

CONSERVATION DEPARTMENT

Condition & Treatment Report

Object: [1979.0029.001] Flute

Creator Name: Bacon & Hart

Category: Musical Instruments

Title:

Material: Wood, Boxwood, Ivory (sperm whale), Paktong, Iron, Felt, Co

Object Date: Dated: Earliest: 1819 **Latest:** 1832

Measurements:

Height:	Length: 61.28 cm (24.12 in)	Width:
Depth:	Diameter: 3.49 cm (1.37 in)	Weight:



Reason for Examination: Exhibition

Requested by: Catharine Christie Dann Roeber

Catalog Description: A transverse wooden flute comprised of four cylindrical sections of hollow-bored boxwood with a knob-like swell and ivory ring border at the juncture of each section (missing ring at the lowest end), six open finger holes and four metal keys with steel springs and felt pads placed to cover other holes in the body. The head piece, or mouthpiece of the flute has a circular removable ivory cap that is adjustable with a threaded ivory screw and cork lining. The individual body sections are friction fit together and waxed twine or thread is wrapped around the inner tenon elements to secure the joins. The exterior is a darker color brown than the interior sections, possibly from a natural resin dye and/or a wax coating. The ivory rings and fittings are made from sperm whale tooth ivory turned on a lathe. Maker's mark on all four sections: "BACON &,HART/PHILA." stamped incuse.

(See Notes.)

Conservation Description: Looking at similar examples of instruments made by Bacon & Hart in the Library of Congress collection (DCM1047 and DCM1277) and conferring with musical instrument conservators at the Metropolitan Museum of Art, it has been determined that this instrument is not a flageolet, as initially catalogued; but rather it is a transverse flute. The mouthpiece consists of a wider hole near the extant end cap, while the six smaller, variable-sized finger holes are located on the middle two sections. Please also see the detailed 2000 examination report by then-conservation graduate student Sarah Kitch in the object's conservation file for more details of the object description and its categorization as a transverse flute.

Materials of construction: boxwood sections that are likely coated and/or dyed; waxed bast fiber twine; sperm whale tooth ivory cap and fittings (or ferrules); silver-plated copper alloy keys; felt pad linings; cork.

The flute is comprised of four sections of hollow-bored boxwood: first, the mouthpiece with ivory end cap on one end and ferrule on the other; second, the first three finger holes with two metal keys and a tenon on either end wrapped with waxed twine; third, the next three finger holes with one metal key, and one ivory ferrule on one end and a tenon wrapped with waxed twine on the other; and fourth, the foot or base of the flute with one metal key, and one ivory ferrule on one end and a tenon with a missing end cap (would have been ivory) on the other end. Each section fits snugly into the next via its tenon-and-socket construction. The waxed twine wrapped around each tenon provides a snugger fit at the joins. The boxwood may have been dyed and coated with a natural resin and/or wax coating; interior surfaces reveal the light natural color of boxwood, while exterior show surfaces appear a medium brown (the wood sections fluoresce very faintly green under long-wave ultraviolet light; see light source information below).

The ferrules and fittings consist of turned sperm whale tooth ivory (see Kitch 2000 for more explicit reasoning of ferrule characterization). The extant end cap consists of two parts: the piece that is visible when assembled contains a tenon that goes into the socket of the bored mouthpiece and is hollowed out with a threaded hole, into which is screwed the second piece of ivory (may be a different animal source, or bone); this screw is imbedded in a piece of cork that provides a longer tenon that could be adjusted by turning the screw for playing purposes.

Three of the four keys are determined to be silver plated brass (see Analytical report of XRF analysis in object conservation file for more details), these are the three that are all aligned vertically, or in the direction of the flute itself. Based on the "higher than trace amounts" of gold (Au) also detected, and by the fact that the ratio of gold to silver changed as the tube strength was increased or decreased, it is suggested that the keys were initially gold-plated brass at one time, before they were later silver-plated as a restorative action. The fourth key, which is the one key attached to section three of the flute, and the only one aligned perpendicular to the flute itself, was determined to be an alloy of copper, nickel, and zinc, otherwise known as "German silver," or "nickel silver." The extant padding underneath the largest key of the end section appears to consist of multiple layers of felt.

