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Waxing Scientific: Exploring New Options for Wax Seal Consolidation

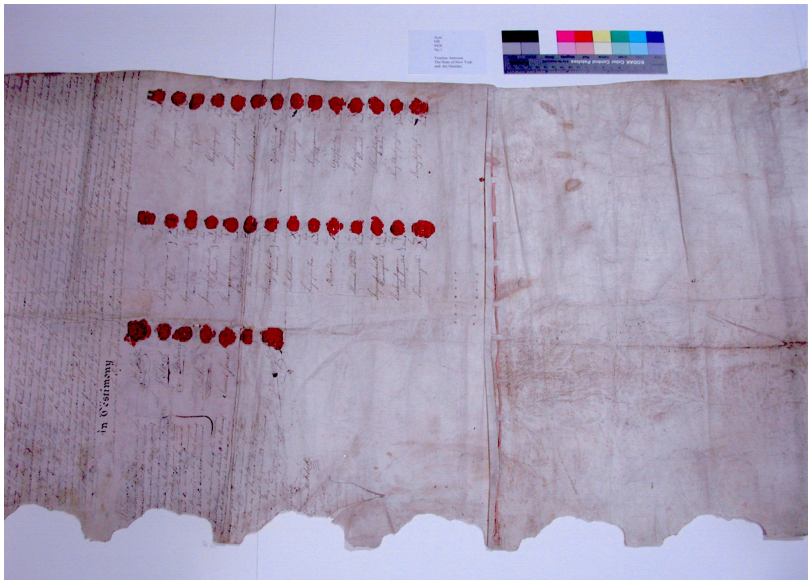

Fig. 1. Wax seals applied to parchment treaty.

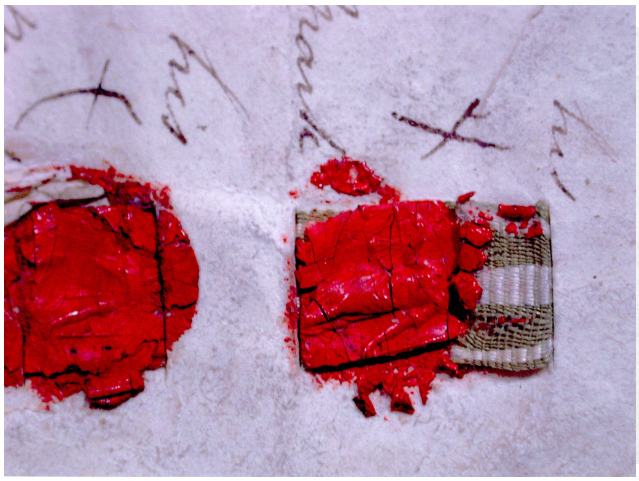

Fig. 2. Detail of wax seals showing damage.

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ABSTRACT

Sample seals were created using an historic wax seal recipe applied to parchment scraps. The sample seals were then broken to resemble the damage seen on the historic seals. Several types of consolidants were tested, including B-72, PVA, and Elvace. The consolidants were rated on the basis of several criteria: reversibility, working properties, change of sheen or color, and adhesion to wax and parchment.

While working on the Newberry Library's Edward E. Ayer Collection of Native American material, funded in part by a generous Save America's Treasures grant, numerous wax seals were encountered. The most problematic of these have been glossy red seals (approximately three-quarters inch in diameter) applied to both the recto and verso of a group of seven parchment treaties (fig. 1). The treaties were made between the Oneida Nation and the State of New York during the 1780s to1820s. The wax seals that exist on these documents have been applied to the skin or to a ribbon woven through the skin next to the treaty signatures. Due to age and use, the seals have become generally shattered and are in poor condition (fig. 2).

In the search for literature concerning wax seal consolidation, treatments emphasized pendant style seals and aesthetic compensation for loss. Many of the treatments described involve heat or solvent melting of the seal as a means of consolidation. Although this method may be useful for larger seals, the fragmentary small seals found during this project warranted another option.

Our aim was to stabilize the condition of the fragmented treaty seals with a non-toxic, widely available consolidant applicable with minimal preparation time and

reasonably predictable working properties. There were several attempts at recreating the wax seals in order to conduct tests by using historic wax recipes. Several consolidants were tested with commercially made wax samples on vellum.

