

K131: U-Shaped Slotted Gold Strip with Cloisonné Garnet and Gold Filigree Decoration
Conservation Report

Conservation started: 17.11.2010

Finished: 10.12.2010

Time Taken: 35

Digital photography: Before treatment (b.t.) ; during treatment (d.t.) and after treatment (a.t.)

The digital photos before and after treatment were taken with an Olympus E620 camera using the overhead lights. The during treatment photos were taken using a Meiji Techno RZ stereo microscope with fibre optic lights and 7.5 – 75 X magnification.

Dimensions: (H) arch stands est. 85mm (W) 19mm (W) rivet head 2mm (L) filigree panel 19.5mm (W) filigree panel 6.5mm (Th) 3mm

Weight: 55.34 g with the soil before treatment 50.73 g after conservation

Catalogue number: 559

Description:

Visual and microscopic examination using a Meiji stereo microscope with fibre optic lights and 7.0 - 45 X magnification.

The object is described as a U-shaped slotted gold strip with cloisonné garnet decoration in the BM&AG catalogue information; however after the investigative cleaning it was possible to see that there are rectangular filigree panels in two of the slots on the proper left (P.L.) side of the U shape.

The cloisonné garnet decoration and the two small panels with filigree decoration are on the front side of the U-shaped strip, while the back surface is undecorated. There is gold foil behind the garnets, which appears to have the standard grid pattern.

The two main rectangular bands of cloisonné garnet decoration are 5.0-5.5 mm wide and consist of three garnet cells in a repeating geometric pattern. The smaller rectangular sections of cloisonné garnets connecting the two main bands are 4.5 mm wide and consist of two garnet cells. The cell walls between the bands are c. 0.5-0.7 mm and within the bands c.0.25-0.4 mm.

The object is distorted and bent out of shape. One side of the U-shaped strip has been bent over the opposite side, covering part of the cloisonné garnet and filigree decoration. Therefore it is not possible to see all the garnets. However the number of garnets on the object can be estimated, since there are 10 garnet cells per cm and c. 48 cm of cloisonné garnet decoration in the two main bands. This comes to c. 480 garnet cells. With the addition of the 49 garnet cells in the connecting 'vertical' bands the total comes to c. **529 garnet** cells.

However due to the distortion and deterioration of the U-shaped strip there are areas of loss and considerable damage to the cloisonné garnet decoration. There are at **least 31 missing** garnets, numerous cracked and fractured garnets and the majority of the garnets have sunk below the cell walls.

The rectangular panels with gold filigree decoration are 18-19 x 5-6 mm, that is, the size of the slots. The filigree decoration consists of an interlacing snake-like ornament, consisting of one larger central band of beaded wire with a smaller band of beaded wire on either side. One of the two filigree panels is pushed inwards and there is a dark grey rectangular fragment in the soil on this filigree panel. The decoration on the indented panel appears to consist of the same snake-like ornament as the intact filigree panel.

There is a single band of beaded gold wire along the edges of the U-shaped object, which is incomplete due to major areas of loss.

Condition:

Visual and microscopic examination using a Meiji stereo microscope with fibre optic lights and 7.0 - 45 X magnification, and a Meiji Techno RZ stereo microscope with fibre optic lights and 7.5 – 75 X magnification.

The U-shaped slotted strip is in a deteriorated condition, in that it is distorted and bent out of shape, and there is considerable damage to the cloisonné garnet and filigree decoration.

One side is folded over the opposite side, covering part of the cloisonné garnet decoration. The gold is torn in places, with the main tear 3.7 mm in the central, lower part of the U shape. The cloisonné garnet decoration is particularly damaged in this central part of the U shape, adjacent to the tear.

This deterioration appears to be old as there is soil from the burial context on the damaged areas and the surface of the object shows considerable use wear, abrasion and scratching.

The tear in the gold and the distortion of the object has resulted in major disruption of the cloisonné garnet decoration, with missing, broken, cracked and sunken garnets, as well as deformed and split cell walls. As mentioned above there are at least 31 missing garnets, numerous cracked and fractured garnets and the majority of the garnets have sunk below the cell walls.

