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Which Cracked First: The Inkin' or the Egg? Analysis and Treatment of Ink Deterioration in the William Bache Silhouette Album

BACKGROUND

William Bache arrived in Philadelphia from England in 1793 with no apparent training as a silhouettist. He began his career in Baltimore in 1803 along with two partners: Augustus Day, who was a Philadelphia carver and gilder, and Isaac Todd. The partners were granted a patent on June 15, 1803 for a physiognotrace, a device for tracing a profile and reducing it by means of a pantograph. The National Portrait Gallery (NPG) album was created by Mr. Bache in New Orleans, between 1803 and 1809, as a record book of silhouettes. The album is notable for the diverse community represented ranging from the prominent families to freed slaves. A partial index of names appears in the back. The album was selected for treatment to appear in the NPG exhibition, *Legacy: Spain and the United States in the Age of Independence 1763–1848.*

Treatment

A prior proposal for this book had been delivered to the National Portrait Gallery (NPG) by Nora Lockshin, pursuant to a rehousing project and grant request. Rosemary Fallon re-examined the book with curators Wendy Wick Reaves and Anne Goodyear and recommended reopening the project with Nora Lockshin at the Smithsonian Center for Archives Conservation. In a joint meeting, the binding treatment was revised and agreed upon; focus shifted to the leaves to be shown in the exhibition. Reaves commented on a reddish-brown powdery substance on the silhouettes and asked if it could be treated or minimized in some way. The black silhouettes were quite glossy in some areas and showed a spotty, uneven, rusty brown appearance across the volume. Lockshin proposed analysis in conjunction with the Museum Conservation Institute (MCI) to augment the conservation treatment and the body of knowledge on Bache's materials and techniques.

Poster presented at the AIC 36th Annual Meeting, April 21–24, 2008, Denver, Colorado.

CONDITION

The brown spots of deterioration appear rusty and powdery, and are extremely friable. The circular areas are not localized in any obvious way, but it is also evident that the powdery and opacifying rusty appearance coincides with high and flex points, such as at the folded-over details, clueing us to abrasion, either from facing leaves or flexion over time. A visual effect of browning and cracking suggested iron gall deterioration, but the material seemed an illogical choice for the artist's intent and the time period. Observation under ultraviolet radiation did not signal iron-gall fluorescence (usually yellow or green); the silhouettes did reflect very weakly in the dark blue-violet range. The fluorescence did not match naturally aged samples of shellacs, ruling out India ink. Another consideration was based on prior research on another artist's silhouettes (Smith 1995; Knipe 2002), which identified the presence of Prussian blue in the black medium. Our hypothesis was that if Prussian blue were present it might be following the same deterioration path of a ferric cation and it would also complex the indicating paper. However, basic iron-gall tests came back negative over several samples.

Due to the fairly quick exhibition and research turnaround, the challenge of finding a suitable consolidant was left for future research. A simple treatment for the exhibition leaves only was proposed and carried out. Removal of brown deterioration product was tested by gently rolling a water-dampened, blotter-drained swab over the deterioration area and the whole silhouette, which was allowed to air-dry. Gloss remained unaffected, except for perhaps being slightly brighter in areas that had fine powder and dust over the smooth surface. Saliva cleaning was also tested and it did not seem to affect gloss of non-deteriorated areas, but it was not more effective than deionized water, and also presented the risk of enzymatic deterioration of the less deteriorated gloss coating. Each silhouette on the exhibition leaves was cleaned with a new swab and air dried. The amount of water present in the swab allowed for quick surface evaporation and blotter and weights were not applied. The album pages were

interleaved with sheets of silicone release paper. Currently, the item is seen as a hazardous object (see Analysis section) and HEPA–filtration vacuuming mitigation with personal protective equipment and individual health monitoring is an envisioned next step.

TECHNICAL STUDY AND ANALYSIS

Technique

Differences that point to technique can be seen across the many silhouettes, such as original variation in thickness, gloss, presence of detailed highlights, retouched losses, and even some accidental inclusions of gilding metals. The ink varies in thickness and gloss through album, especially when looking at pages 38 and 39, in which the silhouettes appear respectively matte and glossy. There is no strong evidence for a machine-manufactured, prepared, commercial silhouette paper. The character of the silhouette appears usually to be a thin wove paper, and the artist numbered the back of the silhouettes to match the index in the preparation of this album. Evidence of slow, evaporative drying can be seen in thicker areas at high magnification. There are air bubbles and craquelure, highly textured surfaces, and embedded dust. The black colorant appears even overall except where deteriorated, without washiness or pooling of black colorant. Extra silhouettes by the same artist also found in the collections provide valuable clues to the artist's technique (inked brushwork visible at the edges of a hollow cut, fully inked and highlighted, but not glossy.)