PRELIMINARY TESTING OF CONSOLIDANTS

Though familiar and comfortable with adhesives and consolidants common to book and paper conservation, such as PVA and gelatin, we included many candidates new to our conservation practice to add variety and depth to our research. Preliminary tests on seals made from store-bought wax sticks narrowed our options to thirteen potential consolidants:

Aquazol 500
AYAA
Acryloid B-72
Beva Gel
Butvar B-98
Cosmoloid 80H
Elvace 45675
Gelatin
Isinglass
Lascaux 498HV
Promacto A-1023
PVA Jade 403
Regal Rez

Each consolidant was assigned and tested solely by one designated conservator. The conservator was allowed to thin or alter the consolidant and to try various application methods, including a small brush, syringe, small pointed wooden stick, cotton swab, and microspatula. This method allowed each conservator to work extensively with a few consolidant candidates but the results were skewed to the individual's skills or preferences. Once treated, all participating conservators examined the seal samples and the test results were discussed. The consolidants were judged on reversibility, flexibility, transparency, drying time, and reaction to wax and vellum. Some consolidants were eliminated due to simple ineffectiveness in a wax to wax or wax to vellum bond. Five consolidants were agreed upon for further tests: Aquazol 500, Acryloid B-72, Lascaux 498HV, Promacto A-1023, and PVA Jade 403. All these consolidants exhibited strong, flexible bonds between wax and vellum, required simple preparation, and were commercially available.

SOLVENTS

Acetone, ethanol, toluene, and water were the common solvents chosen to be tested. Seals (samples formed from commercially available wax) were immersed in a glass Petri dish full of each solvent. All solvents except water resulted in color bleeding. Acetone softened the wax sample to a thick, putty consistency while ethanol softened the wax to a toothpaste consistency. Toluene had a lesser reaction, changing the sample to a beeswax consistency. Water had no effect on the seal sample. Of the five consolidants chosen for further testing, Acyliod B-72 required an organic solvent for preparation. Even though toluene had the least effect on the wax, it was eliminated because of its high toxicity level. Because ethanol had the most reactive effect on the wax samples, acetone was chosen as the organic solvent for preparation of Acryliod B-72. Aquazol 500, Lascaux 498HV, Promacto A-1023, and PVA Jade 403 were prepared using water.

HISTORIC RECIPES

In order to test the consolidants and their working properties with wax as accurately as possible, it was decided to simulate the seals on the treaty documents using historic wax seal recipes. Two historical wax seal recipes were researched and then tested. The variation in recipes and inexact directions complicated this process. The first recipe was from the *Encyclopaedia Britannica*, 1771 ed., which created a rosin/ beeswax sealing wax. The results were not desirable and seemed more similar to pendant seals. The sample was dark red, soft and matte in sheen, unlike the historical seals to be matched, which are orange-red, hard, and have a glossy sheen. The next attempt was made using a shellac sealing wax recipe from *Valuable Secrets Concerning Arts and Trades,* printed in 1795. Unfortunately an adverse reaction occurred when shellac was added to the wax, creating a sticky, unusable ball of wax. The third try resulted in a seal similar in appearance to those on the treaty; however, this wax set so quickly it was nearly impossible to get the correct sized seal on a piece of vellum. Having been unsuccessful in creating historical seal replicas, it was decided to purchase the wax. An email reply to a Conservation DistList query regarding eighteenth-century red wax seals from Mandy Clydesdale of AOC Archaeology Group cited Waterstons in Edinburgh as a source for seals made from an historic recipe. We ordered Waterstons' Bank of England Quality letter wax sealing sticks, which we used in our further tests.

