WINTERTHUR

**CONSERVATION DEPARTMENT**

***Condition & Treatment Report***

**Object:** [1969.4178.002] Floral sculpture, Lilies

**Creator Name:**

No image

**Category:** Garden objects

**Title:**

**Material:** Iron, Bronze

**Object Date: Dated: Earliest:** 1890 **Latest:** 1920

**Measurements:**

**Height:** 166.00 cm (65.00 in) **Length:** **Width:**
**Depth:** **Diameter:** 92.00 cm (36.00 in) **Weight:**

**Reason for Examination:** Stabilization

**Catalog Description:** Squat bronze vase with wide body containing beaded decoration (B); narrow neck and flared lip. Lily buds and blooms attached to rope-like stems; Long leaves arranged below, radiating from center.

H.F. du Pont bought the sculptures; they are originally from New Orleans, Louisiana.

Christie's Comments: A pair of iron vases with iron lilies.

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**Conservation Description:** From Jenkins 2011, "The objects are a pair of tall ferrous metal potted lilies. While the method of construction is difficult to discern from such rusted surfaces, it appears to be a combination of fabricated and cast elements assembled around a central stem. The stem and several of the leaves at the base of the plant [are] set onto the top of a low wide lobed copper alloy vase. While the ferrous elements appear to be held into the vase with a soft gray metal (probably lead), it seems unlikely that the urns are both filled completely with lead. To do so would make the object exceedingly heavy (the density of lead is more than 700 pounds per cubic foot) and would be difficult to do safely. It is more likely that the bases are filled with some other ballast material and then the rims of the vases were sealed with lead."

**Previous Treatment:** In March 2012, Adam Jenkins performed the following steps (as summarized from his report, which can be found in the object file):
1. Digital photographs taken by Jim Schneck in the Winterthur conservation photo studio.
2. There were many multiple detached floral elements - five leaves and two flower cups. These were attached through welding, drilling, and screwing systems (see 2012 report for details).
3. The ferrous metal was treated with several applications of warm 2.5% tannic acid solution (the metal itself was also warmed locally prior to application).
4. A coating of "microcrystalline paste wax" was applied to the heated surface of the objects overall, the solvent was allowed to evaporate from the wax and the surfaces were buffed. Though not specified in the report, through email contact Jenkins believes he used the following wax recipe: three parts Victory BeSq microcrystalline wax 175: one part Victory BeSq microcrystalline wax 195, with 2% Petronauba C (synthetic carnauba wax)

In February 2013, Adam Jenkins reattached a broken leaf tip on 1969.4178.002 that became detached when the lilies were moved indoors from the gardens. He attached the tip by TIG welding the join with a mild steel welding rod.

**Condition:** In March 2012, Adam Jenkins performed a tannic acid-followed by protective wax-treatment (see Previous Treatment section). By November 2012, Winterthur staff noticed bright orange pits of corrosion reappearing and noted that the condition seemed to be worsened from prior to Jenkins' treatment (In his 2011 Condition Report, Jenkins noted the corrosion to be "not active"). In December 2012 the lilies were moved to inside the Research building by Rob Plankinton and other garden staff so that conservation staff could look more closely at them, and the sculptures could be kept indoors throughout the winter while treatment decisions were being made.

During the months of January through March 2013 the lilies were examined, corrosion products were analyzed, and the conservation staff made decisions for its treatment. The condition at this time was noted as follows:

Structure:
Structurally, the lilies were sound, with a few exceptions.
1) During the move from the garden into the Research building in December 2012, one of the leaf tips of 1969.4178.002 broke off. In February 2013 Adam Jenkins repaired this break by TIG welding the tip back into place (mild steel welding rod).
2) One or two of the leaf cluster bases are loose in their attachment in the lead-filled top of the urn. This was noted on sculpture 1969.4178.001
3) Some of the lily cups are loose (est. 2-3 lily cups on each object), but the attachments are noted to be stable and not in any danger of becoming detached or breaking.
4) The lobes of the copper alloy urns of both sculptures are dented in at various points. This was noted in Jenkins' 2011 Condition Report, and the condition remains the same at present.