There is a lumpy green deposit in some of the garnet cells, in particular along the edges and in the splits in the cell walls, as well as on the surface of some of the garnets. The appearance and location of this green deposit suggest that it is copper corrosion from the solder used to secure the cells walls (or a base layer of copper). The bulkiness of the copper corrosion may have contributed to the splitting of the cell walls in some areas and caused the soldered joins to crack.

A soldering technique involving the use of copper salts could explain why there is so much copper corrosion along the split edges of the slots and the cell walls. The preferential corrosion of copper in the gold alloy is also possible, as the XRF analyses indicated c. 2% copper in the majority of objects analysed. Further detailed examination and analysis of the green copper corrosion is recommended.

Before the investigative cleaning there was considerable compact, granular soil from the burial context on the surface of the object, which was disfiguring, abrasive and obscured the two small gold filigree panels, as well as a substantial part of the cloisonné garnet decoration.

The soil contains numerous small, round pebble like inclusions, such as quartz, which vary in size up to ca. 1.0 mm. The colour of the inclusions ranges from translucent, to white to light brown to dark brown/grey. Inclusions such as quartz have a hardness of 7.0 on the Mohs hardness scale, while gold has a hardness of ca. 2.5 – 3.0, therefore the gold surface is easily scratched by the soil. Garnets have a Mohs hardness of ca. 6.5 – 7.5, and should therefore be less susceptible to scratching from the hard, granular soil than the gold.

There are small fragments of black organic material in the soil, which look burnt, as well as grey deposits that may be part of the material used to hold the garnets and gold foil in place in the cells. There is also fibrous organic material embedded in the soil, some of which looks like distinct fibres.

The extent of the soil on the surface made it difficult to assess the condition of the object before conservation, however during the investigative cleaning it was possible to see more of the object and document its condition as the treatment progressed.

Gold:

The surface of the gold is scratched, abraded and worn and this deterioration appears to be old. The metal has split, in particular along the edges of the slots and cell walls. There are two main areas of

splitting in the central curved part of the U-shape. The gold metal has torn in this area, with a 3.7 mm gap. The surrounding metal is distorted with numerous cell walls broken and bent out of shape. As a result this is the most fragile part of the object.

The gold has a black deposit or tarnish on it in numerous areas, in particular on the back undecorated surface. This could be sulphides and may be due to contact with an organic material such as wood, leather or textiles such as wool. There is also red-brown tarnish on the surface of the gold, particularly in areas where there were soil deposits.

Front Surface:

The cloisonné garnet decoration on the front of the U-shaped object is in a deteriorated condition. Many of the cell walls in the decorative bands are distorted and broken, resulting in loss of garnets and gold foil. A considerable number of garnets have cracked, become loose or no longer fit in the cells, and have fallen out as a consequence of being too small or too large. This is particularly visible in the central, curved part of the U-shaped strip where the gold metal is distorted and torn.

After the granular soil was removed/reduced, three complete garnets with their gold foil backing were loose and came out during the investigative cleaning, as well as the gold foil backing in one cell without a garnet.

These areas of loss and the extensive deterioration of the garnet cells has made it possible to see the stratigraphy or layering in the cloisonné garnet decoration, and in some areas details of the manufacturing process are visible.

For example, garnet # 1 has a brown adhesive-like material on the back surface, which has retained the impression of the underlying gold foil surface. The upper surface of the gold foil for this garnet, that is, the surface in contact with the garnet also has traces of this brown adhesive-like deposit. The presence of this brown deposit suggests that the gold foil and the garnet may have been secured using this organic-looking material.

The underside of the gold foil has a dark grey deposit, which has an inorganic appearance and could be the paste used to secure the gold foil and the garnet to the bottom of the cell. There are also traces of this dark grey paste-like material in a number of the empty and damaged cells. Loose fragments of this deposit were collected in a separate, labeled polypropylene (PP) sample container.

The location of the three garnets that became loose during the investigative cleaning and the stratigraphy of the deposits on these garnets and the gold foil backing have been documented in the digital photos at the end of this conservation report. Therefore garnet # 1 with the gold foil backing can be secured back in the cell after further examination and analysis of the layers. The cell walls for garnet # 2 have been pushed in and the garnet with the gold backing no longer fit in the cell.

