An Investigation of Painted Wood Shields from 3rd Century Dura-Europos

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Yale University Art Gallery

Figure 1

Figure 2

At the Yale University Art Gallery (YUAG), three Roman painted wood-plank oval shields dated to approximately A.D. 256 from the site of Dura-Europos are rare, if not the only, examples of this shield type. Previously identified as a Warrior God, the sack of Troy (Homeric shield), and the battle between the Greeks and Amazons (Amazon shield), the decorative elements are also exceptional, well-preserved examples of preparatory and paint layers on a wood substrate from antiquity. While it was projected that these shields "will take an important place in the history of ancient art,"[1] there has been no comprehensive analytical study of these significant finds since 1935, when they were excavated and analyzed by Rutherford J. Gettens and George L. Stout of the Fogg Art Museum at Harvard University. Though still in its early stages, this project aims to complete a study of these shields, investigating the preparatory layers, pigments, binding media, and painting techniques, as well as the wood support and manufacturing methods, and ultimately identifying conservation treatments for these delicate objects.

Provenance

The Seleucids founded the city of Dura-Europos at the intersection of East-West and Euphrates River trade routes in 303 B.C. [Figure 1] The city was captured by the Parthians in the second century B.C. and by the Romans in the middle of the second century A.D. In A.D. 256, the city was sacked by Sasanians, abandoned, and never reoccupied. This, in conjunction with the arid desert environment, resulted in the remarkable preservation of the site's artifacts.

Dura-Europos remained virtually undisturbed until 1922 when a team sponsored by the French Academy of Inscriptions and Letters first began excavation. Yale University archaeologists joined the project in 1928 and excavated the site for ten seasons. At the end of each season, finds were divided between the French and Yale teams. As a result, YUAG has approximately 12,000 artifacts from Dura in its permanent collection.

Excavation & Early Examination

The shields were discovered in January 1935 in an embankment on the north side of Tower 24. [Figure 2] The excavation report states: "The shields lay in a pile together…They lay so far beneath the surface of the fill and so high above the last level of the street that they could only have been placed there in or about 256 A.D. when the embankment was constructed. Preservation of the paintings was due in part to the fact that they lay pressed upon one another. The wood was very fragile and the painting faint."[2]

It is speculated in the same report that the shields were parade shields, and not for use in battle, as they were each lacking bosses, or *unbone*. "The finding of the three fully decorated shields in a group at a point close to the west edge of the Roman camp suggests a shield-painter's shop in the *canabae* as their provenance. The shop was presumably one of the flimsy camp structures along the wall which was covered by the embankment or razed to make a way along its foot."[3]

Herbert J. Gute, the expedition's artist, assisted in excavating and treating the shields before painting highly-detailed watercolors of the shields. [Figures 3 & 4] The October 1935 technical examination report compiled by Stout noted the prior treatment: "Caked clay was removed mechanically in the field. The surface was brushed with one thin and (after drying) with one thick coat of polyvinyl acetate in organic solvents." Getten and Stout's microscopic and microchemical analysis of the ground and pigments on all three shields indicated the presence of a "crude gypsum", possibly containing lime, ground, and carbon black, gypsum white, yellow and red earth and indigo pigments. The binding medium of the paint could not be definitively identified, though "a phosphorous containing a nitrogenous organic medium" seemed to indicate an egg or casein based tempera. The wood was studied by Yale professor Samuel Record, who identified the wood species as pine, probably *Pinus halepensis* commonly known as *Aleppo*, native to the Mediterranean region and found in Syria.

Current Project

In 2012, the Warrior God shield (1935.553) was chosen by Assistant Curator of Ancient Art, Lisa Brody, to be displayed in YUAG's new Dura-Europos gallery. As time was short, the priority was to stabilize and clean this shield. The PVA that was applied by Gute was shiny, had trapped dirt, and obscured the imagery; it was reduced with acetone. Tenting and flaking paint layers were set into place with a Willard heated spatula, as well as Lascaux Medium for Consolidation. After treatment, aspects of the painted imagery could be more clearly recognized and the shield is now displayed on a slanted mount under a bonnet.

