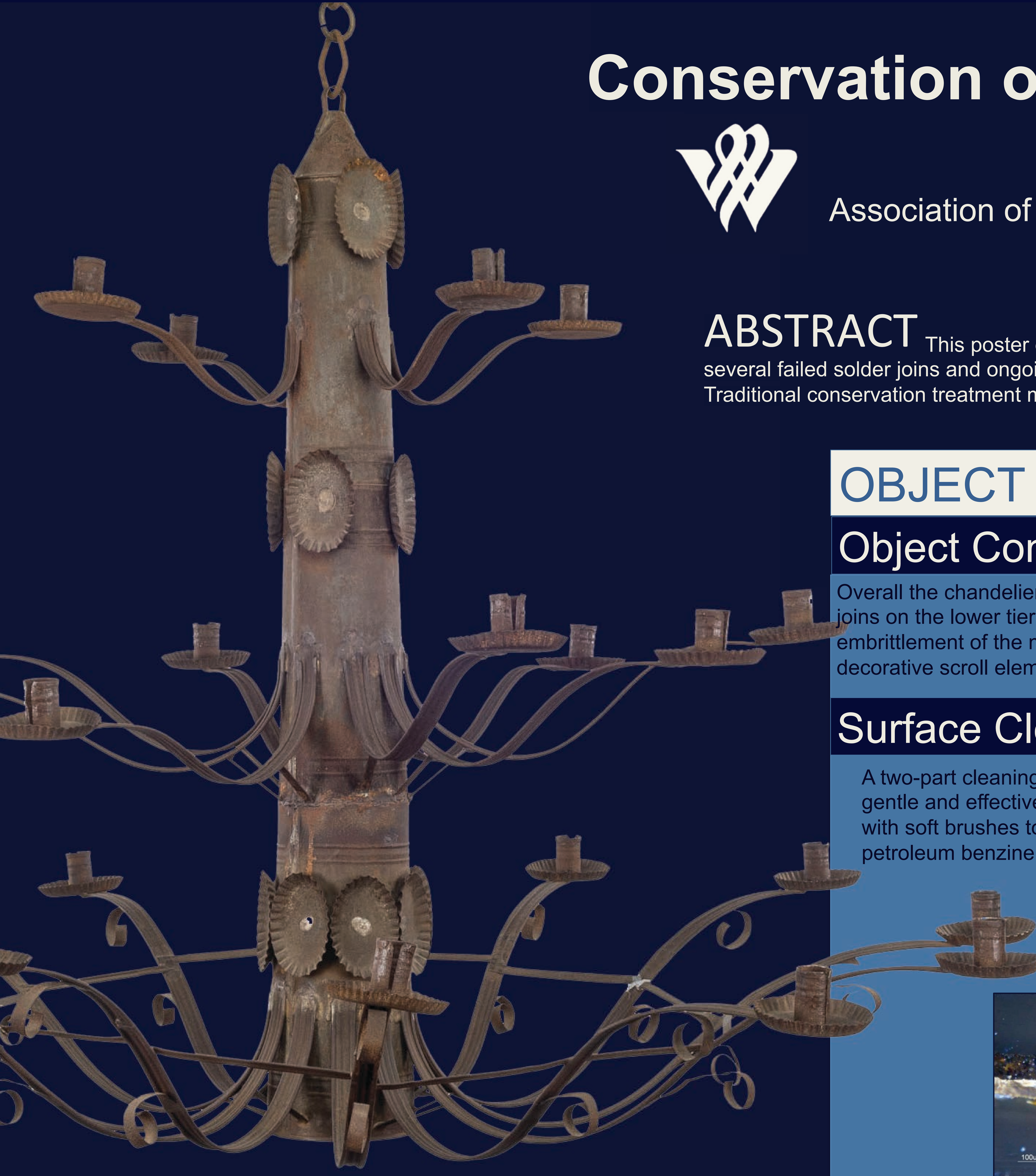

Conservation of American Tinplate: A 19th-Century Chandelier

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ABSTRACT

This poster explores the recent treatment of a 19th-century, tinplate chandelier in the Winterthur Museum collection. The object was removed from its permanent display location in one of the Period Rooms in 2011 due to several failed solder joins and ongoing corrosion. Treatment addressed the structural stability and aesthetic condition through the stabilization of loose and detached elements, corrosion inhibition, and preservation of the painted surface. Traditional conservation treatment methodology of plated metal objects was employed along with the additional novel use of the aminoalochol class of corrosion inhibitors.

