sociopolitical factors and the progress of history have greatly reduced the traditions of Bedouin weaving, it is still at the very least of historical cultural value, and I am honored to participate in its documentation and preservation.

While I am incredibly enthusiastic about this project, I am held back by my level of training and indirect access to expert knowledge. I have taken a course on Textile Conservation, for which I accessed primary texts that ultimately influenced my research, but I have had only

[25] There have been Bedouin tents used as part of temporary exhibitions, such as a feature of contemporary art from the United Arab Emirates in the Los Angeles Art Show in 2015, which later became a temporary exhibit in the Fowler Museum at the University of California Los Angeles (Vankin, 2015).

limited contact with professional conservators. My interview with Rebecca Newberry was highly informative, but I was unable to consult any sources beyond primary readings and videos for the creation of the storage and display proposals. Nevertheless, I believe that this project has value for the Horn Museum and the communities it serves, local and global.

Works Cited

Abdel-Kareem, O, and R. Alfaisal. "Treatment, Conservation and Restoration of the Bedouin Dyed Textiles in the Museum of Jordanian Heritage." *Mediterranean Archaeology and Archaeometry* 10, no. 1 (2010): 25-36.

American Institute for Conservation of Historic and Artistic Works (AIC), "Caring for Your Treasures." Accessed April 2, 2018. http://www.conservation-us.org/docs/default-source/public-relations/caring-for-your-treasures-textiles.pdf?sfvrsn=3

Barr, Mary M. "Oxidation, Reduction and Hydrolysis of Wool Keratin." Ph.D. diss., Iowa State University, 1936.

Bisht, A. S. *Conservation of Textiles, Bone and Ivory*. Delhi: Agam Kala Prakashan, 2010.

Bittner, Elizabeth. *Basic Textile Care: Structure, Storage, and Display.* University of Texas: 2014.

Boersma, Foekje, Agnes W. Brokerhof, Saskia van den Berg, and Judith Tegelaers. *Unravelling Textiles: A Handbook for the Preservation of Textile Collections*. London: Archetype Publications Ltd., 2007.

Cardamone, Jeannete M. and Mary T. Baker. *Historic Textiles, Papers, and Polymers in Museums.* Washington, D.C.: American Chemical Society, 2001.

Cardon, Dominique. *Natural Dyes: Sources, Tradition, Technology and Science.* London: Archetype Publications Ltd., 2007.

Choe, D. H. "Carpet Beetles: Integrated Pest Management in the Home." *University of California Integrated Pest Management*. November 2012. Accessed April 6, 2018 http://ipm.ucanr.edu/PDF/PESTNOTES/pncarpetbeetles.pdf

Choe, D. H. "Clothes Moths: Integrated Pest Management in the Home." *University of California Integrated Pest Management*. March 2013. Accessed April 6, 2018. http://ipm.ucanr.edu/PDF/PESTNOTES/pnclothesmoths.pdf

Dean, Jenny. *A Heritage of Colour: Natural Dyes Past and Present*. Tunbridge Wells: Search Press, Ltd., 2014.

Fabbri, Bruno. *Science and Conservation for Museum Collection*. Florence: Nardini Editore, 2017.

Finch, Karen, and Greta Putnam. *The Care and Preservation of Textiles*. London: B. T. Batsford Ltd., 1985.

Frisina, Ann. "Conservation and Preservation of Historic Textiles." *Minnesota Historic Society*. December 9, 2009. Accessed March 17, 2018. https://www.youtube.com/watch?v=OYI5ExSdUHs

Hardman, Judy, and Sally Pinhey. *Natural Dyes*. Ramsbury: The Crowood Press Ltd., 2009.

Hilden, Joy T. *Bedouin Weaving of Saudi Arabia and Its Neighbors*. London: Arabian Publishing Ltd., 2010.

Landi, Sheila. *The Textile Conservator's Manual*. London: Butterworths, 1985.

Lennard, Frances, and Patricia Ewer. *Textile Conservation: Advances in Practice*. Abingdon: Routledge, 2010.

Merritt, Jane, and Julie A. Reilly. *Preventive Conservation in Historic House Museums*. Lanham: Rowman Altamira, 2010.

Newberry, Rebecca. 2017. Interview by Kelly Lorenz. St. Paul, Minnesota. August 4.

North Carolina Museum of History. "How to Care for Your Textiles." *Collections*. Accessed March 28, 2018. https://www.ncmuseumofhistory.org/collections/artifact-care/textiles

Paul, Roshan. *Functional Finishes for Textiles: Improving Comfort, Performance and Protection.* Amsterdam: Elsevier, 2014.

Pinniger, David, and Peter Winsor. *Integrated Pest Management: A Guide for Museums, Libraries, and Archives*. London: Museums and Galleries Commission, 1998.

Rudkin, Linda. *Natural Dyes.* London: A & C Black Publishers Ltd., 2007.

Said, Edward. *Orientalism.* New York: Pantheon Books, 1978.

Selwyn, Lyndsie. "How to Test For Sulfur in Materials Using Lead Acetate Test Paper." *Canadian Conservation Institute*. Last Modified November 11, 2017. Accessed April 2, 2018. https://www.canada.ca/en/conservation-institute/services/conservation-preservation-publications/canadian-conservation-institute-notes/test-sulfur-acetate-paper.html

Smithsonian. "Acid Free Tissue Paper for Textiles and Costumes." *Smithsonian Museum Conservation Institute.* Accessed April 7, 2018. https://www.si.edu/mci/english/learn_more/taking_care/acidfree.html

Strang, Thomas J.K. and John E. Dawson. "Controlling Museum Fungal Problems." *Technical Bulletin*, 12 (1991).

Textile Lab, CCI. "Stitches Used in Textile Conservation." *Canadian Conservation Institute Notes* 13/10. (2008) Accessed April 2018. *https*://www.canada.ca/content/dam/cci-icc/documents/services/conservation-preservation-publications/canadian-conservation-institute-notes/13-10-eng.pdf?WT.contentAuthority=4.4.10

Vankin, Deborah. "UAE Exhibit at L.A. Art Show a Portrait of a Rapidly Changing Region." *Los Angeles Times*, January 10, 2015. Accessed April 6, 2018.

http://www.latimes.com/entertainment/arts/la-et-cm-la-art-show-emirates-20150111-story.html

Van Stralen, Trudy. *Indigo, Madder & Marigold: A Portfolio of Colors from Natural Dyes.* Loveland: Interweave Press: 1993.