Art & Craft

The Art and Science of Textile Conservation: Behind the Scenes at the Royal Ontario Museum

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By Michelle Woodvine

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Combine *Indiana Jones* with *CSI: Crime Scene Investigation* and set it at the Met Gala, and you get the fascinating world of textile conservation. I recently went behind the scenes at the Royal Ontario Museum's Textiles and Costumes department to visit the lab of Senior Conservator Chris Paulocik, and spent a fascinating morning learning about what conservators do, the science of textile conservation, and how you can preserve your heirloom or heritage textiles at home.

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A Day in the Life: What Textile Conservators Do.

Textiles are windows into society and technology of the past. A conservator's job is to analyze, document, and stabilize all kinds of textiles, from iconic garments to archaeological fibre fragments, so that we can enjoy and learn from them today and for generations to come.

The conservator's work often begins before a piece is even acquired by the museum. Conservators are asked to determine if a prospective purchase is real or counterfeit, if any damage can be stabilized, and how the item might be safely displayed.

When the piece arrives at the lab, the conservator creates a full-scale condition report to document everything that's known about it—its provenance and history—including a photographic and scientific assessment of stains, alterations, and/or damage. This report stays with the piece when it travels as part of an exhibition or permanently moves to another museum. Finally, conservators determine the safest conditions for display, storage, and travel.

Every item that comes into the lab, from a Dior dress to an Asafo flag from Southern Ghana comes with its own story and its own unique challenges. Sometimes it takes a team effort to uncover that story. During my visit, a group of tiny, ragged fabric fragments sat on one of the lab benches like pieces from a jigsaw puzzle with no reference picture. Chris explained that they are Egyptian Tiraz textile fragments, inscribed with an Arabic script called Kufic. Unable to read Kufic, Chris consults with a curator familiar with the language and related culture to understand how the pieces fit together, and what they might be made of.

Archaeological textiles like this Tiraz textile fragment from Egypt, featuring intricate designs and Kufic writing, are windows into the past.

Chris mixes a solution of gellan gum to make a poultice for stain removal. Photo credit: The Royal Ontario Museum.

Not What it Seems: Identifying Fakes

Items of historical interest become more valuable over time and, as technology improves, counterfeiters gain more tools to create convincing replicas. But sometimes even a fake can turn out to be important.

For instance, take the case of a rare—and fabulously expensive—18th century painted silk dress that the museum was interested in purchasing. In the 18th century, many painted silks on the European market were Chinese imports. Their green pigments included copper-based verdigris, which, over time, would rot the underlying fabric and flake off—not something the museum would want to pay a lot of money for. Chris was tasked with analyzing the condition of the dress. She found that not only was the painting technique not what she expected from a typical Chinese painted silk of the time, but there was no copper, no lead white, and no silver outlining (the latter two both common in Chinese painted silks of the period [silver outlining made the silks glow in candlelight]). Consulting with other experts in the conservation community around the world, she learned that the dress was a fake, but not just any fake. In the 18th century, when England had banned import of Chinese painted silks to protect their own textile industry, knockoffs began to show up on the English market, and this dress, thought to have been made in Charlottenburg, Germany, was one of them. In the end, the fake turned out to be a historically significant find because of the story behind its creation—and so the museum made the purchase.

Collateral Damage: Repairing and Stabilizing Textiles

Copper isn't the only metallic natural dye mordant that can cause losses (holes and tears) in textiles. Mordants are binding or fixing agents: chemicals that help natural dyes to stick to fibres. Iron-, tin-, and alum-based mordants can also do significant damage to textiles over time, especially when exposed to sunlight. To stabilize damaged pieces, Chris uses compatible patching and backing fabrics where possible: cotton for cotton, wool for wool, silk for silk. The fabric is then dyed to match the original, using pre-metalized dyes that won't cause future losses.

Like fabrics, threads are chosen to be as close to the original as possible. They're dyed to match the fabric and prewashed to avoid bleeding and/or transfer (also called fugitive dyes). When making repairs, conservators follow the existing stitch line and use the original stitching holes and stitching techniques wherever possible. Items to be stabilized are sewn by hand (with as few stitches as possible), using the self-couching stitch and extremely fine curved needles—size 10 or smaller.

Conservators are always learning and incorporating new technology into their work. Sometimes they encounter items that have had pieces cut out of them for other uses, leaving large losses. When preparing for the ROM's recent Chintz exhibit, conservators used digital printing on fabric to repair a jacket that had had large circles cut out of it.

The Good, the Bad, and the Ugly: Dealing with Dirt

Cleaning is a complex issue. The provenance of the piece, its story, determines how it is treated—or not treated. Consider the coat that Abraham Lincoln was wearing when he was shot, or the Asafo flags from Southern Ghana; ethnographic curators look at the blood and dirt on these pieces as important evidence of use. It's significant dirt, so it stays.

