Tania Desloge and Netanya Schiff

Fighting Fit: conservation of a Japanese samurai armour at the British Museum

Abstract

In 2017, the British Museum acquired its first full suit of Japanese samurai armour dating from 18th century Japan to be displayed in the newly refurbished Mitsubishi Japanese Galleries. Extensive treatment was needed prior to display due to a number of conservation issues: previous pest infestations that caused damage across materials such as doeskin, silk, wood, horn, leather and gilding; and degrading lacquer with fragile, mobile areas at risk of additional loss. Time restraints meant the treatment focused on consolidating and securing mobile lacquer and leather, stabilising wood and horn structurally unstable from pest damage, netting fraying textiles and adapting the traditional wooden stand for mounting purposes. Throughout the treatment there were discussions with curators regarding the extent of conservation necessary to help create an approach that combined modern and traditional methods. Although all components of the armour were treated, this article will focus on the conservation of the cuirass (do) and storage box (gusoku bitsu) that best exemplifies the overall method implemented.

Keywords

Samurai armour, cuirass, X-Radiography, Edo period, lacquer, shimbari, wheat starch paste

Introduction

In 2016, the Mitsubishi Japan Galleries at the British Museum was closed to allow for a refurbishment and rotation of new objects for display. One of the more popular pieces from the previous display, a samurai armour[1] pieced together from an assortment of pieces made between 16-19th centuries from the Momoyama Period, had been on display in the Japan Galleries since 2006. After being displayed for 10 years, the samurai suit was scheduled for long-term storage as per the Museum's conservation policy for light sensitive materials that encompasses lacquer and textile objects.

1. BM registration number OA+.13545.b

With the generous support of the JTI Japanese Acquisition Fund, the Museum was fortunate in acquiring its first complete suit of samurai armour[2] (fig. 1) dating from the 18th century to be displayed in the refurbished gallery. Acquired in Spring 2017, the armour needed considerable conservation work before mounting and display. Discussion between curators and conservators resulted in an interventive treatment that incorporated some Japanese techniques such as shimbari clamping technique[3] and refurbishing the traditional wooden yoroi stand while using predominantly synthetic consolidants and Western mounting methods. Due to similar treatments across the components and to allow for a more detailed investigation into some of the more complex conservation issues, this paper will only discuss the conservation of the cuirass, one storage box and the overall mounting of the armour. The conservation proved to be an exciting and challenging project for both the organics conservator and conservation student on placement within the team. It provided them the opportunity to gain an understanding of the materials, manufacture and significance of the various components of the armour, which was new to them before developing a minimally interventive treatment incorporating some Japanese techniques. It also allowed a detailed examination of components to better understand the manufacture of the armour aided by x-ray imaging.

2. BM registration number 2017,3024.1.1-11

3. Bainbridge, 2015

Fig. 1. Samurai armour as it came into the collection. Seated on two storage boxes and mounted with traditional yoroi wooden stand.

History of samurai armour and acquisition of object

The style of samurai armour has altered significantly throughout history. Originally it depended on the style of combat favoured, such as horseback or hand to hand. The armour was worn to protect the wearer during battle and accompanied a strict code known as bushido, which equates to chivalry in Western countries.[4] The code required that a warrior would announce his rank and clan before fighting; the design and decorations on the armour would help identify him to all parties involved. Armour was primarily known for its functionality such as using lightweight materials like rawhide for ease of movement.[5]

During the Edo Period (1603-1868) peace was brought to Japan and samurai armour began to focus on aesthetics and exaggerated decorative elements rather than functionality. Examples include helmets with tall pagodas that are too heavy and impractical for the individual to comfortably wear such as those found in the Kyoto Museum Collection. By the end of the 19th century the Meiji Restoration outlawed samurai from wearing swords; the samurai culture as it had been ended and armour was relegated to ceremonial occasions.[6]

The British Museum's samurai armour dates back to the 18th century during the Edo Period. It is from the Mori clan, located within the Harima province of what is now known as the Hyogo Prefecture. The Mori family crest or mon of a crane in profile within a circle can be seen on nearly every component of the armour. While intricate, the armour retains functional features like the holes of the face mask to help drain blood and sweat. The armour is made up of 14 different pieces: the surcoat (jinbaori), crest (datemono), helmet (kabuto), face mask (menpo), neck guard (nodawa), cuirass (do), upper arm guards (sode), gauntlets/arm guards (kote), banner (washi), baton, skirts (kuzazuri), thigh guards (haidate), shin guards (suneate/tateage) and two storage boxes (gusoku bitsu).

