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The Sigtuna scorifiers in context

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The small flat crucibles referred to as “melting plates” or “ceramic dishes”, have been the subject of discussion for a number of decades. When Wallace wrote her article (Wallace 2021; see this volume of *Situne Dei*) in 2005, few larger series of analyses had been carried out, even though a less extensive study had already shown the way (Krongaard Kristensen 1990). Today, a few larger studies have been conducted and the common conclusion is that these vessels most likely were cupels or scorifiers, used when testing silver or refining silver samples.

I prefer to use the term “scorifier”, to distinguish them from “cupels” – crucibles made of a mix of bone ash and clay used for the same purpose; silver testing, or cupellation. This terminology follows modern usage for the crucibles employed in this process: scorifiers for the ceramic crucibles and cupels for those made of bone ash.

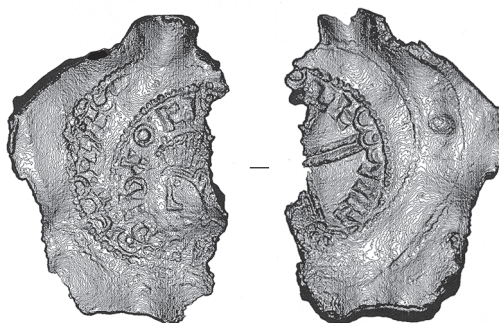
Wallace presents a comprehensive series of analyses of scorifiers from the site of “king Olof’s mint” in Sigtuna, the fine-craft site connected to king Olof Eriksson’s minting c. AD 995–1022, due to the finding there of two leaden imprints on which one of his mint masters tested coin dies prior to the process of hardening and subsequently distributing the dies into the production line (cf. Malmer, Ros & Tesch 1991, Malmer 2010:34ff, Söderberg in press).

The analysed scorifier fragments derive partly from house A89 (c. AD 990–1000) in which the smaller leaden imprint was found (fragments nos 3609, 3304 and 3561), house A79, commonly referred to as “the mint” (c. AD 1000–1025), from where the larger leaden imprint illustrated in *fig. 1* was found (fragment no 3988), and in connection with house A81 which was next to A79 (fragment no 2731). House A89 was the predecessor of house A79, built on exactly the same spot (Ros 2009:113ff, 126ff).

Other analyses

Two larger series of analyses have been made quite recently, one a study of fifteen shards of household pottery from Prague re-used as scorifiers (Zavfel et al 2019) and the other a study of six cupels or scorifiers, two crucibles and one sample of hearth-lining from Oostvleteren in Western Flanders (Saussus & Thomas 2019). Both collections of samples derive from 10th–11th century activities, as is the case with the Sigtuna scorifiers. Analyses have also been made of similar dishes from Novgorod, with the conclusion that they were probably used for testing or refining silver (Eniosova & Rehren 2012:214).

Figure 1. The larger lead piece, from house A79 at the Urmakaren site, with imprints of dies for Olof's coins of the Long Cross type/Sigtuna O/E style, stylistically dated to c. 1015–1020 (Malmer 2010:36). Laser scanned for Sigtuna Museum by Henry Freij, The Archaeological Research Laboratory, Stockholm University.



The results of these analyses align well with those from Wallaces analyses. The predominant characteristic is the high percentages of lead oxide – highly plausible, as lead is the main medium in the refining process – and smaller amounts of silver as well as copper presumably to have been extracted from the silver alloy during the refining process. The scorifiers from Oostvleteren differ in that they contain large percentages of phosphorus (<28% of P_2O_5), indicating that bone ash may have been included in the process (Sassus & Thomas 2019:242f, 246f). The analyses of the ceramic bodies of the vessels show usual clay compositions without phosphorus, indicating that a layer of bone ash was most likely added separately on top of them before use – these vessels seem to represent a transitional stage between scorifier and cupel. The advantage of bone ash is its porosity and that its absorbent properties will remain throughout the process, which is not the case with ceramics. The idea is that the molten lead oxide, the litharge containing other metal oxides from the metals removed from the silver alloy, is to become absorbed by the bone-ash material. In present day cupellation the silver sample melts together with the lead in the ceramic scorifier, into a lead-and-silver button that is finally cupelled in a bone ash cupel. We don't yet know exactly how ancient this process is in all its stages, including the manner of operating both the scorifier and the cupel.

