53. AN UNUSUAL GILT-DECORATED FACETED GLASS BEAD, by Paul Lawson (1997, 31:12-13)

A blue, octagonal, faceted tubular glass bead (#12,155.1; Fig. 1) was recovered during the Portland State University Archaeology Summer Field School in 1996, at the early-19th-century Chinookan village site of Cathlapotle, near Ridgefield, Washington, USA. The site (45CL1) is in the Ridgefield National Wildlife Refuge and was known as Cathlapotle when Lewis and Clark visited briefly in 1806. It was occupied prehistorically from ca. 1400, and was abandoned initially after epidemics in 1832-1833. The village was probably occupied briefly by Klickitat Indians until 1859, when an Indian Agent removed remaining Indians in the area up the Columbia River.

The bead was found in a storage pit near one wall of a plank house, approximately 1.1 m below grade. It is a translucent blue, octagonal tube with four rows of ground facets, two rows at each end with the facets closest to each end being quite small. It measures 2.5 cm in length and 0.84 cm in diameter, and has a perforation that is 0.28 cm (7/64 in.) wide. Under some lighting conditions, its color is an intense blue. Stating an exact Munsell color is not possible with available chips, but 5BP 4/2 is an approximate value. The glass fluoresces a strong lemon yellow under both short- and long-wave ultraviolet light. Together with a refractive index of 1.51, a specific gravity of 2.44, and a weight of 2.83 g, it is probable that the bead is a lime glass.

A unique feature of this bead is that the long side facets show "shadow" marks where gilt was once applied. This gilt decoration has eroded away (a characteristic also observed on some Ching period Chinese ceramics). Each side had one of two gilt patterns, with each pattern found on alternating sides. The shadow of a gilt band (0.4-0.5 mm in width) is also present on each side, oriented perpendicular to the length of the bead at the mid-point of each side, thus dividing the bead lengthwise into two equal decorative zones.

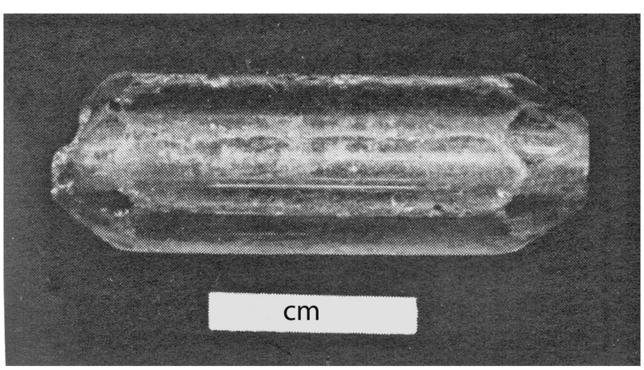

Figure l. The octagonal, faceted tubular glass bead from Cathlapotle.

54. CONSERVATION OF THE DAUGMALE CASTLE-MOUND BEADS, LATVIA, by Jana Lībiete (2000, 36:5-11)

One of the largest collections of beads in Latvia was acquired during the excavation of the Daugmale castle-mound complex. The site is located on the Daugava River not far from the capital city of Riga and in ancient times it was an important craft and trade center. Incorporating the ancient town, harbor, and burial ground, the castle mound is one of the most significant cultural and historical monuments in Latvia, where the most extensive archaeological investigations have been performed.

The occupation of the Daugmale site appears to date back to about 2000 B.C. Excavations there were undertaken over a number of years, both before and after World War II. Archaeological research of the castle mound was started by V. Ginters in 1933, and continued in 1935-1937. After a 30-year hiatus, excavations were resumed by V. Urtāns during 1966-1970, and continued in 1986-1998 under the leadership of G. Zemītis and A. Radiņš. It is important that the organizer of these excavations has been the Latvian History Museum, thereby ensuring not only a high degree of scientific and professional research, but also the preservation, restoration, and conservation of all the recovered antiquities at this museum.

There are about 9,000 beads in the collections of the Department of Archaeology at the museum which need to be restored to preserve them for further study and exhibition. The oldest specimens date back to the 3rd century, but the largest part of the collection dates from the 10th to 12th centuries. The beads originated from a large multinational area extending from Scandinavia in the north to Byzantium in the south, and from Western Europe to Russia in the east. The beads bear witness to significant trade and cultural relations between these nations in the past.

There are 1,541 beads in the Daugmale castle-mound collection and these came from 12 different excavation layers. Five hundred ninety-six of them were examined and restored. Comparing these beads to those found in other archaeological excavations in Latvia revealed that they were remarkably varied. They were classified according to the following attributes: color; size; form (ring-shaped, cylindrical, barrel-shaped, ribbed, and biconical); glass composition; and production technology (wound, poured into a mold, cut from a glass tube, or decorated with gold or silver foil or a colored glass inlay).

The condition of beads recovered from archaeological sites is mainly determined by the nature of the soil in which they reposed and the chemical composition of the glass.

The glass gradually decomposes under the influence of moisture in the ground. In a wet environment, salts and alkali are reduced so the structure of the glass changes. When excavated, the beads are covered with a layer of soil cemented by calcium carbonate and generally have been damaged to some degree. Many specimens display an iridescent layer.

