A Natural Legacy: Conserving Orra White Hitchcock's Classroom Charts

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Orra White Hitchcock was one of the earliest documented female botanical and scientific illustrators in the United States (Fig. 1). She was born in 1796 in the western Massachusetts town of South Amherst. Orra likely met Edward Hitchcock between 1816 and 1818, when Edward was headmaster at Deerfield. Edward was a renowned a pastor, geologist, professor of chemistry and natural history, and future president of Amherst College. The couple married on May 31, 1821. Although no biography has been written on the Hitchcocks, the 2011 Mead Art Museum catalogue *Orra White Hitchcock: an Amherst woman of art and science* (Herbert *et al.*2011) provides a thorough and insightful view of Orra's life and art.

Figure 1. Orra White Hitchcock (1796-1863.) Pocumtuck Valley Memorial Association, Memorial Hall Museum, Deerfield, Massachusetts, USA

History

Hitchcock was educated by the Wright Sisters of South Hadley, Massachusetts, and then at an unnamed ladies school in the Roxbury section of Boston. Immediately upon completion of her formal education, Hitchcock began teaching at Deerfield Academy, then a school for ladies located twenty-five miles from her home. The diverse subjects she taught included fine and decorative arts, mathematics, botany, and astronomy. Orra is described by author Elizabeth Farnsworth as 'Fearless.' Farnsworth explains:

> First, she did not limit herself to the most traditional role of wife and mother, but became an equal and complementary partner to the brilliant and complex Edward…Although she did not exhibit her work, it became known to contemporary scientist including Benjamin Sillman, John Torrey, and Chester Dewey' (Herbert *et al.* 2011: 47.)

The couple began collaborating on Edward's geological publications as early as 1822. The Hitchcocks settled in Amherst, Massachusetts, in 1826 and Edward began teaching chemistry, natural history, and so called natural theology classes at Amherst College (Herbert *et al.*: 49).

The origin of the classroom charts

In addition to her increasingly well known works of art on paper, Orra started to create painted cotton textiles depicting geological and zoological subjects. The classroom charts range in size from thirty-five cm² to over five meters long and were used by Edward and his colleagues at Amherst College as teaching tools. They were hung in a dedicated geology lecture room and changed throughout the term according to the class syllabi. Sixty-one of the classroom charts survive in the Amherst College Archives and Special Collections.

In the 2011 exhibition catalogue authors Robert L. Herbert and Daria D'Arienzo write that, "Orra drew her charts in ink and watercolor on canvas from about 1828 to the 1840s. At some point, probably around 1840, the charts were gathered and their edges bound in tape; titles and sequential numbers were applied in stencil…The mixed media throughout include ink, ink wash, pencil, watercolour, and gum Arabic.' (Herbert *et al.*: 95–96)

In the same publication, author Tekla Harms writes that Hitchcock's challenge with the classroom charts was 'to faithfully represent what could only be imagined'. For example, *Megatherium* (Fig. 2) had to be adapted from published lithographs because it was not among the fossils in the Amherst College collection (Herbert *et al.*: 51). Edward was not afraid to engage his students in geological controversies, such as the origin of the great sand and gravel deposits found throughout the New England region. Some believed they were caused by a Biblical-style flood, while others argued they resulted from the movement of glacier ice. Likewise, Hitchcock's depictions of prehistoric animals like mastodon and paleotherium clearly acknowledges that they differed from those known in their time (Herbert *et al.*: 51–53). The couple was openly supporting a belief that the earth and its creatures are dynamic and changing years before the 1839 publication of Charles Darwin's *Voyage of the Beagle* and 1859's *On the Origin of Species*.