4. Nitobe, 2010

5. Maruyama, 1994

6. Ibid.

Description of the cuirass

The cuirass is a two-piece cuirass (nimai do) that hinges on the right side and is secured with ties on the left (fig. 2). It shows exceptional craftsmanship and attention to detail. It is made of mainly lamellar construction with some solid plates, mainly in the underarm, neck and shoulder areas. The lamellar sections are made of small individual plates of urushi (Japanese lacquer) built up over a centre of either rawhide or ferrous metal. These are laced together with thick indigo-dyed silk cord threaded through the top and bottom of each plate in full-lacing, or kebiki odoshi pattern. While the majority of lacing is in the indigo-dyed silk cord, a tricolour woodpecker patterned cord and an orange cord are used decoratively in the edge rows of lacing for the shoulder guards and the skirts (fig. 2).

X-Radiography revealed the distribution of rawhide and metal core plates placed in different arrangements across the body (fig. 8); the top of the cuirass was made predominantly with metal plates. Such a design ensured protection of the vital organs in the upper body during battle and potential impact, whilst the use of rawhide in other areas reduced the cuirass's overall weight making it easier to wear and manoeuvre in. X-radiography also unveiled how the last row of metal plates overlapped the thicker rawhide bottom rim, which itself was actually made of several pieces nailed together instead of one singular piece.

The solid plates cover the nearly the entire top half of the cuirass and are covered with white leather, potentially deerskin, stencilled with coloured pigments. There is a detachable leather central panel also stencilled with coloured pigments. Dark blue silk cord and horn toggles are hidden under metal covers to fasten the shoulder straps. There are additional horn toggles along the bottom rim of the cuirass to attach the lacquered skirts. The cuirass has a brigandine collar incorporating hexagonal metal plates underneath textile to provide protection for the wearer's neck. Made from brown wool textile, it is decorated with knots of orange silk braid and coloured embroidery threads outlining the hexagonal plates. A decorative braided pale pink silk knot hangs from the right side of the chest.

Other decorative elements include small metal hardware, etched metal coverings with lacquer and makie (gold dust) technique for the horn toggles around the shoulders and metal edging along the sides of the cuirass. The interior is lined with gilded leather.

Fig. 2. Cuirass and skirts (whose treatment is not discussed in this article) before treatment.

Condition of the cuirass

One of the main conservation issues for the cuirass was the condition of the lacquer. The majority of damage was caused by physical impact, fluctuating temperature or relative humidity. Hairline cracks found on the lacquer were especially prevalent on the plates along the bottom rim (fig. 3). Large cracks with associated loss around break edges were present on the bottom rim with some mobile cracks. Both types of damage can be partially explained by the way the cuirass had been stored: traditionally kept in its box, the cuirass had been sat resting on its curved lower rim for extended periods of time that placed stress and pressure on localised areas. This, coupled with constant fluctuations in relative humidity and temperature, could have made either the rawhide or metal interior expand and contract enough to create cracks with subsequent loss to the lacquer. The fluctuating RH could also explain differential expansion and contraction between the metal and lacquer as well as localised corrosion of the metal. Several of the plates had large breaks in both the lacquer and preparation layer that exposed the metal (fig. 4).

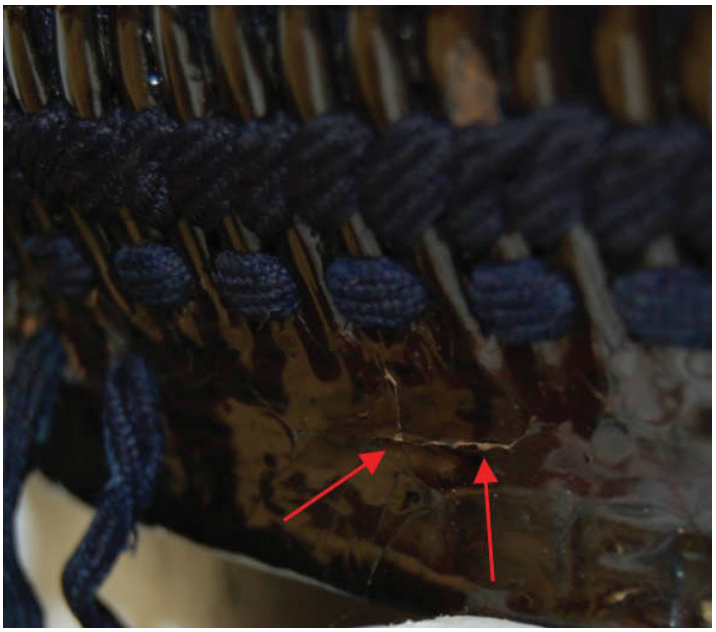

Fig. 3. Hairline cracks can be seen along the lacquered rawhide rim.