There is an orange-brown deposit around the edges of some of the damaged garnet cells and in the empty cells, as well as on the sides of the U-shaped object, adjacent to the beaded wire. This deposit has a more compact, clay-like texture, and could be Staffordshire soil, which can be orange in colour.

In some areas on the front, decorated surface of the object there is a black deposit that looks like burnt organic material embedded in the soil and in some of the garnet cells. In particular, adjacent to the indented filigree panel, where it is overlying the garnets in some cells, as well as in some of the empty cells with missing garnets.

During the investigative cleaning numerous cells with gold foil but no garnets were uncovered, revealing a brown adhesive-like material on the upper and lower surfaces of some of the gold foil. In one of the damaged cells on the central, lower edge of the U-shape, where the cell walls had been pushed apart the gold foil backing was loose and could fall out. Therefore it was stored in a PP sample container for further examination and possible analysis. The location of this piece of gold foil was recorded in the

microscopic photos during treatment, and it can be adhered at any time to preserve its position on the object.

Back Surface:

The investigative cleaning indicated that there was organic material in the soil on the back surface of the U-shape strip, and possibly several different types. There is a textured black deposit embedded in the soil on the back of the indented gold filigree panel and adjacent to this area on the back of the U-shaped strip, which appears to be burnt organic material such as wood or possibly bone or ivory. Soil was left on the surface around this deposit to help secure it, as analysis is recommended to make a definite identification of the material type. There are also traces of a black deposit in the soil on the sides of the U-shaped strip adjacent to the beaded wire edge.

In addition to this there are different types of fibres and small fragments of organic material embedded in the soil on the back surface. There are fragments of a light coloured fibrous material, as well as small fragments of what appears to be a thin type of organic material in the soil. Another small fragment of organic material is similar to the fragment found on the back of the gold and cloisonné garnet fitting K 1226. There are also several dark fibres caught in the black deposit on the side of the U-shaped strip near the remains of the burnt black deposit mentioned above.

The loose fibres and fragments of organic material were collected and stored in separate, labelled polypropylene (PP) sample containers. The soil removed from the back surface was also collected and stored in a separate PP container from the soil removed from the front surface with the cloisonné garnet decoration. This separation was done to facilitate any future analysis of the surface deposits.

Analysis of the different organic material found in the soil on the back surface is recommended as it appears that the U-shaped strip was attached to another type of material, probably organic, but exactly what type of organic material is not clear. Therefore the identification of the organic fragments in the soil on the back surface could help to understand this object and what it was used for.

The Curator, Dr David Symons has said that there are different possibilities, including as a decorative element on an ornamental horse harness or trapping, in which case the organic material attached to the back surface could have been leather or possibly wood. Alternately the object could have been a decorative element on the sides of a relatively small casket or reliquary box/shrine, in which case the associated organic material may have been wood, ivory or bone.

On the back undecorated surface there are also a number of raised circular protrusions that have the small rim of metal that is formed when a hole is punched through from the front. At one end of the U-shaped strip where there is no cloisonné garnet decoration on the front, two of these protrusions can be seen to go through the metal forming 2.0 mm holes. In two of the holes there is a circular piece of grey metal, like the end of a rivet. Microscopic photos during treatment were taken of these features.

After the investigative cleaning on the front surface it was possible to see that there were in fact two small rivets, made of grey metal, c. 2.49 mm in length with a c. 2.21 mm diameter head. They are located in the recess of two of the empty slots.

Treatment:

Carried out using a Meiji stereo microscope with fibre optic lights and 7.0 - 45 X magnification.

The aim of the conservation treatment was investigative cleaning to reveal the cloisonné garnet and filigree decoration, and thereby assist in the interpretation of the object, since its function is not well understood. At the same time the investigative cleaning prepared the object for display as part of the 'Top 50' group and facilitated interpretation by the general public while on display.

Surface deposits, tarnish, corrosion products and any unusual features were preserved and documented, so that they could be examined in more detail and possibly analysed in the future. In

particular, the significant amounts of black material in the soil that look like burnt organic materials such as wood or possibly bone or ivory, and the unusual amount of fibres embedded in the soil were preserved on the object or retained in separate PP sample containers for possible analysis.