Analysis

Testing was undertaken with a team from MCI. To identify organics, both Walter Hopwood and Lockshin performed Fourier transform infrared spectroscopy (FTIR), and pyrolysis-gas chromatography/mass spectroscopy (py-GC/MS) on a minimum of acceptable samples, leading to no definitive conclusion but providing some clues that suggested resins and albumin. Lynn Brostoff used a handheld X-ray fluorescence (XRF) spectrometer on pages 38 and 39—the pages with matte and glossy silhouettes—to determine the presence of metals. Only trace amounts of iron and calcium were identified, along with significant levels of sulfur in glossy areas, and lead and/or arsenic in a few samples. As some arsenic signals overlap with those of lead, the arsenic was thought during initial analysis to be a trace element. Due to time constraints, further investigation was deferred until after the exhibition. A handling warning was issued for return of the object; more thorough XRF testing was performed, confirming the presence of arsenic in some form throughout the volume on all representative surfaces and swab wipes.

To further identify and localize the metal concentrations, Judy Watson performed scanning electron microscopy with energy dispersive spectrometry (SEM-EDS). The SEM-EDS was extremely useful as we were able to zoom in location and depth with great precision on fragments and microsamples on stubs, from black area to rusty area, including sampled rusty powder only to create elemental maps. The elemental map for sulfur alone shows a lack of sulfur at the topographically high point. The sample of rusty powder scraped from the surface of a deterioration spot was identified as containing sulfur only. Elemental mapping suggests that 1) the ink is carbon-based, 2) the coating contains sulfur, 3) the high points of the silhouettes have worn down due to pressure and abrasion of facing pages over time, and 4) the brown powder is a byproduct of this abrasion. An elemental map for iron was generated after the other analyses had taken place; it was present in amounts lower than calcium and silicon.

The object was returned after exhibition for more rigorous arsenic testing via XRF and x-ray diffraction (XRD). The analytical method XRF is not directly quantitative, but results can be compared with reference materials, also referred to as standards, of known composition. Protocols for XRF identification and quantification of arsenic-containing pesticides have been under development by scientists at MCI, using pressed pellets of microcrystalline cellulose containing embedded known quantities of arsenic trioxide as reference standards. By comparison of sample spectra to these reference standard spectra, it is possible to extrapolate that each page in the book may contain between 200–1000 ppm. Attempts to speciate the arsenic's compound form are underway. The object's container and wrapper are now labeled with a hazard warning in accordance with best practices.

COLLABORATIONS, CONCLUSIONS, AND FUTURE RESEARCH

To answer our original question (which cracked first: the inkin' or the egg?) from the evidence in front of us: the slow drying, the terpenes, the albumin, the gold and silver foil, the thickness, the available silhouettes that are not in the album that appear matte, we propose that it may be Bache's own formulation applied as a coating to the finished brush and lampblack or bone-black ink drawings, something volatile, and minimally aqueous, that would not solvate the fine brush work of the silhouette. When terpenes were identified, Lockshin began to think "outside the watercolorist's box," as it were, and started thinking about painter's supplies, like dammar. That, coupled with knowing that Bache's partner was gilding frames for the silhouettes, gives a source of egg and furniture coatings. Don Williams, furniture conservator, suggested "signpainter's glaire," which is a mixture of isinglass and egg mixed with spirits of wine.

Future work, as mentioned in the Treatment section, may involve residue mitigation or technical studies by interns or fellows. Further study options include: testing coating mixtures for application; artificial aging and comparison;

close-up examination of silhouette edges (are they scissor- or knife-cut?); consolidation trials and identification of consolidant; and developing a protocol for ongoing treatment by future interns.

Conclusion

This project has certainly added to the body of knowledge on the work of William Bache's portrait silhouettes for conservators, curators, collectors, and the general public. The treatment was greatly facilitated by a fertile environment for inquiry and communication. Having access to and sharing curators' notes and prior scientific research done in the subject area, and holding open meetings with curators, conservators, and scientists, allowed MCI to reconnect to NPG's needs. It also provided a chance for MCI to test new, non-destructive instrumentation detection limits on paper-based material.

Unexpectedly, it has also served to promote awareness of potential hazardous material in book and paper collections where there were no warning flags. Due to the history of collections management at the Smithsonian, and in no small part due to the efforts by Smithsonian and external colleagues to raise awareness of hazards in collections, paper and book conservators now know to regard to objects with relationships of taxidermy, ethnologic, botany, or treatment history of silking as suspect. Unfortunately, this object had no signaling relationship to any of these disciplines, nor had it been part of a collection with an historic treatment protocol. There was no visible indication that might alert a conservator that the surface dirt was not just accumulated dirt and dust of two hundred years, but in fact the residue of intervention with a heavy metal pesticide. On the basis of this object alone, Lockshin is revisiting her lab policy to suggest all surface cleaning on unique materials to be conducted wearing gloves and/or with other HEPA personal protective equipment.

Without a climate that supports conservation research beyond exhibit treatment, and the support of technical scientific staff, it is unlikely that this object would ever have been identified as a case study in hazardous collections management. The authors look forward to continuing research on questions raised by this object.

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