Fig. 4. Plates along the shoulders that shows the exposed metal layer with some corrosion.

There was dirt and dust on the surface, within crevices of the cuirass and stubborn ingrained dirt present in gaps between the lacquer plates possibly from periods of display and storage. There is evidence of photo-oxidative degradation of the lacquer visible as a hazy or cloudy surface. Found in mostly horizontal areas such as shoulders, this damage is likely linked to extended periods of display in the past where the armour was illuminated from above. The lacquer degradation is known to be exacerbated by UV light in the presence of fluctuating RH (Bainbridge, 2015). Light damage was also evident on the textile and coloured rawhide elements with both showing extensive colour fading.

Several of the components of the cuirass exhibited evidence of pest damage including the horn toggles, the textile collar and the decorative rawhide. Numerous insect casings, thought to be carpet beetle larvae, were found behind the lacquered plates and silk cords. However, an absence of frass or insect remains in the most damaged areas suggested an historic infestation and subsequent cleaning (fig. 5) prior to acquisition. Nearly all the horn toggles had extensive loss caused by pests and were not strong enough to fasten the silk cord loops to support the weight of the cuirass's skirt (fig. 6). Although insect casings were found amongst the silk braids, the braids did not appear to have any insect damage; rather the brown wool on the collar had small holes and areas of loss. Surface grazing was evident on leather panels.

Fig. 5. Insect casing found behind silk cord on cuirass.

Fig. 6. Horn toggle damaged by pest infestation.

The textile components of the cuirass were in various stages of degradation. The blue cords were in the best condition whereas the orange and pale pink dyed silk was beginning to disintegrate. The brown textile for the collar was brittle and had large amounts of damage and loss. The blue cords had minimal shedding when handled and were robust despite some mould spotting consistent with storage in humid conditions. Some literature suggests that cords in such good condition would signify that the lacing had been replaced at some point (Breeze, 2008). In contrast, the orange and woodpecker silk braids had degraded and were vulnerable to powdering and abrasion when manipulated. On the collar the poor condition of the brown wool was acerbated by physical damage caused by the internal metal plates (fig. 7). An iron/tannate brown dye might also have accelerated chemical degradation; this was not confirmed although the fibres were felt to be brittle.

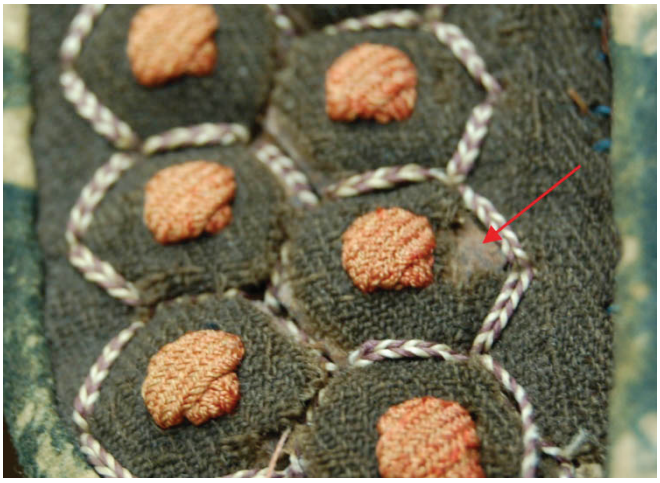

Fig. 7. Brigandine collar with hexagonal metal plates exposed.

The cuirass had begun to slump and lose its shape, attributed to the blue silk laced cords beginning to weaken as suggested by the cords lengthening and the corresponding slumping of the cuirass. Hundreds of metres of cord would have been used to thread the plates together with many ties and knots hidden behind the overlapping plates. It was unknown, however, if there were additional issues that could not be seen. X-radiography confirmed that there was no internal damage and it also provided interesting information about the composition and manufacture of the armour, such as the distribution of rawhide and metal plates (fig. 8).