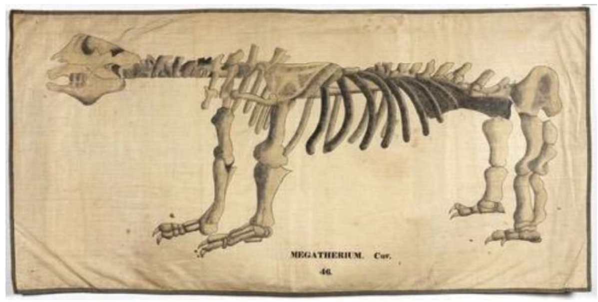

Figure 2. *Megatherium cuv* by Orra White Hitchcock. Ink and watercolour on cotton with cotton binding. Photo by author. Amherst College Archives and Special Collections.

Initial conservation

Museum Textile Services, a private textile conservation facility located in Andover, Massachusetts, was contracted to surface clean, humidify, assess, and rehouse the classroom charts following the 2011 Mead Art Museum exhibit *Orra White Hitchcock: An Amherst Woman of Art and Science*. Conservators identified at least two different types of cotton plain weave used as a foundation for the classroom charts. The cotton was heavily sized to give the artworks varying degrees of stiffness. The tape mentioned above is two centimetre wide cotton in the style and pattern commonly found on dress hems from the time period. Also present on the charts are pieces of paper on which numbers and letters were stencilled. Hitchcock frequently used paper and fabric to correct spelling errors and other mistakes in her charts. As the images are stable and were not the focus of our conservation treatment, conservators did no further materials characterization.

The collection was separated into four groups based on the urgency of conservation treatment. Twenty-nine of the sixty-one classroom charts were identified as being in excellent condition without holes or significant stains. Nine textiles were labelled as being in very good condition, showing only small amounts of staining and dishing. One textile measuring approximately one metre by five metres was in the worst condition with stains and damaged areas that were exacerbated by its large size. The remaining twenty-two textiles were found to have one or more of the following condition issues: wrinkling and distortion; liquid-borne staining; detached paper patches; splits associated with dark ink and paint; and losses caused by an unknown caustic material.

All of the classroom charts were surface cleaned with a high-efficiency filtered vacuum and humidified in a Goretex™ chamber. Smaller textiles were wrapped in Photo-Tex tissue and placed in singles and pairs into custom-made trays that fit into pre-existing drawers at the Archive's off-site storage facility. Larger textiles were rolled onto acid free tubes and interleaved with Photo-Tex tissue for eventual storage on Ethafoam cradles on nearby shelves (Cochran 2012).

In 2017, the entire collection of classroom charts was requested for loan to the American Folk Art Museum in New York City. This provided Museum Textile Services with the much anticipated opportunity to address endemic problems found on the twenty-two textiles diagnosed with distortion, discoloration, and associated losses. These condition issues were addressed with a number of standard techniques including surface cleaning, humidifying, realigning, consolidation, and linings. In addition, advice was given on the safest way to display the classroom charts.

Wrinkling and distortion

All twenty-two textiles were lightly pressed with a warm iron through muslin where needed to reduce folds and creases. This straight-forward approach was undertaken because Goretex™ humidification had proven too conservative in 2011, allowing many creases to return while the textiles were in storage. Overly tight cotton bindings were found to be exacerbating the problem of creasing and dishing. Some creases had worsened after textiles were rerolled multiple times by museum staff. Four of these textiles had substantial holes or tears that made them candidates for lining, so conservators decided to remove their cotton bindings to allow the lining material to extend fully to the edges.

Prior to reattaching the bindings to the lined textiles, they were wetted with filtered water, stretched slightly, and blocked with pins to dry. The cotton tape released a significant amount of cellulosic discoloration into their cotton wicking cloths. This process lengthened the bindings enough that they no longer distorted the textiles when reattached with hand stitching and cotton thread.

Staining

Different types of stains were tested on several textiles with both deionized water and 91% isopropyl alcohol. This produced no discernible release of discoloration. The presence of water-soluble sizing, watercolour paint, and ink further complicated stain removal. Stains on several textiles made it clear that water had been harmful in the past causing colours to run and transfer.