However, when cleaning is required there's still a lot to consider. Sometimes the treatment is remedial, and a vacuum will do. Or conservators might use an enzyme treatment (amylase from pig saliva) to break down unwanted biological material.

Stains are a dual source of potential damage. Leave a stain untreated, and it might damage the fabric, but the process of treating it may also do harm. The conservator must first determine what the stain is made of. Then they can decide whether to treat it and how. Acidic stains, for instance, will completely rot fabric and must be treated.

Chris works with scientists from the Canadian Conservation Institute, the world's largest conservation facility, to identify stains using methods ranging from chemical analysis to application of UV light.
It's important for conservators to take precautions when handling new acquisitions. Many historical dyes and preservatives contain poisonous components like arsenic. Feathers, for instance, used to be preserved using arsenic-based treatments. So, conservators use nitrile gloves and work under a fume hood when necessary to prevent exposure.

Once a stain is identified and a wet cleaning is needed, Chris uses natural sponges to apply a product called Orvus (also known as quilt soap). Unlike commercial cleaning products that are designed for contemporary fabrics and contain adulterants like optical whiteners, brighteners, and perfumes, Orvus is pure soap—sodium laurel sulfate—in a concentrated gel.

If Orvus doesn't work, there are other, more complex, treatments that can be used, and help is available from a network of conservators and scientists around the world.

Chris recommends using Orvus, which is available from farm or fibre-related supply stores, to safely clean your heirloom textiles at home. But remember: It's very concentrated—a little bit goes a long way!

Clear and Present Danger: Keeping Textiles Safe During Display, Storage, and Travel

Who turned off the lights?

Have you ever wondered why it's so dark in textile exhibits? Light damage is a major issue for textiles, so conservators keep light levels low (ideally around 50 lux) and limit the duration of the exhibit. The UV component of light causes both fading (often exacerbated by metallic mordants in dyes), and photooxidation (which makes fibres brittle, something you often see with silk curtains).

When you look at the washed-out colours of textiles from hundreds of years ago, you might think life back then was dull and colourless, but the faded colours are the result of sun damage. Peek into the seams of historical garments, and you'll see vibrant pinks, shimmering greens, deep blues, and rich purples—the brightly coloured natural dyes of the time.

In Victorian times, silk was sold by weight, so merchants added metallic salts to make it heavier. This process also gave cheaper fabrics more body and that characteristic "scroupy" sound. Then, dyers would add more metallic salts in the form of dye mordants. Expose these fabrics to the sun, and they become brittle and shred.
While careful sun bleaching is an option for at-home cleaning (never use oxidizing bleaches on heirloom fabrics), Chris recommends keeping precious textiles out of the sun as much as you can.

They're always hungry...

Insects like clothes moths and carpet beetles can wreak havoc on textiles. At the museum, incoming items are quarantined to check for bugs and then treated by freezing if necessary. When there are insect infestations on things that shouldn't be frozen, like ivory, these items are given an anoxic treatment: sealed in a chamber in which the air is replaced with argon gas, effectively suffocating the bugs.

The key to home bug infestations is prevention. Chris advises to make sure your textiles are clean before storing them. If you have a bug infestation, freezing is an option, but beware of fabrics becoming moist in the process, potentially causing dyes to run. Visit the CCI for additional information about preventing bug infestations.

Safe and sound—in storage, on display and everywhere in between

Textile treatments and embellishments can release volatile gasses over time, especially as chemical components age and break down. These gases can impact things stored around them, so it's important to store and display items using stable, inert products that (a) won't react with the piece, and (b) will keep it from interacting with things around it. When packing items for storage or travel, conservators use acid-free card and stable, inert Coroplast® sheets for storage boxes. They use Marvelseal® as a vapour barrier to protect from external threats like wood, which outgasses organic volatiles, and Ethofoam®, an inert foam that can be carved into whatever shape is needed, for support during storage, transport, or display.

For home storage and display, the museum-quality materials mentioned above are widely available online.

But it's a dry heat...

Extreme heat, cold, and humidity—and sudden changes in environmental conditions—can be devastating to textile-related materials. Baleen (whalebone), popular as a structural support in 19th century dresses, delaminates (flakes apart) in humid conditions. Ivory can crack in hot, dry conditions. Under warm, humid conditions, it may only take a day or two for mould to start growing—devastating to fabric and dangerous to anyone with upper respiratory issues.

At home, try to store items in relatively stable climate conditions. Avoid storing things against exterior walls that can be damp, and if you encounter mould on textiles, quarantine them immediately in a resealable bag to prevent spores from spreading. The CCI provides resources for dealing with mould here.