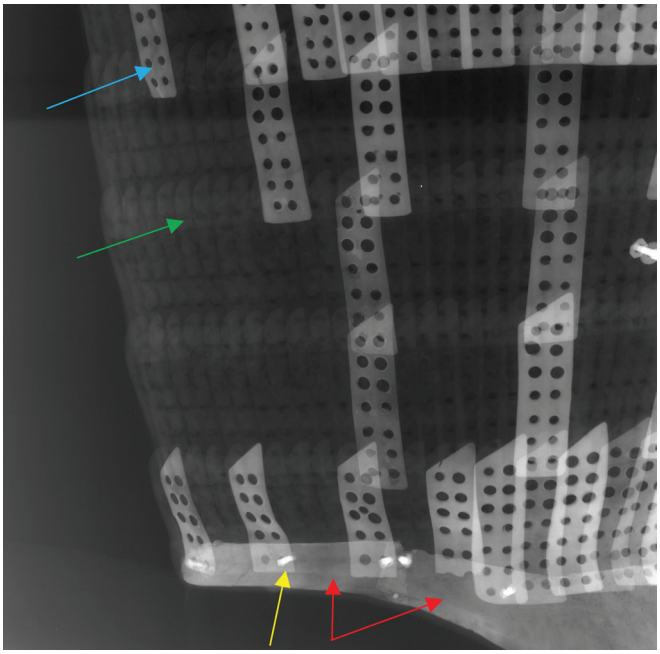

Fig. 8. X-rays showed the distribution of materials: metal plates (blue arrow), rawhide plates(green arrow) and thicker rawhide bottom edging (red arrow). Notice how the bottom rawhide is made of several pieces and nailed together (yellow arrow).

Description and condition of the storage box

The armour set included two rectangular lidded boxes, or gusoku bitsu. These are traditionally used to store armour when not in use and are often used as a support when displaying the armour. The boxes were made from an unidentified hard wood, covered in a thin outer skin of leather that was coated with what appears to be black urushi lacquer. Separate additional strips of leather coated with red lacquer create edge borders. Chinese characters of the Mori family crest were applied on three sides of each box in gold using the makie technique. Metal fittings include handles, hinges and lock that were all covered in black lacquer (fig. 9).

Fig. 9. Storage box before treatment with the Mori family crest clearly visible.

The amount of loss and damage on the storage boxes jeopardised their structural stability and was caused by the extensive pest infestation to the wood. Damage was also seen on the lacquered leather with areas of loss that exposed the wood underneath and numerous insect flight holes (fig. 10). Furthermore, the leather was now brittle and beginning to detach from the wood. This could be explained again by constant fluctuations in RH resulting in dimensional changes to the wood substrate and ultimately affecting the adhesive join between the leather and wood.

Fig. 10. Loss to wood, leather and lacquer from pest infestation.

The leather was unsightly from dirt and dust that had become embedded within small crevices on the exterior with additional loose dirt found inside. Other issues included the loss of the lacquer coating on all metal components. Several metal components also had localised patches of inactive corrosion. The extent of visible damage across the storage box meant it was unsuitable for display—the public would perceive the object as damaged and focus on its flaws rather than viewing it as a whole.

Conservation approach

At the British Museum the conservation of Japanese objects is often approached with a combination of traditional and synthetic materials used with both traditional and modern techniques. This would include animal glue for securing mother of pearl shell inlays but Klucel G (hydroxpropyl cellulose) for wood damage, or loss compensation with Japanese tissue paper such as manilla hemp (kozo) instead of clay powder (tonoko). In Japan it can be common for conservators to use materials such as urushi when conserving lacquered Japanese objects. In the case of the armour, several discussions with curators took place before treatment began regarding the ethics and extent of conservation, particularly whether conservation materials should be traditional, synthetic or both, and the level of loss compensation desirable. Aesthetics can play an important part when displaying Japanese objects as the conservation approach may sometimes be highly interventive with reintegration of materials. In order to view the object as a whole, some of the conservation treatment focused on reducing noticeable areas of loss with toned in-fills.

Discussions with Japanese trained conservators from the British Museum's Hirayama studio of Eastern pictorial art also informed the treatment and assisted in the modification of traditional Eastern techniques for conservation. Discussions about best methods and materials informed the eventual treatment plan. Conservation of the cuirass would use synthetic adhesives and materials for loss compensation or to restore function. Such an approach would allow for future conservators to identify recent treatment. However, if traditional techniques and adhesives such as shimbari or Japanese wheat starch paste proved more effective they would be utilised. The wooden stand traditionally used to display armour would form the basis for the exhibition mount but would be adapted and padded to provide better support to the cuirass and help reduce some of the strain on the silk cords. This strategy was also implemented when approaching how to mount the armour—the silk cords holding the lamellar plates of the cuirass were beginning to weaken and needed additional support. The traditional wooden stand became the basis for the new mount for display and for long-term storage.