HISTORICAL CONTEXT

What is Tinplate?

The term tinplate refers to sheet iron with a layer of tin or a lead-tin alloy applied to its surface as a sacrificial metal and corrosion inhibitor. The production of tinplate was a commercial process performed by two main processes: "hot-dipping" or electroplating. The former involved submerging the sheet iron into a vat of molten lead-tin alloy, while the latter is a process patented in 1840 that deposits pure tin onto the surface electrochemically.

Tinplate was very popular as the resulting metal was malleable, strong, corrosion resistant and lightweight—ideal for many domestic wares. Tinsmiths received the tinplate, worked it into useful forms by hand or machine, and peddled their wares.

Tinplate at Winterthur

Common American domestic wares were often made from tinplate until the mid-20th century. They ranged from highly decorated to bare-metal surfaces. Henry Francis du Pont, founder of Winterthur Museum, amassed a large collection of tinplate to be displayed in the historic house museum. This chandelier, purchased in 1929 by Mr. du Pont, is a rare surviving example of a commissioned tinplate object. The three-tiered form suggests that it was made to be used as a public-space fixture, possibly in a theater. The chandelier was on display for many years on an open-air porch that was later closed in to become the Room known as the Hall of Statues.

Chandelier on display in the Hall of Statues, 1957; Photo courtesy, Winterthur Museum.

OBJECT CONDITION AND TREATMENT METHODOLOGY

Object Condition

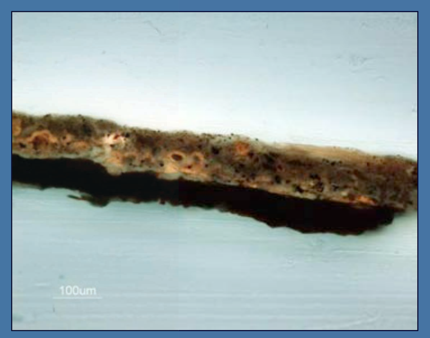
Overall the chandelier was in fair condition prior to treatment due to several structural breaks and ongoing corrosion. Specifically, two solder joins on the lower tier as well as several solder joins connecting struts to the central column had failed. Significant corrosion had led to embrittlement of the metal overall and appeared to be ongoing in several areas. The original paint layers, where present, were friable, and one decorative scroll element was missing from the lower tier. There was also a significant layer of surface grime on the object.

Surface Cleaning and Consolidation

A two-part cleaning system incorporating mechanical and solvent methods allowed for the balance of gentle and effective cleaning. A HEPA-filtered vacuum fixed with a rheostat was used in conjunction with soft brushes to remove large-particulate grime. Polyurethane cosmetic sponges dampened with petroleum benzine were used to lift fine, embedded grime.

Becky cleaning an arm with cosmetic sponges.

The cross section samples shown in visible light (left) and UV (right) reveal iron and tin corrosion products (orange and silver/grey), and two distinct paint layers. A varnish layer (cream-colored) is visible at the top right under UV.[1]



The friable paint and varnish layers required consolidation—eventually achieved with a 1.75% (w/v) solution of Paraloid® B-48N in acetone. Consolidant mixtures were tested on study collection objects to attain the correct sheen, strength and saturation (Table 1).

Table 1. Consolidant Systems Tested

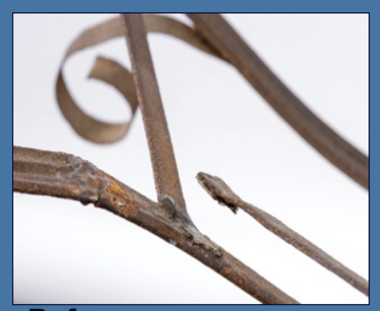
Consolidant Tested	Surface Result
Aquazol® 500 (5% w/v in ethanol)	Saturated/glossy
Aquazol® 500 (2.5% w/v in ethanol)	Saturated/glossy, less so than the 5%
Aquazol® 500 (2.5% w/v in ethanol), glass microballoons	Blanched/white
Paraloid® B-48N (1.75% w/v in ethanol)	Very minimal change, only slightly saturated
Paraloid® B-48N (10% w/v with 1% dodecane thiol in 95% Shellsol A100 and 5% ethanol)	Saturated

Structural Repairs

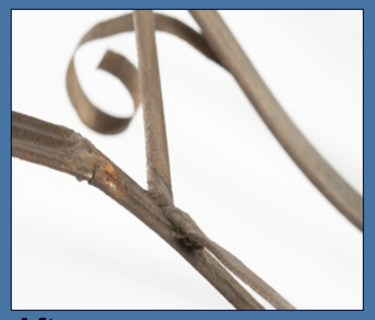
Structural repairs were made using a variety of materials and techniques. Materials chosen possessed the optimal working properties to impart the necessary strength, flexibility, color and sheen for the chandelier and could be manipulated in a variety of ways.