Archaeologically recovered glass beads exhibit different kinds of damage, and several of these are often encountered on the same bead:

1. Deterioration of the surface layer (a crumbling, calcified outer layer in the form of a thin film):

a) Crizzling: This is characterized by tiny cracks that cover the bead (Pl. IB bottom). The crizzling starts in several places on the glass and gradually covers the entire object. Muddy-white plate-like fragments come off the undamaged glass, the surface of which is dull and rough.

b) Delamination/iridescence: Here, a thin onionskin-like film completely covers the bead (Pl. IC top). In this case what appears to be an undamaged bead at the time of excavation develops thin iridescent layers on its surface. The decomposition of the glass had already started while the bead was buried but the rapid dehydration of the glass after excavation accelerated the process, creating the iridescent film.

2. Internal deterioration:

a) Leaching: The whole bead has crumbled (Pl. IC bottom). Soluble sodium (Na) and potassium (K) alkali have been leached out of the glass leaving just the so-called silicon (Si) structure. Such damage is caused by the action of ground water.

b) Infiltration of foreign substances: Damage to the whole body of a bead. There are small bubbles introduced into the glass during the manufacturing process which allow air, water, and dirt to get inside the bead and damage it.

c) Strain-cracking: Star-type cracks (small cracks emanating from a single point) that start from one point and radiate out over the glass causing more and more cracks. They split the glass structure with the result that the bead becomes fragmented.

In order to preserve the beads which suffer from the above maladies, they must be conserved and restored. The Restoration Laboratory of the Latvian History Museum started its work in 1931. In the beginning, a great deal of attention was paid to the restoration of archaeological metal; later also to ceramics. In 1984, restorer A. Mastikova initiated the restoration of glass beads using several different methods. After comparing the results, it was clear that none of the existing methods cleaned the beads completely. This led to the development of a new methodology in cooperation with specialists from the Laboratory of Silicate Technology at the Riga Technical University. After determining the chemical composition of the beads, a restoration program was created in which not only the chemical composition of the glass was taken into consideration, but also the kinds and extent of glass damage. In 1990, the two new methods developed by Dr. I. Vītiņa in co-operation with museum restorers were put into practice, the physical condition of the beads to be restored dictating which method would be used: 1) the "normal" method for relatively well-preserved beads and 2) the "soft" method for heavily damaged beads.

The laboratory procedure is as follows. Dirt, soil, and dust are removed from the surface of the beads with a soft dry brush. They are then washed in an alcohol/water mixture (1:1), after which the beads are visually evaluated under the microscope to determine which of the two methods should be employed.

In the "normal" method, glass beads are boiled in turns in 3% acetic acid and 3% potassium hydroxide (KOH) for 5 minutes each time. The process is repeated until the beads are clean, the final boiling being in acid to neutralize the KOH. To neutralize any further effects of any residual acid and alkali on the glass, the beads are boiled in distilled water which is changed several times until a neutral environment is achieved. The beads are dried by immersing them in ethyl alcohol for an hour (Pls. ID, IIA).

Using the "soft" method (for glass beads that are in bad condition, crumbled, and/or with an elevated lead content), beads are steeped in warm (40-50°C) 3% acetic acid for 5-15 minutes and then neutralized by washing in distilled water until a neutral environment is achieved (Figs. 1-2).

It is preferable that the cleaning be undertaken by certified conservators as the condition of the beads needs to be accurately assessed to determine the degree of deterioration and which method is indicated. The use of either method by untrained individuals may result in the destruction of the beads being cleaned.

As many beads are found in a fragmented state, they need to be glued together. It was very difficult to find the most appropriate material for this purpose. As the beads are small and the fragments are often difficult to keep in position once glued, long-drying glues were not suitable. Acrylic glue (cyanoacrylate resin, a.k.a Crazy Glue) was chosen as it hardens quickly. Keep in mind that this material is not a permanent adhesive so the varnishing process described below is necessary. Before gluing, the fragments are cleaned

Figure 1. Yellow beads before "soft" cleaning (12th-13th centuries).

with acetone. The pieces are then carefully matched under a magnifying glass, a tiny spot of glue is applied to the pieces which are then pressed together.

A protective varnish to seal the surface of the beads was chosen taking into account that it had to preserve the specimens from further deterioration, pollution, and humidity. Nowadays the synthetic's industry offers many products from which a restorer can choose the most appropriate one. The most important features for a varnish are chemical and physical stability, resistance to yellowing and water, good binding properties with glass, and a low drying temperature. Taking into consideration the suggestions of our chemists and the experience of colleagues in other countries, a 7% solution of polyvinylbutyral (PVB; C_2H_5OH) in alcohol was chosen. It creates a colorless transparent layer on the glass and its perviousness to water is low. The restored beads are covered with this varnish using a fine brush, filling all the glass pores. The varnish does not give mechanical strength to the glass; it is reversible and can be easily cleaned. A solution of Paraloid B-72 (polymethyl methacrylate) dissolved in acetone or ethanol usually 2-5% wt./vol. has also been found effective.

Figure 2. Yellow beads after "soft" cleaning (12th-13th centuries).

The restoration program and methods developed by the staff of the Restoration Center at the Latvian History Museum have proved effective. Repeated examination of the beads restored using the methods outlined above has shown that the process of decomposition has been stopped and there are no further changes in the glass structure. A portion of the restored beads are on exhibit at the museum, while the rest are in storage at the Department of Archaeology. As the museum regularly organizes exhibitions of its archaeological material, all the Daugmale glass beads will eventually be restored. As the restoration of glass beads at the Center continues, so does research aimed at refining techniques and developing new ones. It is hoped that the techniques developed here will be of use to others faced with damaged beads around the world.

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