The location and extent of the black deposits and the fibrous material suggests that there may have been organic materials associated with the back surface of the object, at least in the burial context. In particular the presence of fibrous material in the recesses of the distorted edges of the object appears to be significant. The soil and fibrous material were left in place in these areas.

Therefore only the relatively loose granular soil was removed from the object. Areas of more compact or cohesive soil that was well adhered to the surface were left in place, to retain any information they may contain. Removal of the well adhered soil deposits could also have destabilized some of the garnets due to the damage and disruption to the cell walls, which has left many of the garnets loose in the cells. This was taken in account during the investigative cleaning, and a balance between revealing the cloisonné garnet and filigree decoration, and keeping the object as intact as possible was aimed for.

A summary of the treatment is as follows,

1. The granular, relatively loose soil was removed from the back surface of the object using the tip of a thorn secured in a pin vice and fine pure bristle paint brushes, one of which had the tip cut flat to help lift the loose soil off the surface. The soil was retained and stored in a small PP sample container to be kept with the object. Ethanol was applied sparingly on a fine pure bristle paint brush to soften the granular soil deposits and facilitate its removal. No solvents were applied directly on the surface of the gold on the back of the object.

More compact and cohesive soil deposits were left in place on the back of the object to preserve any organic materials embedded in the soil on the gold surface. For example, the soil on the back of the indented gold filigree panel was not completely removed as it included a textured black deposit that appeared to be burnt organic material such as wood or possibly bone or ivory.

Fragments of the burnt black deposit on the back surface that came loose during the investigative cleaning were retained in a PP sample container and the location of the fragments was recorded with digital photo-microscopy using 50-60 X magnification.

On one of the loose fragments of the black deposit, c. 6.2 x 3.9 mm, it was possible to see that there is a thin layer of what appears to be soil on the lower surface, and also numerous scratches in the surface of the gold in the area where the fragment came from.

2. The granular, relatively loose soil was removed/reduced from the front decorated surface of the object using the same procedure as outlined in step 1. The soil was retained and stored in a separate small PP sample container to be kept with the object.

Care was taken not to destabilize the cloisonné garnet decoration by removing too much of the soil in the areas with damaged garnet cells. As mentioned above three garnets with their gold foil backing were loose and came out of their cells. Of the loose garnets, one was sticking out almost vertically and was too big for the damaged cell because the cell walls had been pushed in. The other two garnets had become too small for their damaged cells as the walls had been pushed apart, and the garnets and gold foil were loose as a result.

3. One of the loose garnets - # 3 in the digital photos – was adhered back into the cell with the gold foil attached, using 10% w/v B 72 in acetone applied on a fine pure bristle paint brush. The remaining two loose garnets - # 1 and #2 in the digital photos - were placed in separate PP sample containers for further examination due to the presence of layers of adhesive and paste like material on the surface of the garnets and gold foil, which may have been used to secure the garnet to the gold foil and the gold foil to the bottom of the cell. These materials on the upper and lower surfaces of the garnets and gold

foil were documented in the microscopic photos during treatment and examples are included at the end of this report.

4. Other loose garnets and gold foil without garnets were adhered where necessary using 10% w/v B 72 in acetone applied on a fine pure bristle paint brush. The small grey rivet on the proper right (P.R.) side of the U-shaped object was also secured using a dot of 10% w/v B 72 in acetone applied on a fine pure bristle paint brush. If further examination of the area under the rivet is required, the B 72 can be easily softened with acetone, and the rivet removed.

5. After loose elements on the front surface had been stabilised, the garnets were cleaned with ethanol applied sparingly on cotton swabs. The swabs were rolled carefully over the surface of the cloisonné garnet decoration to avoid dislodging any of the deposits remaining in the empty cells.

6. The granular, relatively loose soil was removed/reduced from the sides of the object using the same procedure outlined in step 1. The soil was retained and stored in a small PP sample container to be kept with the object. Fragments of organic material embedded in the soil around the beaded wire on the sides were also collected in a PP sample container.

5. The K number was adhered to the back surface with 10% w/v Paraloid B 72 in acetone, applied on a fine pure bristle paint brush.