UV light source: Hand held Mineralight® Lamp, model number UVGL-58 with multiband UV at both 254nm and 366 nm; operates at 115 V, 60 Hz, and 0.16 Amps; manufactured in December 1998 in Upland, CA.

Condition: The condition of the flute is fair, with at least one missing element, tarnish on metal elements, and medium-to-heavy surface dirt and grime overall.

Structure:

The flute is structurally sound, with the majority of elements intact and securely fastened. The waxed twine which likely once held the sections together quite firmly has now become brittle, and the sections can easily be disassembled. The twine wrappings are mostly intact, except for those on the second tenon of the flute's second section (that which contains the first three finger holes); on this tenon, the twine has become loose at the top and bottom of the wrapping, and three small fragments became detached when the flute sections were disassembled for this examination (these twine fragments were collected and bagged and will be kept in the object's conservation file).

The extant ivory cap and ferrules are also structurally sound, though the end cap suffers two

radial cracks originating from the outer perimeter; both cracks go through the thickness of the cap and terminate (with small hairline tails) where the tenon begins. There is a thick piece of yellowed tape wrapped around the tenon of the ivory cap, which extends past the end of the tenon; this was most likely applied to add a layer of thickness and improve its fit into the bored mouthpiece, rather than to provide any structural stability to the piece. The ivory(?) and cork insert section has a broken tip at the end of the screw, which would have protruded out the hole of the end cap. Finally, the end cap at the foot of the flute, which would have also been made of whale tooth ivory, is missing.

The metal keys now appear black, as the plating is highly tarnished. Presumably, there would have been felt pads beneath all of the keys, but the only felt pad remaining is under the largest key present on the end section.

Surface:

In addition to the tarnished metal surfaces, the boxwood surfaces have also endured a good bit of wear. There are many fine scratches from use, as well as several minor accretions. Two of these accretions, which appear slightly yellow in visible light, fluoresce bright orange under long-wave ultraviolet light, possibly indicating that these are shellac; one is located on the ivory ferrule of the third section, and the other is located on the wooden surface of the second section, to the proper right of the lowermost key. Other accretions include several small white specks (paint?) on the mouthpiece, a smear of white near to the stamped maker's marking on the second section and several white specks near the keys, as well as a few smaller white specks on the third section near the finger holes.

Accession numbers/markings:

The accession number "79.29.1" is written in red paint (no barrier layers) in four locations: 1) on the extant ivory end cap, vertical face; 2) on the interior of the uppermost tenon of the second section; 3) on the interior of the socket of the third section; and 4) on the interior of the socket on the end piece.

- Proposed Treatment:**
1. Before treatment photography carried out by Jim Schneck in the Winterthur conservation photography studio.
 2. Surface clean, first with dry methods using HEPA-equipped vacuum suction and soft brushes, as well as soft sponges such as the polyurethane cosmetic sponge. For the ivory components, other dry cleaning methods can be used as necessary, such as natural rubber Groomstick, and aqueous methods (1% nonionic surfactant in deionized water) or solvent-based systems (1:1 ethanol/deionized water) on cotton swabs.
 3. While three of the twine-wrapped tenons are stable and secure, the twine of the lowermost tenon on section two needs to be stabilized. One option is to tighten the wrapping and secure it with a microcrystalline wax; another option is to wrap the section with Parafilm M stretchable film, provided that this does not add too much thickness and prevent proper reassembly of the flute sections. If successful, this latter option could also be used as a preventive method on the other tenons to provide a layer of protection to the wrapped twine and tighten the joins.
 4. Lightly polish the metal keys using a combination of mechanical methods: a polyvinyl chloride eraser to provide gentle abrasion, aluminium oxide and/or precipitated calcium carbonate in a slurry with 1:1 ethanol/water to provide a surface shine, and gentle rubbing with a Shino cloth (jewelers rouge abrasive).
 5. Provided key plating is indeed silver, after these elements and thoroughly rinsing (deionized water) and degreasing (acetone), coat with Agateen nitrocellulose lacquer to protect delicate

plating from further tarnish while on open display in the collection.