Conservation treatment of the cuirass

Given the evidence of substantial past pest infestation, and in line with the museum's IPM policy, the treatment of the cuirass began by quarantining the armour for six months as the combination of materials meant it was not suitable for freezing. This would entail packing the components separately in polythene sheeting with acid free tissue and monitoring for any pests or frass during quarantine that might suggest an active infestation.

After quarantine the cuirass was surface cleaned with a soft brush and museum vacuum with HEPA (high-efficiency particulate air) filter to remove dirt and dust on the surface. Over 100 insect casings were found between the lacquered plates and behind blue silk cords on the cuirass and were removed with tweezers. Spot tests were carried out to assess the viability of further cleaning of the lacquer using solvents with mixed results: white spirit (composition variable – petroleum distillate) and xylene removed little if any dirt, most likely because of their non-polarity. Low pH water at 3.5 (to mimic the acidity of the lacquer's surface) was more successful in removing dirt but had minimal effect in improving the overall appearance of the armour and was not pursued. A more perceptible change to the overall appearance of the cuirass was achieved when removing mould on the blue silk cords with 50:50 IMS (industrial methylated spirits)/deionised water mixture by gently dabbing the areas with a lightly moistened conservator's sponge (hydrophilic closed-cell sponge). The mixture was selected to clean the cords without introducing excessive moisture.

A paper based fill material was chosen to reinforce the more extensively damaged horn toggles. Paper based fill materials are currently being widely used in the BM Organics studio for 3D objects in place of other fill materials such as microballoons (hollow phenolic resin spheres) due to ease of application and removal. For the horn toggles cotton rag paper was pulped and dyed with Procion fibre reactive dyes. The cotton rag produced a thicker and bulkier fill material while the short fibred paper gave a smoother finish. Paper pulp would also allow for the fill to be removed easily in the future. Dyeing the pulp gave a saturated and uniform colour throughout the fill that painting with acrylic and watercolour could not achieve. The dyed pulp was mixed with Lascaux 498 HV (thermoplastic copolymer butyl-methacrylate dispersion) and applied to areas of loss using a micro spatula. The Lascaux 498 HV was chosen for its ease of application, glossiness and flexibility. The fill surface was smoothed with acetone when partially dry to give a degree of sheen matching the horn. Once dry it allowed for all the toggles to be fastened (fig. 11).

Fig. 11. Horn toggles before and after treatment. Infill made with dyed cotton paper rag with Lascaux 498 HV.

Conservation of the lacquer proved to be time consuming but fairly straightforward. Light damaged lacquer is sensitive to polar solvents, which limited the type of adhesives that could be used to successfully consolidate cracks and mobile elements. Paraloid B-72 (ethyl methacrylate copolymer) in xylene was chosen and used in various concentrations of 3%, 10% and 20% to consolidate breaks in the lacquer and any mobile areas on both the bottom rim of the cuirass and lamellar plates (fig. 12). As an adhesive, Paraloid B-72 had several advantages: in lower concentrations it would not stain the lacquer, the adjacent rawhide or ground preparation layers underneath lacquer; it is soluble in non-polar solvents such as xylene that do not affect degraded lacquer surfaces; the slow evaporation time of xylene allowed for the consolidant to penetrate deep into the substrate; and it imparted strength sufficient for structural purposes. Xylene and its vapours are highly toxic and therefore good extraction and PPE were necessary when undertaking treatment.