After examining this shield together, the authors decided to look at the other two shields, which had been in storage for many years. All three had been previously examined by Simon James and included in his 2004 publication *Excavations at Dura-Europos 1928-1937 Final Report VII: The Arms and Armour and other Military Equipment*. The Homeric and Amazon shields are in far more vulnerable states than the Warrior God; the Amazon shield (1935.552) is in the poorest condition, with the most extensive paint flaking, tenting, and loss, as well as the most fragile wood.

Anthony De Camillo of YUAG's Department of Visual Resources photographed all three shields under normal, raking, UV, and IR light. Gute's original watercolors of the shields, also in YUAG's collection, had been thought to be optimistic projections of what survived on the shields, but IR imaging proved otherwise, showing complex and well-wrought paintings, especially on the Homeric shield (1935.551), which has become the focus of the first stage of this project. [Figures 5 & 6]

Surviving Roman paintings on wood substrates are rare, with perhaps the most frequent examples being Roman Egyptian mummy portraits and painted panels. Analogous examples of painted shields are even more uncommon. James refers to four fragmentary 4th century A.D. oval shields at the University of Trier, but the imagery is painted on leather or parchment, which was then glued to wood boards.[4] Shields with painted parchment on wood planks or on plywood are also found in the Dura collections at YUAG, but will not be included in the study at this time.

Much of what is known or understood about ancient painting techniques is through literary sources such as Theophrastus, Vitruvius, Pliny the Elder, and Dioscorides, as well as through published analytical studies of Roman Egyptian painted material, such as mummy portraits, as well as Late Classical to Hellenistic era Greek painting techniques.[5] This project aims to elucidate more information about painting techniques from antiquity, and to place Roman practice in the greater historical context of panel painting from antiquity to the Renaissance.

Figure 5

Figure 6

Figure 3

Figure 4

Shield painted with two scenes from Iliad
ca. 323 B.C.-A.D. 256

Figure 7

Figure 8

Wood Support

The Homeric shield is comprised of thin pine planks or laths. Currently there are nine fragmentary wood laths and seven nearly complete ones. The central planks are wider and longer and are flanked by narrower ones; the thickness varies across the shield from 5 to 6 mm at the center tapering near the edges to about 2 to 3 mm. An x-ray of the shield has elucidated some information about the properties of the wood. [Figure 7] The boards were butt-joined along their long edges with the grain oriented vertically. Glue was used along these joins. The type has not yet been identified, but FTIR analysis is planned. If proteins are found, MALDI may be used to identify the protein type.

The varying widths and thicknesses, as well as the number of the laths, may indicate that the shield once had a slight convex surface, though it is now difficult to determine original curvature because of deformation. Aligning imagery that spans across boards may help in determining curvature. Steam bending may have been used to shape the wood around a mold. After shaping, smoothing the wood surface and gluing the planks together, the carpenter would have trimmed the edges of the wood boards to give it an oval shape. The edges of the shield were then beveled.[6]

The grip was cut after the wood substrate was built. Tool marks like those of a saw are visible along the perimeter of the opening; tool marks are also visible on the verso of the boards. The center grip has two openings: a top one, wider and curved along the upper edge, has sufficient space for the knuckles and part of the hand; the lower quadrilateral opening is narrower, but has space for the fingers. In between the two openings, a central wood bridge, which was the core element of the grip, is now missing. A metal bar fixed to the verso of the shield may have reinforced it.[7] A metal boss could have covered the grip on the recto. There is a circular space (22 cm in diameter) reserved in the central floral and geometric motif of the shield. This space was painted with a flat dark blue color; no rivet nail holes are present around the opening likely indicating that the boss was never attached.[8]

Three copper alloy rivets present on the shield may have been used to fasten the metal bar to the verso of the shield. Two rivets are positioned along the traverse axis of the oval shield, approximately 30 cm apart from each other. The bar may have originally extended to the edges of the shield, fixed with two missing additional rivets. The bar, not only strengthened the wood grip, but also reinforced the structure and retained the convex shape. A third rivet, present in the upper proper left quadrant, was used to secure a ring to which a loop or strap was attached to hang the shield to a wall[9] or sling it over the shoulder.[10] Other nail holes are present on the surface and may relate to verso structural elements. Preliminary x-ray fluorescence energy dispersive spectroscopy (XRF-EDS) analysis completed by Drs. Erin Mysak and Gwen Kavich from the Institute for the Preservation of Cultural Heritage-Center for Conservation and Preservation (IPCH-CCAP) at Yale University indicates that the two center rivets are composed of brass, and differ from the upper rivet, which is a different copper alloy.