6. New white polyethylene (PE) foam was prepared for the storage box for the U-shaped object. The small PP sample containers with the two loose garnets, loose fragments of garnet < 1 mm and the loose gold foil were included in the storage box and cushioned with PE foam. The remaining PP sample containers were placed in a larger storage box along with the storage box containing the object.

When examining this object for the researcher on the national geographic filming day 2.2.11, it was noted that in the slots for the filigree panels there are tiny areas of gold, like a shallow lip where the filigree panels could just rest against while being positioned and possibly held in with paste (see images folder) At the end of the strip, the end which is almost covered by the folder curved section, it was noted that there was an X and possibly two scored parallel lines. See images folder. Additionally one garnet became detached and was put in a tube (15) D. Cane

While examining the object to pack it for the Mercian trail tour a further garnet became dislodged; this was marked on the paper report and tubed (16) the garnet has a foil back and possible paste residue, it was thought it may be useful for analysis. 14.6.11 D. Cane

12/10/2011

While packing object for Washington DC loan, noticed a loose/vulnerable rivet in empty snake panel area. Consolidated back of pin with HMG brand Paraloid B72 from the tube diluted with acetone to secure it in place for its travels.

Samples collected in small polypropylene (PP) containers:

1: Loose garnet #1 with gold foil backing. The garnet has traces of a brown adhesive-like deposit on the back surface. The gold foil has the traces of this deposit on the upper surface and a dark grey, inorganic deposit on the underside that could be the paste used to secure the gold foil to the cell.

2: Loose garnet # 2 with gold foil backing. The garnet/gold foil no longer fits in the cell due to the damage to the cell walls.

3: Loose gold foil from a cell with no garnet.

4: Loose garnet fragments < 1.0 mm in size embedded in the granular soil

5: Miscellaneous fragments that appear to be unusual, e.g. small pieces of metal

- 6: Fragments of dark grey inorganic material found in the cells, which could be the paste used to secure the garnet/gold foil to the bottom of the cell.
- 7: Organic fragments found in the granular soil on the front surface of the object. **DISPOSED**
- 8: Black fragments found in the granular soil removed from the front surface of the object.
- 9: Fragments of the green deposit in the granular soil removed from the front surface of the object.
- 10 a & b: Granular soil removed from the front surface of the object.
- 11: Fragments of the black burnt organic material (?) in the more compact soil on the back surface of the indented filigree panel.
- 12: Fragments of the black deposit in the granular soil on the back surface of the object.
- 13: Organic fragments in the granular soil removed from the back surface and sides of the object. **DISPOSED**
- 14: Granular soil removed from the back surface of the object. **ADDED TO SAMPLE 10**
- 15: Garnet that came loose during filming in Feb 2011
- 16: Garnet with foil backing and residue paste on the foil.

Time: 35 hours including digital photography, photo-microscopy, background research, investigative cleaning, documentation and modifying the storage container.

References:

East, K., 1985, A Study of the Cross-Hatched Gold Foils from Sutton Hoo, Anglo-Saxon Studies in Archaeology and History 4, 129-142.

J.W.

10.12.2010

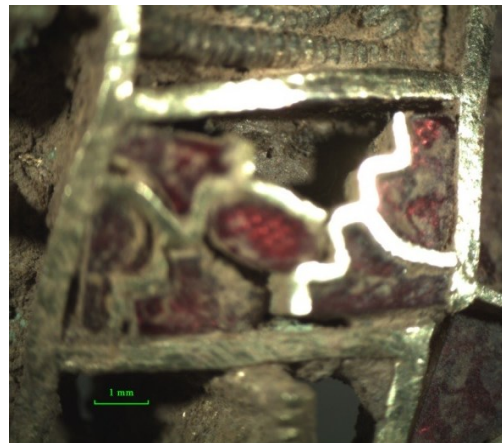
Appendix:

Microscopy photos of garnets # 1 and 2 with the gold foil backing and the different materials on the upper and lower surfaces are included in the following pages. The location of the cells where the two garnets come from is documented in the photos.