Since Museum Textile Services initially evaluated the Orra White Hitchcock classroom charts, conservators have worked with American freelance textile conservator Jennifer Cruise to test various methods to remove iron stains from cotton textiles using chelators and other chemicals (Selwen and Tse 2008). Cruise found that sodium dithionite could reduce fresh iron stains and brown tide lines on test fabrics when delivered through an agarose gel poultice. This treatment was more successful at reducing fresh iron stains when the object was soaked in a bath; however, this method so far has been unsuccessful on older iron stains. Furthermore, soaking was not possible with Hitchcock's water-soluble painted and stencilled textiles.

New research and testing will have to be done to determine whether chelators, including dithionite, would be effective in reducing old yellow or brown stains like those seen on the classroom charts. Unfortunately, no new funds were allocated by Amherst College for this purpose and no additional attempts at stain reduction were possible at this time.

Paper patches

Many of the classroom charts had one or more paper patches on the front that needed to be re-adhered before exhibition (Fig. 3). Most were addressed with just a drop of liquid BEVA 371 allowed to dry beneath a weight. Paper patches on four textiles posed enough of a risk for separation or tearing that conservators opted to use overlays. Undyed silk crepeline coated with a 50:50 solution of Plextol B-500 in water was cut into small rectangles and adhered to the front surface with a tacking iron set to 50°C (Fig. 4).

Figure 3. Detail of detaching paper patches, before treatment. *Anaplotherium commune cuv* by Orra White Hitchcock. Ink and watercolour on cotton with cotton binding. Photo by author. Amherst College Archives and Special Collections.

Figure 4. Detail of detaching paper patches, after adhesive repairs. *Anaplotherium commune cuv* by Orra White Hitchcock. Ink and watercolour on cotton with cotton binding. Photo by author. Amherst College Archives and Special Collections

Splits and tears

Splits were found within the cotton ground of several textiles, often along dark lines. In order to stabilize not only actively splitting, but also potentially weak areas, conservators applied underlay patches to the back of vulnerable areas of ten classroom charts. The material of choice was 'nude' polyester organza. Of ideal stability, weight and transparency, these patches do not stretch and their boundaries are not visible from the front. After testing, 1mm BEVA film was chosen as the adhesive. BEVA was first applied to the organza with tacking iron set to 50°C. Next, the textile was placed face down and patches were thermo-set to the back of weak areas with the same tacking iron. The textile was returned to the face up position, adhesion was double checked on the front, and additional tacking was done as necessary.

Losses

Five textiles had substantial holes or tears requiring full linings to enable exhibition (Fig. 5). The material found to be most compatible was Holytex, a non-woven polyester, which is light-weight, stable, and resembles the classroom charts in its slightly papery behaviour.

Figure 5. Detail of discoloration and losses, before treatment. *East and West Section Across Massachusetts* by Orra White Hitchcock. Ink and watercolour on cotton with cotton binding. Photo by author. Amherst College Archives and Special Collections.

BEVA film was ironed to the Holytex using a tacking iron set to 65°C. A higher temperature caused the Holytex to curl and pucker, additional pressure with the iron was helpful to achieve a good bond. Each textile was first placed face down on an ironing surface. The adhesive side of the Holytex was placed over the textile and minimally tacked with a tacking iron set to 50°C. The textile was then flipped face up and ironed again from the front side through a piece of silicone-release film. Excess Holytex was carefully trimmed from the perimeter of the textiles with small scissors (Fig. 6).

Figure 6. Detail of discoloration and losses after lining with Holytex. *East and West Section Across Massachusetts* by Orra White Hitchcock. Ink and watercolour on cotton with cotton binding. Photo by author. Amherst College Archives and Special Collections.

The resulting linings are relatively low tack but supportive enough for exhibition purposes. The Holytex and BEVA film are reversible when heated. Some areas of discoloration and associated loss did not adhere to the lining very well due to their brittle condition. A tacking iron set to 50°C was needed to re-secure the edges of these areas from the front of the textile through a silicone-release film.

