

Thesis

for the

DLA dissertation

“Metal-lathing or wax-lathing:

**The analysis, investigation of the
production-technology and reconstruction of
archaeological metal objects containing
contains round parts or produced by a
variety of turning systems ”**

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The subject of my presentation concerns research in to the nexus between the Roman lathe and beeswax-lathing. In the research I analysed the single existing original Roman lathe imagery. I investigated Roman objects with traces of the lathing process on their surfaces. To get a complete picture about ancient western technologies I researched Egyptian and Greek objects as well Roman objects.

In my daily work I dealt with the conservation of many Roman bronze objects without understanding the technical aspects of their production. Even though, in some cases, the traces of the objects show that they were produced on a metal-lathe, I felt that their shapes were more likely created on a wax model. To demonstrate this idea, it was necessary to find objects which clearly confute the possible of use of a metal-lathe. This evidence can be indirect for demonstrating the existence of wax-lathing as a technology to produce a round form.

In my research, I choosed four Roman bronze objects which were found in Budapest (Hungary). I assumed that the surface characteristics of these objects would support the wax-lathing hypothesis. The result of this research confirms that wax-lathing, a hitherto unknown unproven technology was used to produce these four objects. I offer my presentation to

researchers, archaeologists and restorers-conservators who carry out research into the technologies involved in the production of at least some groups of Roman archaeological metal objects.

There are many round metal objects from the ancient period produced using various technologies to produce them. Even so, I believe there are too many assumptions that metal-lathes were without good evidence. Based on my work, it seems more likely that the production of the form metal vessels with round shapes begins mainly with the wax model lathing method. In many cases, it is not even necessary to lathe the bronze vessel after casting. Of course, this does not mean that the metal-lathing did not exist in the Roman period but I think the key to bronze vessel production was wax model-lathing.

1. Wax-lathing

Wax-lathing or chipping may be defined as a process that uses some kind of turning system and where the form of the cold and hard wax is created by separately shaping the external surface of the wax. It is connected to a certain extent to the so-called lost wax-casting method.

The most effective and obvious technology for carrying out wax-lathing is the potter's wheel, best known for ceramic production.

Explanation :

1. Most ancient city had ceramic workshops with potter's wheels.
2. The potter's wheel turns in one direction. Because of its weight, it works like a flywheel, creating sufficient torque for wax lathing.
3. It is easy to create the shapes from clay which will form the internal core of a metal vessel. The clay shape can then be covered in hot wax in as many layers considered necessary to create vessel walls of sufficient thickness to make the metal vessel model. The wax is allowed to cool and harden.
4. To lathe the cold and hard beeswax is as easy as working with wet clay.
5. In order to insure successful lost wax-casting it was important for ancient crafts people to understand the different properties of the materials which were used for the internal and external cores.
6. The traces on the surface of the wax which was lathed on a potter's wheel are exactly the same as the traces found on the Roman metal objects. They are continuous and run in one direction. This technological trace was created either through the use of an endless rope or by shaping the object on a potter's wheel.

2. High-tin content Roman bronze mirrors

The conclusion of the investigation's (SEM/EDS) however showed that the metal composition of Roman mirrors meant they could not be lathed using a metal-lathe because of the high-tin content the alloy is hard like the glass and can not be chipped or lathed. In fact no

data exists showing the casting was lathed as a metal. These mirrors with their concentric traces and decorations must have been produced by wax-lathing or chipping.

3. Roman *simpulum* (balance-dish)

It may be seen that lead-implications on BSE (Backscattered Electron) photographs of the profile of the Roman *simpulum*'s stamped ornamentation show no deformations even though the metal is relatively soft. Thus, there is no evidence that the decorations were embossed on the outer surface of the bronze *simpulum*. This suggests that there is a good chance that the shape of the balance dish was created in beeswax and the final form was produced by lathing the wax before casting.

4. Roman double-nozzle bronze lamp

I investigated the lamp using a stereo-microscope and recognized that there was no soldering of any kind between the body and the nozzles of the lamp. Additionally, there is no evidence that the bronze nozzles were applied separately onto the bronze lamp body. There are lathing traces on the internal surface of the lamp body. Thus, the surface traces suggest the entire lamp form was carved in wax before casting.

5. Outer race for a Roman chariot wheel-bearing

The ornamentation on the outer races of the wheel-bearings comprises varying profiled grooves. The quality of these grooves differs on each race. If these grooves had been produced by a metal-lathe they would be straight or the wave of the line would be long. However the wave-trace grooves undulate strongly showing that the grooves were produced as the result of slow turning of a soft material. Thus, probably, the Roman craftspeople lathed beeswax to produce the model for the outer race and then cast the individual races.

6. Reconstructions

While making reconstructions of the Roman bronze mirror, the Roman bronze *simpulum*, and a Roman double-nozzle bronze lamp I discovered that if I covered a clay or ceramic internal core with beeswax I could lathe round forms on a lathe or potter's wheel. I could also show that the nicely decorated and lathed surface with the concentric ribs and grooves I created on the surface of the wax are visible in nearly the same way on the bronze-cast as well. Thus, the lost wax-casting method is a perfect method for creating a bronze object from a round beeswax model. However, it is clear that Romans also used simple direct metal-lathing although it is a logical and basic concept that the metalworkers would have preferred to create rounded details of surface decoration in beeswax rather than trying to carve them out directly in a hard metal material on a lathe.

Lost wax-lathing is not being presented as the sole method that could have been used to produce rounded metal objects but I wanted to present another technical possibility and demonstrate of the technologies to produce something and it can prove that there must have been a connection between some ceramic workshops and workers in fine metal objects.

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