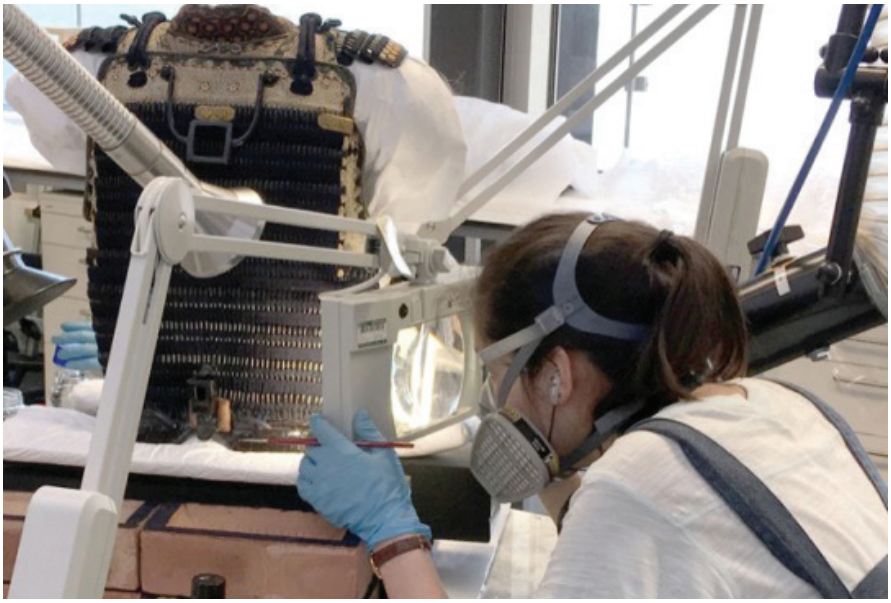

Fig. 12. Consolidating lacquer with Paraloid B-72 in xylene.

Securing shallow hairline cracks and consolidation of break edges were achieved with 3% Paraloid B-72 in xylene. For larger breaks, particularly around the bottom lacquered rawhide rim, two to three applications of 10% and 20% Paraloid B-72 in xylene were applied and clamped with either lightweight carbon fibre clamps (Berna clamps) or quick release clamps that allowed for greater pressure to be exerted on areas that were partially sprung from released tension. As the majority of damage was on the bottom rim that would be covered by the lacquered skirts once assembled no loss compensation was necessary.

Damage on the brigandine collar was stabilised by encasing the fragmentary textiles between patches of a new support fabric slipped underneath the brown textile with a nylon net overlay and secured by stitching with a fine polyester thread. Dyed cotton jersey was chosen as the support fabric rather than new wool as it will be less attractive to pests in the future and visually infilled the losses in the original material well, covering and enclosing the exposed metal plates with nylon net stitched with Gutermann Skala polyester thread (fig. 13).

Despite the fragility of other textile elements—the multi-coloured and orange silk cords/braids—it was decided the best approach to ensure long-term preservation would be to discourage excessive handling rather than carrying out any interventive treatment. No further

treatment was carried out on the textiles.

As described previously, there were only small areas of localised corrosion on the metal edging to the rim near the underarms. All metal was cleaned with white spirit on cotton swabs to remove dirt and dust. The corrosion was removed with a scalpel and cleaned with white spirit on cotton swabs after.

Fig. 13. Covering of hexagonal metal plates with textile and netting for the brigandine collar.

Conservation treatment of the storage box

The aim of the treatment was to clean, stabilise and undertake loss compensation to give the storage box a more uniform appearance. Only one storage box was chosen for treatment due to time restraints.

Soiling and dirt present on the exterior surface and within the box was removed using soft brushes and a museum vacuum with a HEPA filter. The pest infestation had left the wood structurally unstable and needed consolidation before other treatments such as relaying the leather could be carried out. The wood was consolidated with 3% Paraloid B-72 in xylene, either injected with a syringe or applied with a fine tipped brush directly into the flight holes in the wood. Three rounds of consolidation were applied with a waiting period of 24 hours between each round to let the consolidant partially cure. Paraloid B-72 was chosen due to its strength and unlikelihood of staining at lower concentrations. The xylene also allowed for considerable amounts of consolidant to be introduced without risk of solubilising lacquer nearby. Afterwards the wood ceased to be soft to the touch as it regained structural integrity. Where there was extensive loss to the wood, voids were filled with pulped cotton rag dyed and mixed with 20% Klucel G in IMS.

Once the wood substrate had been treated attention turned to the delaminating lacquered leather coating. Four adhesives were tested to determine the most suitable for relaying the leather: Klucel G in IMS, Klucel G in deionised water, Lascaux 498 HV and Japanese wheat starch paste. As the adhesives would be minimally applied on the underside of the leather and not be in contact with the lacquered top half, it was felt the benefits outweighed the small risk to the leather exterior. Each adhesive had relative success in relaying the leather but the wheat starch paste offered the best results in terms of immediate tack, strength and ease of use. It was applied to the underside of the leather with a micro spatula and applying light pressure with a soft silicone tool to lay it down. The moisture content helped to soften the brittle leather, gently humidifying and making it more pliant and therefore reducing the risk of damage while relaying the leather (fig. 14).