6. Recreate missing ivory end cap. Possible materials for reconstruction include whale tooth ivory, Micarta, or cast epoxy. Adhere reconstruction in place in a secure, but reversible manner.

7. After treatment photography will be carried out by Jim Schneck.

Proposal By: Lauren Fair

Proposal Date: 11/15/2013

Authorized By: Bruno Pouliot

Authorization Date 11/19/2013

Authorized By: Ann Wagner

Authorization Date 11/19/2013

Treatment: 1. Before treatment, Jim Schneck carried out photodocumentation in the Winterthur conservation photo lab.

2. Vacuumed all surfaces using soft brushes and a HEPA-equipped vacuum cleaner. Next, used dry cosmetic sponges (polyurethane) to clean outer surfaces, including wood, ivory, and metal. On ivory components only, removed grime using rolled cotton swabs dampened with saliva (followed by deionized water). A solution of 1:1 ethanol/deionized water on cotton swabs was also used in some areas where the dirt was more ingrained. 1 hour

3. The twine of the lowermost tenon on section two was stabilized by tightening the wrapping delicately, using fingers and small tweezers to realign the threads. During this re-wrapping process, a number of already-loose threads became detached from the remainder of the wrapping. These were saved and kept in the polyethylene bag along with the other detached thread fragments. Currently there are now ten detached fragments of thread. The remainder threads in tact were secured in place with Multiwax® W-445 (microcrystalline wax, m.p. 76-82°C, mfg. by Sonneborn Refined Products), which serves to keep the loose threads in place, while at the same time serving as a protective barrier when the tenon is inserted into the neighboring flute section. 1.5 hours

4. The three silver-plated keys and one German silver key were all polished using the following methods: first, a polyvinyl chloride eraser provided gentle abrasion, but did not remove much tarnish. Next, subsequent slurries of aluminum oxide and precipitated calcium carbonate in 1:1 ethanol/water were used to remove the dark and thick layers of tarnish, while at the same time not resulting in a "too shiny, high gloss" polish, in order to stay in line with the overall darkened patina of the flute's wooden body and aged ivory rings. After removal of the heavier areas of black tarnish, the polyvinyl chloride eraser was again used on the surface of the keys; at this point the eraser was able remove small areas of tarnish that were left behind by the previous polishing techniques. The final eraser cleaning was successful at unifying the overall look of all four keys. 3 hours

5. The polished keys were then rinsed with deionized water, degreased with acetone, and coated with two brush applications of Agateen nitrocellulose lacquer to protect the metal surfaces from further tarnish while on open display in the collection. During both polishing and coating of the keys, the remainder of the flute elements were protected by wrapping them in Parafilm M. 1 hour

6. An end ring was recreated using a sperm whale tooth, turning the ivory on a lathe the shape of the ring, including the decorative beading. The placement of the beading was a decision made in conjunction with Winterthur curator Ann Wagner, and by looking at photographs of similar flutes made by Bacon & Hart from this time period (see object conservation file for prints of similar flutes in other museum

collections). To hollow out the inner portion of the ring, a metal lathe was used for greater precision. After the shape of the ring was further polished and refined, it was coated with microcrystalline wax tinted with dry pigments to match the aged appearance of the other rings. For greater integrity of the coating, a final coat of SC6000 (blend of waxes and acrylic resin emulsified in aqueous isopropyl alcohol, mfg. by The Leather Conservation Centre) was applied. The replacement end ring was secured to the flute using dabs of Multiwax® W-445. 8 hours

7. After treatment photography was carried out by Jim Schneck.

Analysis:

Test For	Method	Result	Tested By	Date	SRAL #
elemental analysis	XRF - stationary		Catherine R. Matsen	12/06/2014	AL5777

Treated By: Lauren Fair

Date Completed:02/20/2014

Treatment Hours: 14.50



1979.0029.001 AT_02_2014_1



1979.0029.001 AT_02_2014_2



1979.0029.001 AT_02_2014_3



1979.0029.001 OV 1 BT
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1979.0029.001 OV 2 BT
11-2013



1979.0029.001 OV 3 BT
11-2013



1979.0029.001 detail BT
11-2013



1979.0029.001 Flageolet