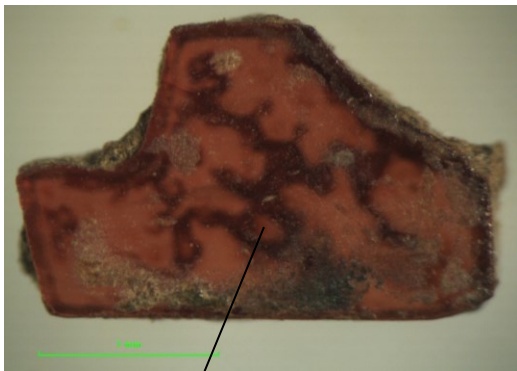
Location of cell for garnet # 1



Close up of cell for garnet # 1



Garnet # 1: Upper surface



Garnet #1: Lower surface



Upper surface of garnet # 1 with the brown adhesive-like material visible through the garnet

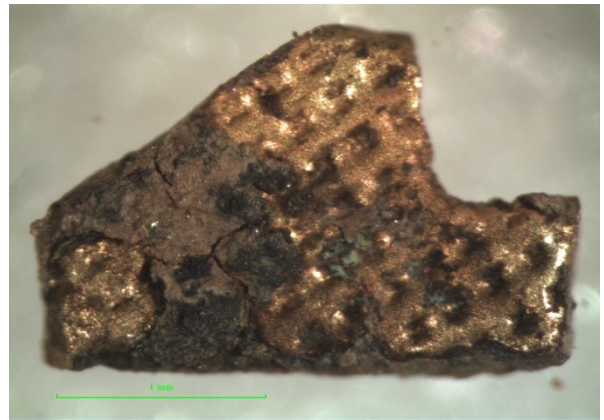
Lower surface of garnet # 1 with brown adhesive-like material retaining the impression of the gold foil surface

Gold foil for garnet # 1: Upper surface

Gold foil for garnet # 1: Lower surface

Upper surface of gold foil for garnet # 1 with traces of the brown material

Lower surface of the gold foil for garnet # 1 with a dark grey, inorganic-looking material



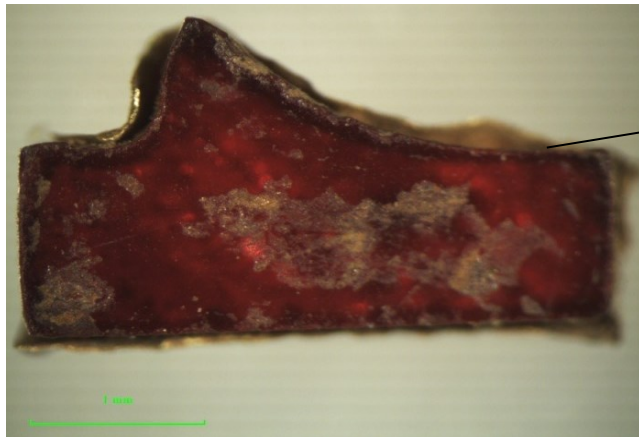
Location of cells for garnet # 1 and # 2



Damaged cell for garnet # 1 – cell wall pushed out

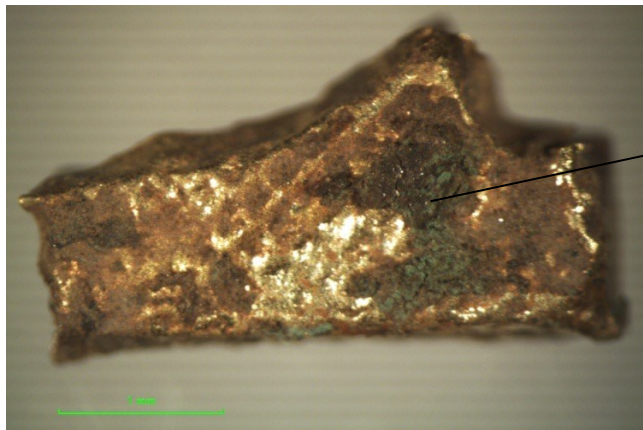
Damaged cell for garnet # 2 – cell wall pushed in

Garnet # 2: Upper surface



Garnet # 2 with gold foil backing wrapped around the sides

Garnet # 2: Lower surface of gold foil backing



Lower surface of gold foil backing for garnet # 2 with traces of grey inorganic-looking material and green deposit – possibly copper corrosion