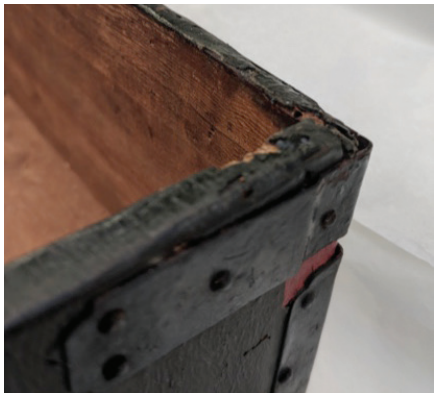

Fig. 14. Relaying leather with wheat starch paste.

The treatment of the storage box gave the opportunity for the conservators to try the traditional Japanese clamping technique shimbari. The method involves applying flexible bamboo sticks as a way of clamping, was used to hold leather in place during curing where modern clamps could not be applied. This method for clamping has become very useful as it allows for variations on pressure across an object or strong, even pressure across non-flat surfaces.

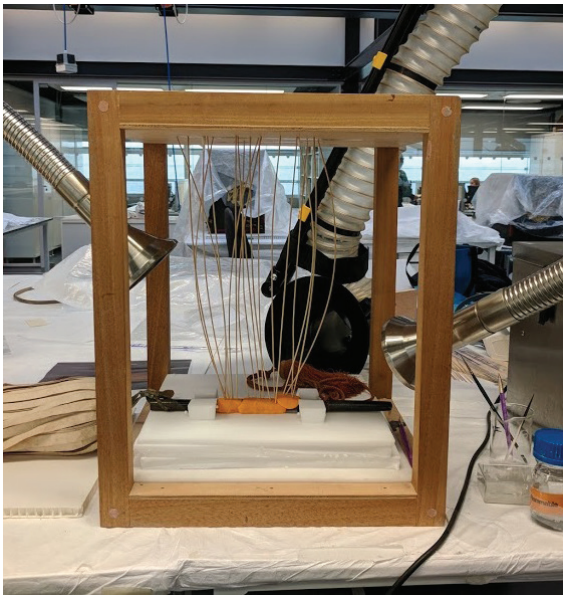

Fig. 15. Lacquered banner handle and shimbari method being demonstrated to relay lacquer.

Although it the thin, brittle leather was too fragile for shimbari, the clamping technique was used on other pieces of the armour (fig. 15).Further treatment focused on removing the remaining embedded dirt from the lacquered leather. Solvent cleaning was tested as dry surface cleaning methods (brushes and sponges) had not been entirely successful. Due to the sensitive nature of lacquer previously explained, it was decided not to use polar solvents such as deionised water or IMS despite there being no indication during testing that these solvents solubilised the degraded black and red lacquer. White spirit, applied by rolling a cotton swab across the surface, was chosen to minimise the risk of accidental damage to the lacquered surface.

The curator expressed a desire for loss compensation for aesthetic reasons. The light coloured exposed wood stood out starkly against the black and red lacquered leather design. Loss compensation only extended to hiding the exposed wood, not attempting to recreate the entire design. Areas where the light wood substrate was visible but without excess loss would be covered with Japanese kozo paper and adhered with 20% Klucel G in IMS to provide a barrier layer when in-painting (fig. 16). Pigments mixed with water and Primal B60A (acrylic emulsion) as a binder were applied to the kozo paper to provide a more uniform appearance for the box. Areas imitating red leather had a final coating of Liquitex brand gloss medium to imitate the finish (fig. 17).

Fig. 16. Testing use of painted Japanese tissue paper to cover areas of exposed wood that is distracting to the eye.

It became increasingly clear during conservation that the armour would need a bespoke mount: the significant number of components and how they attached to one another caused concern as many pieces were attached with degrading silk cords that needed adequate support. Many of them also overlapped so padding between layers was desirable.

The basis of the mount for the cuirass was the modern wooden stand acquired with the armour but not registered as part of the collection. The stand is made in the traditional form to display or hang armour for temporary storage and display that collectors in Japan often use. The cuirass would be hung on a horizontal wood rail with all the weight of the costume borne by the shoulder area and relying on the strength and integrity of the silk cords and horn toggles. A smaller wood rail allows the same for the face mask. Because the stand was designed to have the armour hang with no support for the cuirass from underneath modification was required. The stand became the basis of the upper portion of the mount that is to hold and support the cuirass. It was covered in aluminium tape to prevent off-gassing of VOCs (volatile organic compounds) and protruding sections were sawed off.