The appearance of the adhesive-coated Holytex in areas of loss needed to be addressed prior to exhibition. Exposed unspent adhesive was shiny and tacky. It can pose a risk to other parts of the textile if not properly addressed. Paper pulp was created by filing scraps of acid free mat board using a stainless steel nail file. This process was slow but resulted in optimal colour matching by combining more than one shade of board. Silicone-release film was placed below the area being infilled (Fig. 7). The pulp was dispensed evenly onto the unspent adhesive and covered with silicone-release film (Fig. 8). The adhesive was reactivated through the paper pulp with a tacking iron at 55°C. Excess pulp was removed with a soft paint brush. Larger holes needed to be covered with pulp and heat reactivated several times in order to achieve the desired amount of coverage.

Figure 7. Applying paper pulp to areas of loss backed with Holytex adhesive lining. Detail of *Ichtheosaurus* by Orra White Hitchcock. Ink and watercolour on cotton. Photo by author. Amherst College Archives and Special Collections.

Figure 8. Setting paper pulp with a tacking iron through silicone-release film. Detail of *Ichtheosaurus* by Orra White Hitchcock. Ink and watercolour on cotton. Photo by author. Amherst College Archives and Special Collections.

Exhibition

Nine of the sixty total classroom charts that were loaned by Amherst College to the American Folk Art Museum had usable linen tabs that were stitched on for the 2011 exhibit. The remaining textiles required a new display system to ensure that they would hang as flat as possible and be stable in air currents. Museum Textile Services was consulted on the optimal solution and conservators suggested rare-earth magnets (Fig. 9).

Figure 9. Display of classroom charts in *Orra White Hitchcock: An Amherst Woman of Art and Science*. Ink and watercolour on cotton. Photo by author. Amherst College Archives and Special Collections and the American Folk Art Museum.

Magnetism has been used since the late 1980s as a reversible and reusable method of suspending or securing artworks. Developed in 1983, neodymium rare-earth magnets have recently superseded earlier magnet types such as alnico and ferrite. Neodymium rare-earth magnets are stronger relative to their size and have an inert coating that can be used directly against museum objects. A barrier, such as Melinex, is recommended between magnets and artwork when the object is subject to indentation or its surface is fragile, as in the case of historic painted murals (Spicer 2010).

Museum Textile Services conservators recommended that the American Folk Art Museum employ disk-shaped N40 strength neodymium rare-earth magnets. One of two approaches could be taken: three millimetre thick magnets measuring two or more centimetres in diameter could be matched to either a ferromagnetic material or to a second magnet. These shallow magnets could be camouflaged with paint, fabric, or paper to blend in with the surface of the classroom charts (Carbone 2017). Instead, the museum staff opted to embrace the aesthetic of the magnetic system and did not camouflage the magnets. Silver-coloured magnets measuring .625 centimetres tall and .625 centimetres in diameter were paired with either an embedded steel screw or a second magnet (Fig. 10). The cylindrical shape of the magnets has the added benefit of being easier to grasp when removed.

Figure 10. Detail of rare-earth magnets used to suspend a classroom chart against an acrylic support in *Orra White Hitchcock: An Amherst Woman of Art and Science*. Ink and watercolour on cotton. Photo by author. Amherst College Archives and Special Collections and the American Folk Art Museum.

Conclusion

Orra White Hitchcock was truly a woman of arts and sciences, as the 2011 exhibit title states. She is a kindred spirit to all conservators, using science to advance the understanding and preservation of art and artefacts. In the words of author Tekla Harms, 'it was Edward's partnership with Orra White Hitchcock that gave visual representation to his subject, and it was she who allowed generations of students to see the full scale and scope of geology' (Herbert *et al.*: 54).

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Supplier's Information

Photo-Tex tissue, silicone-release polyethylene film, Holytex

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Rare-earth magnets

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Pipersville, PA 18947 USA

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www.kjmagnetics.com

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