STRUCTURED TESTING OF CONSOLIDANTS

Five conservators tested each consolidant (Aquazol, B-72, Lascaux, Promacto, and PVA) in a controlled environment. Each conservator had three seal samples to test per consolidant. The application methods included a small pointed wooden stick, small brush, and syringe,

Opposite: Fig. 3. Consolidant characteristics and working properties

Consolidant Characteristics and Working Properties

Consolidant	pH	Reversibility	Flexibility	Transparency	Drying Time	Wax	Vellum	Other
Acryloid B-72 Ethyl methacrylate copolymer resin.	7.0	Soluble in acetone and many other organic solvents.	Very flexible.	Transparent. Can be colored with pigments.	1 hr.	**ADHESION**: Bonds well, however inconclusive because of melted wax. **REACTION**: Melts wax, color bleeding. Dulls sheen.	**ADHESION**: Bonds well. **REACTION**: No cockling and no translucency of vellum.	A 50% solution of acetone provided better adhesion. A 15% solution dries too quickly to provide a solid bond. All organic solvents tested melted wax and showed extreme color bleeding.
Aquazol 500 Poly (2-ethyl-2-oxazoline)	8.0	Soluble in water and organic solvents.	Water mix was somewhat brittle when fully flexed, but still flexible.	Transparent.	Needs a good 5-10 minutes under pressure to set, and fully dries in 24 hrs. Still tacky after 30 min.	**ADHESION**: Strong to medium. **REACTION**: Has the same sheen as the "shellac" wax. Hardly detectable when dry.	**ADHESION**: Strong to medium. **REACTION**: Extensive cockling and translucent areas of vellum developed.	Slightly messy working properties: sticky, honey-like qualities.
Jade 403 PVA Resin based, internally plasticized polyvinyl acetate emulsion.	7.0	Soluble in water. Not soluble when dry.	Flexible.	Cloudy.	Straight and 1:1 solution needed about 10 minutes to dry completely. Straight sets faster but no immediate tack.	**ADHESION**: Straight and 1:1 (with water) solution very weak. **REACTION**: Straight and 1:1 solution leave a slight matte finish on wax, even when cleaned with water.	**ADHESION**: Straight and 1:1 (with water) solution strong. **REACTION**:1:1 solution created slight transparency of vellum. Straight and 1:1 cockled vellum.	Application was not easy to control. The straight solution did not dissipate as well as 1:1 (with water) and both left a filmy residue, which could not be removed.
Lascaux 498 HV Copolymer butyl-methacrylate dispersion thickened with acrylic butyl-ester.	8.0-9.0	Soluble in water and some organic solvents. Not soluble when dry.	Flexible.	Transparent.	Under 1 min. tack, about 15 min. to completely dry.	**ADHESION**: Strong. **REACTION**: No change of sheen or color bleeding was noticed. Dried Lascaux resembles wax surface.	**ADHESION**: Strong. **REACTION**: Some cockling and no transparency of vellum.	The viscosity of straight Lascaux allows it to act as a fill under uneven chunks of wax. 1:1 (with water) wicks into cracks very easily. Excess is removed easily with dry or wet (water) swab, leaving no film.
Promacto A-1023 Synthetic resin emulsion based on a vinyl acetate homopolymer, high solids.	5.0-6.0 in liquid.7.0 when dry.	Soluble in water.	Flexible.	Cloudy.	1-10 minutes to set, 24 hrs. for complete bond.	**ADHESION**: Strong. **REACTION**: Dulls sheen. Filmy residue can be removed with water if adhesive has not completely dried.	**ADHESION**: Strong. **REACTION**: No cockling and slight transparency of vellum when used with a 1:1 (with water) solution.	Application was not easy to control. The straight solution did not dissipate as well as 1:1 (with water) and both left a filmy residue. Cleaning the residue off of the wax surface resulted in minor abrasions.

while the working tools included cotton swabs, tweezers, and microspatula. These final tests were conducted at a common table while discussing each conservator's experience with the consolidant. This arrangement minimized the bias of skill level and preference affecting our results (fig. 3).

CONCLUSION

In the end, Lascaux was the preferred consolidant because of its strength, flexibility, transparency, and good working properties. Even so, no single consolidant worked for every criteria that was required. Acryloid B-72, which must be dissolved in organic solvents, melted the wax and was unsuitable for use. Aquazol and Promacto are soluble in water and therefore more easily reversible, but the addition of moisture proved detrimental for the vellum. Cockling occurred in the PVA and Lascaux vellum samples. All consolidants produced strong, flexible bonds between wax and wax except PVA, which proved a weak bond between wax and wax. As a result of this research it is hoped that the various methods used will offer conservators more viable options for the consolidation of wax seals of this type.

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