Direct Application (via brush):

- 40% Paraloid® B-48N
- Clamp to dry
- Mends reinforced with toned Japanese paper



Before



After

Bridges (applied perpendicular to join):

-Japanese paper toned with Golden® Fluid Acrylics

- 20% Paraloid® B-48N

Before (with a temporary Parafilm® M repair)

After

Adhesive Injection (via syringe):

-40% Paraloid® B-48N

-3M® Glass Bubbles

-Dry Pigments

-Adhesive injected into cracks or to bridge small gaps

Courtney injecting the bulked, pigmented adhesive.

Aesthetic Loss Compensation

- Single-ply matboard toned with Golden® Fluid Acrylics covered with Japanese paper, also toned with acrylics
- 20% Paraloid® B-48N used to stiffen the new scroll element
- Dried under weight

Before

A glass weight was used to shape the curl as it dried.

After

Corrosion Inhibitors

The passivation of the metal was carried out in a two-part system that included the application of an aminoalcohol-based corrosion inhibitor followed by a microcrystalline wax.

What are aminoalcohol-based corrosion inhibitors?

They are mixed inhibitors that form an adsorptive film to exclude aggressive ions from the surface in low weight percentages. Volatile and non-volatile species exist, allowing for a range of application techniques. The aminoalcohols were developed for and are used extensively in the concrete industry to protect steel embedded in cementitious matrices. However, they have not been extensively researched in a conservation context.

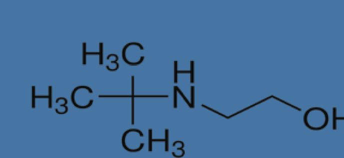
Courtney applying the inhibitor in the spray booth for adequate solvent extraction.

Why an aminoalcohol?

-Little aesthetic change

-Wide range of solvent miscibility

-The selected species, 2-(tertButylamino)ethanol, is soluble in nonpolar solvents, thereby avoiding disruption of the painted surface.



2-(tert-Butylamino)alcohol

Application methodology:

-Brush-applied a 1% (w/v) solution of the inhibitor in Shell-sol D-38 to all exterior surfaces.

-Delivered a 5% (w/v) solution of the inhibitor in Shell-sol D38 drop-wise via pipette into the column, relying on the vapor-phase deposition.

Microcrystalline Wax:

Because the effectiveness of the aminoalcohols has not been extensively tested in open systems, a secondary protective wax coating was applied to the exterior metal surfaces. Several modes of application were tested, as the goal was to impart minimal change in saturation and surface sheen. A Leister heat gun was used to warm the surface. Then, Renaissance microcrystalline wax was applied using a soft brush and the surface was again warmed. The wax was not buffed in order to avoid imparting an undesirable sheen.

Becky warming the metal prior to waxing.

INSTALLATION

Candles and Re-hanging

After consultation with curator Ann Wagner, it was decided that candles would be added to the chandelier to provide a historically accurate aesthetic. Careful consideration was given to the height and weight that was appropriate for each candle. In the end, 6" Handipt® candles from Colonial Candle were modified to a height of approximately 3.5" by cutting and burning the ends. This modification lessened the weight load on the fragile arms. The candles were individually modified to fit loosely into each cup and were wrapped with an isolating layer of Parafilm® M before they were installed. To lessen the risks associated with moving the chandelier with the extra weight of the candles in place, they were installed just prior to the re-hanging of the chandelier in the Hall of Statues.

[1] Cross section microscopy performed by Richard Wolbers on a Nikon Eclipse 80i Advanced Research Microscope; Normal Light View: *Nikon Excite 120 Mercury Lamp; cross-polarized*; UV View: *Violet Excitation (Nikon BV-2A Cube; EX 400-440, BA 470nm)*

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Photo Credits: Bartosz Dajnowski and Crista Pack (before treatment), Jessica Ford (corrosion inhibitor), Jim Schneck (studio photography assistance and chandelier installation)