Preparatory & Paint Layers

After construction, the wood substrate was coated with a thin layer of glue; in areas of recent loss, this layer is visible through stereomicroscope observation as a transparent and brittle layer characterized by a minute craquelure. The whole wood surface of the shield was then prepared with a thin ground layer of calcium-based white and lead white as indicated by XRF-EDS. The ground provided a smooth surface on which the artist would paint. Stout noted in his 1935 report that there was "…little or no visible indication that a medium or film-forming substance is present" in the "crude gypsum" ground layer. The absence of a binding medium such as animal glue seems implausible and further scientific investigation is needed. In areas of recent loss, the ground appears inconsistent in particle size and color.

In areas of both paint and ground loss, vegetal fibers can be seen glued directly to the support, mixed into the ground matrix, and placed between layers of ground.[11] The plant fibers are fine and long and appear to be glued on the whole surface of the support rather then just along the joints of the wood boards.[12] During initial investigation, is appears that the plant fibers are incorporated in the ground with the fibers laying perpendicular to the wood grain.[13] The fibers would have reduced the effects of the joins between planks on the painted surface and imparted stability to both the support and the preparatory layer. Small pieces of plain-woven fabric have also been found below the ground layer, but their locations do not appear to be related to specific structural issues. [Figure 8]

Above the ground layer, except for the central area with decorative circular bands, the artist laid a reddish preparatory layer on which he then directly painted.[14] It is difficult to evaluate the color hue of the red preparatory layer because of PVA saturation. XRF-EDS has identified compositions of possibly two pink colors: organic red, likely madder, lead white and/or red lead; and calcium-based whites and/or a calcium-based substrate for the organic red pigment. In Stout's conservation report the "pale red" was analyzed and it was identified, as "a pigment of the usual iron-earth type and it is probably a variety of bole." Optical microscopy shows that the colored preparatory layer has pink and white pigment particles of different sizes, and is granular and porous in aspect, and looks loosely bound. Uneven PVA absorption by the paint layers may be related to the specific characteristics of the pigments or the use of different binding medium for the preparatory and paint layers.

Because of its state of preservation, it is difficult to understand how the painted imagery was applied. It does appear that the artist laid the paint directly on the colored preparatory layer to build the composition. The modeling of composition was done by using two to three tones of a same color, overlaid or juxtaposed; the highlights and the shadows are built last using pure color. Little to no mixing of the paint seems to have been done directly on the surface. The contours of the figures, the features of the faces, as well as other elements were emphasized by dark brown lines of paint. The expressionist quality of these lines can be clearly seen in the IR image, and the lines show the great ability of the artist to freely handle the paintbrush in constructing forms and details. Further microscopic investigation and XRF-EDS analysis confirms several layers of paint buildup on the wood panel. Elemental analysis suggests that the painted layers on top of the preparation layers contain the following pigments: calcium-based whites, lead white, orpiment, red lead, organic red (likely madder), vermilion, indigo, iron oxides and/or earth pigments.

Stout suggested that egg yolk or casein was used as a binding medium for the paint layer. This needs to be confirmed with new analysis with FTIR and, possibly, MALDI. Nevertheless through stereomicroscope observation the paint layer is characterized by a minute craquelure that is quite typical of an old tempera medium paint. The craquelure present in the paint and colored preparation layer is quite different, possibly suggesting two different binding mediums.

Along the edge of the shield, a series of holes are visible; they appear to have drilled or bored after the shield was completely painted. A leather binding was likely applied to the edge of shield when the leather was wet; it would shrink upon drying and impart further support to the shield edges.[15] The leather was then secured to the edge of the shield with twine stitched through the holes.[16] Though no twine or leather remains on this shield, examples are found on other shield types in the collection.

The first phase of this collaborative research study has underscored the importance of these shields and placed them in the broader context of painted surfaces from the Roman times. After evaluation of this initial analysis and completion of future analysis, the first stage of treatment can be planned. Consolidation of the preparatory and paint layers, as well as the removal of dirt, grime and PVA will allow a better understanding of the painted surface and the technique used by the artist to paint this unique object.

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[10] Rostovtzeff et al op.cit.
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