High density Ethafoam (closed cell polyethylene foam) was shaped to create the body and base for the cuirass mount (fig. 18). The mount would be used for the display and eventual storage of the armour so a hard and uncompromising material was needed. It is frequently used in costume mounting and can be produced in large sheets. Although high density Plastazote (cross-linked closed cell polyethylene foam) would also be suitable, it was considered a more costly option. The Ethafoam core was further padded with polyester wadding and covered in black jersey.
The fragility of materials such as textile, silk cords and lacquer meant that they needed to be handled sparingly during the mounting process. Additionally the creation of the mount was more similar to costume mounting and required the expertise of a textiles conservator. Mounting for other pieces of the armour used similar materials. Flexible arms were created to provide support for the arm guards; a bendable wire was enclosed in polyester wadding and polyester felt and covered in black jersey. Slim cushioned pads made from polyester felt covered in black silk were placed between overlapping pieces such as the shoulder guards, arm guards and skirts to prevent contact and surface abrasion between the layers (fig. 19). A partial face was carved from Ethafoam, covered in polyester wadding and black jersey to help support the helmet and its metal armature mount.

Fig. 17. Storage box after treatment.

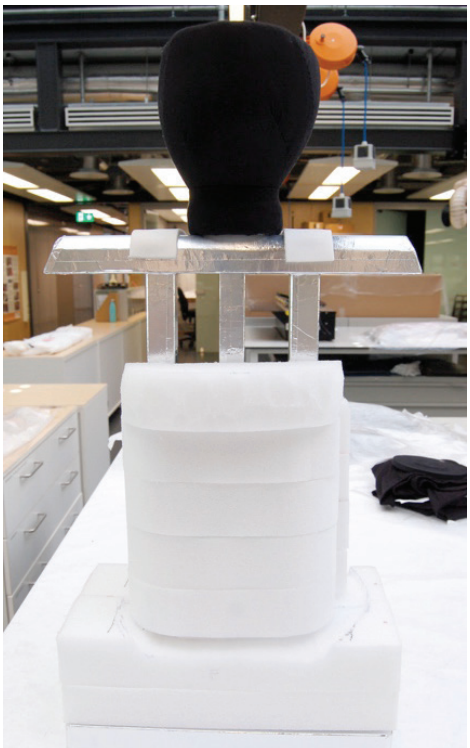

Fig. 18. Traditional wooden stand modified for mounting with Ethafoam, with the wood covered in aluminium tape to prevent off-gassing.

Fig. 19. Hanging pads to help support the armour and ensure they do not come into contact with other pieces.

Although the original idea included the modified armour stand sitting on top of one of the original storage boxes, the total weight of all the pieces was deemed too heavy for a structurally weakened box to support such weight. Furthermore the original storage box was too tall and made the armour disproportional with the new mount. The biggest problem however was that the armour was top heavy; the top mount needed to be secured to the box in order for it to be secure. A new wooden box was made with smaller dimensions and covered in Melinex (polyester sheeting) to prevent off-gassing and covered in black jersey. The wooden frame was then screwed onto the box. The end result was one mount consisting of frame and box made with conservation grade materials that could easily be moved for display or long-term storage (fig. 20).

Fig. 20. The armour on display in the Japan Galleries at the British Museum

Conclusion

Conservation of the cuirass took over 60 hours. Another 20 hours was spent treating the storage box. Overall, conservation of the entire armour including mounting totalled over 260+ hours. The treatment consisted of mostly synthetic adhesives and materials to improve the structural stability of the lacquer and horn on the cuirass in combination with using some Japanese materials and techniques, all of which proved highly successful. This acquisition provided an opportunity for the authors to gain a thorough knowledge of the armour's historic significance in addition to working collaboratively with other conservators when conserving and mounting the object.

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Contact

Tania Desloge:

British Museum.
Great Russell St, London WD1B 3DG.

Main contact: tdesloge@britishmuseum.org

Netanya Schiff

Institute of Archaeology, University
College London.
31-34 Gordon Square,
London WC1H 0PY

Biograpy

Tania Desloge is an organics conservator at the British Museum with an emphasis on ivory, wood and archaeological collections. She received her MA/MSc in conservation at University College London. Previous projects have focused on the conservation, mounting and installation of Japanese samurai armour, the Sassoon Ivory Collection and ancient Egyptian polychrome coffins. Her research interests include the use of lasers on organic substrates and finding new techniques to treat complex composite objects.