Surface:
1) Most alarming is the abundance of deep pitting corrosion occurring throughout the surface of the iron lily components. The pits range in color from bright powdery orange (indicative of active corrosion), to deep maroon-red. A microchemical spot test was performed on samples from several of these pits to test for the presence of chlorides, which would be indicative of iron

chloride corrosion, but the result of the test was negative for chlorides ("test for chloride using silver nitrate" was carried out according to Odegaard 2000, pp. 108-109). Corrosion samples from both the bright orange and deep-red pits were submitted to the Winterthur SRAL for Raman microanalysis to characterize the corrosion products. This request is still outstanding at present.
2) The copper alloy urns remain in good condition, and there appears to be an applied patina.

2012 Wax coating:
The wax applied in 2012 (refer to Previous Treatment section) was noted to be blanched and incomplete at this time, with losses over large expanses of the iron components. In many areas, the blanched wax appeared white and perforated. The wax coating on the copper alloy urns was also slightly blanched, mostly having lost its original sheen and becoming matte.

**Environmental Recommendations:** Due to the especially extensive amount of corrosion present on these sculptures, as well as the partially experimental nature of the treatment process, the lily sculptures need to be monitored and regularly maintained while out in the gardens. They plan to be returned in early May 2013 for permanent installation and should be rewaxed every six months, at minimum once per year. Additionally, the sculptures should be covered through the winter months (early December through early March) with wooden enclosures executed by the Garden Department. These will not completely cover the sculptures; but rather a small space at the bottom of the boxes will allow for some air flow within the enclosure, while at the same time keeping snow and rain off of the surfaces and providing some protection from temperature drops.

**Proposed Treatment:** Concerning the iron components:
It was determined that because a wax coating had already been applied to these sculptures, complete removal of the wax in order to do any kind of chemical treatment of the corrosion would be time and labor intensive, and would likely not be successful at removing all the wax that had been allowed to penetrate the metal grain structure. Therefore, it was decided that some of the wax would be reduced by solvent - solvent that also has a corrosion inhibitor in it - but not with the goal of total wax reduction. The goal instead would be to remove some wax while at the same time getting surface contact of a corrosion inhibitor to complex with corrosion. This would then be followed by a hot-wax application of a wax mixture that also has corrosion inhibitor in the system, thereby offering added protection, more than just wax alone.

Concerning the copper alloy elements:
For aesthetic reasons and to replenish the wax coating present, the bases would be hot-waxed as well.

**Proposal By**: Lauren Fair **Proposal Date:** 03/05/2013

**Authorized By:** Maggie Lidz **Authorization Date** 05/16/2013

**Comment:** JRH - proxy

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**Treatment:** 1. Working in a walk-in spray booth with adequate fume extraction and wearing respirators, the conservators applied a mixture of 2% tertbutylethanolamine (TBEA) in Shellsol D-38 (w/w) by brush to all iron surfaces. During steps 1-3, the copper alloy bases were protected by wrappings of plastic sheeting secured with blue tape. The lead-filled vases were protected by balled up paper towels to collect solvent running down the vertical surfaces of the leaves and stems. This solvent-TBEA application sought to reduce the previous wax coating, while at the same time providing contact to the ferrous metal with a corrosion inhibitor. The solution was brushed on and worked into the surface with a medium-stiffness brush, then excess wax and solvent was wiped off the surface with paper towels. The brush was rinsed wish Shellsol D38 solvent after each brush application.