Inherent Vice: Tales of Terror from the Conservator's Lab

Simply put, inherent vice is when something self-destructs over time. Textile conservators encounter it a lot.

Glass bead disease, for instance, is irreversible and happens as a result of too much alkalinity in the glass during manufacturing. Affected beads change colour, appear frosty, and crystals grow on their surfaces, which become pitted. Any fabric in contact with the beads is damaged. It's commonly seen in the trade beads that were shipped from Europe to North America during the exploration and colonization of the continent.

Fugitive dyes (dyes that bleed or transfer) are a common problem with textiles from the Victorian era right through to the 1920s because dye fixing methods were still being developed. Even today, Chris warns to check both fabric **and** thread for colourfastness when cleaning or making repairs.

Then there are sequins. In the 1930s, gelatin replaced tortoise shell and mother-of-pearl as the sequin material of choice, because it was cheap and readily available. But store gelatin sequins in a humid environment and the gelatin softens, causing the sequins to stick to each other and anything around them—including any dust particles in the air. The damage is irreversible. When manufacturers began making sequins (and fans, combs, etc.) with cellulose nitrate instead, they created new problems. Cellulose nitrate is extremely flammable and as it breaks down it gives off gases that damage everything around it.

It Takes a Community

Conservators are detectives, scientists, historians, and problem solvers, each one part of a small but mighty community that protects the past to inform the future. As my visit to the lab came to an end, Chris left me with these words about the conservation community:

> ***"We have a whole arsenal of different treatment options, we have conferences and publications that we read, and we talk to each***

other all the time. The network is quite small, so you call the V&A in London and say, 'Hey, I've got this piece. What do you think, what would you do?' We all help each other. We're all nerds."

My kind of people.

Image Gallery

Chris and the ROM have generously provided a collection of photos providing an insight into the work they do and the textiles they work with. Click any image to enlarge.

A fragile specimen.

Archaeological textiles like this Tiraz textile fragment from Egypt, featuring intricate designs and Kufic writing, are windows into the past.

Insights into the long life of the textile.

Like assembling a puzzle with no reference picture! Tiraz textile fragments can date back to the 9th century. Some were found to contain traces of DDE, a by-product of the DDT that was widely used as an insecticide in Egypt in the 1960s.

Conservator at work.

Chris mixes a solution of gellan gum to make a poultice for stain removal. Photo credit: The Royal Ontario Museum.

Storage equipment.

Ethofoam®, acid-free cardboard tubes, Coroplast®, stockinette tubing, and Marvelseal® are all used to protect and preserve textiles during storage, display, and travel.

A crucial product.

Orvus is pure soap—sodium laurel sulfate. Shown here mixed with water in a beaker and ready to be applied using a natural sponge. When using Orvus at home, remember that it's very concentrated. Use too much and you'll be rinsing forever!

Tools and materials for restoration.

Hanks of silk thread dyed and ready to be unplied for use. Also shown, a selection of incredibly fine curved needles.

Ready for study.

This rare 18th century chintz warrior tunic (su'a senakut), was made in coastal southeast India for the Thai market. The pattern was printed on the fabric, which was then assembled. Over time, the piece underwent many alterations. Chris studies dirt and fade patterns and the stitch lines to determine where the original stitching was and how it had been altered, to understand how it originally looked.

Details require close examination.

Some of the remarkable detail in the Thai warrior tunic. Conservators study patterns of alteration and stitching and the techniques and materials used to make the original piece to try and conserve as much of the original garment design as possible.

An antique masterpiece.

This rare, 18th century block-printed chintz jacket was made on the Coromandel Coast of India for the Dutch market.

Close examination reveals problems.

This close-up shows losses (indicated in the yellow circles), that are the result of an iron mordant which is causing the underlying fabric to rot. The losses will be stabilized by backing them with compatible fabric and thread, both dyed to match using premetallized dyes.

Careful work.

Chris painstakingly removes accretions from damaged fabric. Photo credit: The Royal Ontario Museum.

A modern textile masterpiece.

Contemporary chintz masterwork by Renuka Reddy, created on cotton, using painted mordants and dyes. Made in Bengaluru, India.

I would like to thank Chris Paulocik, Senior Curator, Textiles & Costumes at the Royal Ontario Museum for her time, generosity, and for nerding out with me; and Mariana D'Alberto from the ROM's Media Relations Department for making my visit possible. — MW

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About Michelle Woodvine

Michelle Woodvine is a Toronto-based freelance writer and editor on a quest to never stop learning and making. When not wordsmithing for others, Michelle can usually be found working on her trilogy of speculative fiction novels, learning a new skill, or goofing around with her family (including her very own rocket scientist, two teenage boys, and one feisty ginger cat). Follow the weird, wonderful, and wordy adventures @woodvinewrites or visit www.woodvinewrites.com

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