2. Because the solvent-TBEA system is fairly toxic if inhaled, the work had to be executed in a high-powered spray booth with significant air draw. While adequate for safety, the air flow also facilitated quick evaporation of the solvent, thus disabling a long dwell time of the inhibitor on the ferrous metal. Research by Bommersbach and others (2005) showed that a dwell time of two hours yields the best results for corrosion inhibition of ferrous surfaces. Therefore, another 2% solution of TBEA was applied with the goal of getting contact with liquid inhibitor on the ferrous metal for two hours. This time, the carrying solvent chosen was Shellsol A-100 (2% w/v) because its evaporation rate is much slower than the D-38. The solution was applied to the ferrous elements with spray bottles, working from top to bottom. After one application, the sculptures were covered in plastic wrap to further slow solvent evaporation, and when top sections began to dry, another top-down coat was applied. This process was repeated several times until the ferrous surfaces had been exposed to the solvent-TBEA system for two hours.

3. The iron components were then hot-waxed. Using hand held propane torches, the iron was slowly heated in sections before applying wax with a brush, working it into the surface and then heating again to ensure good penetration and coverage.
The wax mixture used consists of:
Three parts Be Square™ 175 microcrystalline wax (melting temperature ~175-180°F, contains a higher concentration of branched hydrocarbons that make it much less crystalline than paraffin or hard microcrystalline waxes. Manufactured by Bareco division of Baker Petrolite)
One part Be Square™ 195 microcrystalline wax (wax with melting temperature ~195°F, contains normal paraffinic, branched paraffinic and naphthenic compounds. Manufactured by Bareco division of Baker Petrolite)
2% by weight Petronauba C (synthetic Carnauba wax used in modifying wax coatings)
2% by weight tertbutylethanolamine (TBEA)

Two applications of this wax mixture were applied. The first, untinted, and the second, tinted with a small amount of vine black (carbon-based) dry pigment.

4. The copper alloy vases were uncovered, and using the hand held torches, the surfaces were heated and an untinted coat of Butcher's® Clear Paste Wax (a blend of carnauba and microcrystalline waxes blended with mineral spirits and turpentine) was applied with brushes.

5. After one hour of wax application, the surfaces were then lightly buffed with clean dry stiff-bristle brushes.

6. Both sculptures (.001 and .002) are accessioned objects, but neither contain the accession number. In consultation with the curator (Maggie Lidz) and Registration, it was decided to apply the accession numbers to the copper alloy vases of each sculpture in a conspicuous area. Using Golden acrylic red paint (medium cadmium red hue), the numbers were hand painted below the half-rounded neck rim on each over top the wax-coated copper alloy bases. A secondary top coat of clear paste wax was applied over the painted number for protection from abrasion and general wear in an outdoor environment.

Additional notes:
Many studies have been done into the efficacy of corrosion inhibitors and their interaction with iron and steel surfaces; however, little is known about their long-term effects in an art conservation context. As such, this treatment was carried out in an attempt to add a further layer of protection beyond the routine wax application, which had proven to be insufficient in regards to the corrosion present on the iron components. See bibliography for consulted sources on this topic.

Please see Recommendations for continued care of these sculptures.

Bibliography:
Andreev, N. and Yu. Kuznetsov. 2012. “Volatile inhibitors of metal corrosion: I) vaporization.” International Journal of Corrosion Scale Inhibition 1: 1. 16 - 25.

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Gaidis, James M. 2004. "Chemistry of corrosion inhibitors." Cement & Concrete Composites 26: 181-189.

**Treated By:** Lauren Fair **Date Completed:**04/23/2013

**Treatment Hours:** 30.00

**Treated By:** Linda Lennon **Date Completed:**04/23/2013

**Treatment Hours:** 28.00

WINTERTHUR

## CONSERVATION DEPARTMENT

### *Condition & Treatment Report*

**Object:** [1969.4178.001] Floral sculpture, Lilies

**Creator Name:**

No image

**Category:** Garden objects

**Title:**

**Material:** Iron, Bronze

**Object Date: Dated: Earliest:** 1860 **Latest:** 1930

**Measurements:**

| | | |
|---|---|---|
| **Height:** 162.00 cm (64.00 in) | **Length:** | **Width:** |
| **Depth:** | **Diameter:** 90.00 cm (35.00 in) | **Weight:** |

**Reason for Examination:** Stabilization

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