The Sigtuna scorifiers

As a means of refining or testing noble metals, it shouldn't come as a surprise that scorifiers show up in mints and in goldsmiths environments. What we learn from four sites in Sigtuna where scorifiers have been found, is that the main occurrences belong to the period 990–1050 (figs. 2–5). This period was probably a period when large volumes of silver were in circulation in Sigtuna. The first Sigtuna minting covered the period c. 995–1030 and this was also roughly the period for the final Viking *danegelds*, where large volumes of silver were extorted from the king of England by Scandinavians, possible even a prerequisite for early Scandinavian minting.

Of the four sites, the one at the Urmakaren site and the one at the Humlegården site show the earliest peaks in the diagrams, the late 10th century. This ties the smithy “house X” in Humlegården close to the workshop in Urmakaren. The two workshops also had in common that they both produced large amounts of Viking spheroid weights. House X was the largest producer of weights in Sigtuna in the period c.

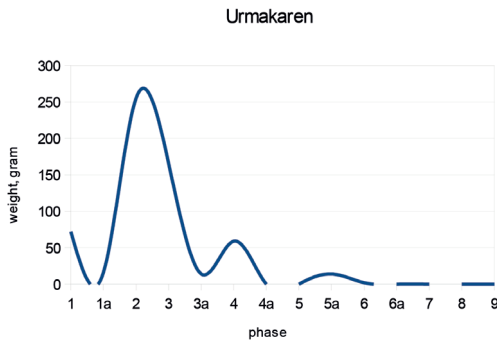


Figure 2. The occurrence of scorifiers at the Urmakaren site, c. 970–1300. The highest peak occurs in phases 2 and 3, c. 990–1025.

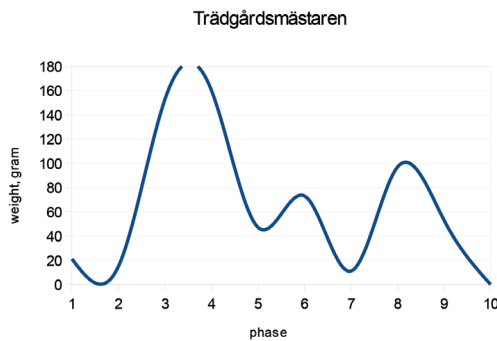


Figure 3. Scorifiers from the Trädgårdsmästaren site, c. 985–1260, with the highest peak in phases 3 and 4, c. 1020–1075. The third peak aligns with an increase in the occurrence of bone ash cupellation material, not visible in the diagram

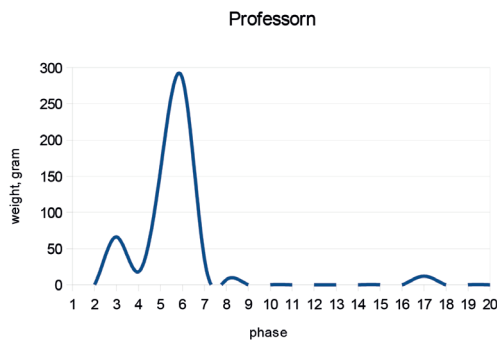


Figure 4. Scorifiers from the Professorn site, from the 900s down to 1950. The highest peak occurs in phases 5 and 6, c. 1000–1030. Chronology according to Wikström et al. 2021.

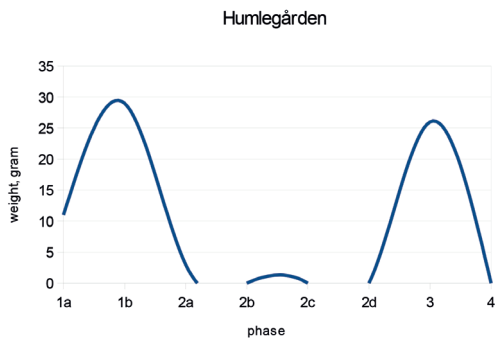


Figure 5. Scorifiers from the Humlegården site, c. 970 down to the 1900s. The highest peak occurs in phase 1b, c. 990–1010. Phase 3 represents a considerably long period, between c. 1080–1300. The volumes of finds from this site are very low compared to the other sites.



Figure 6. Die imprints on lead from Trädgårdsmästaren and the neighbouring site Kammakaren of a coin die for king Knut Eriksson, stylistically dated to the 1180:s (Golabiewski Lannby 2019:40). The imprint from Trädgårdsmästaren was found in layers dated to c. 1200–1230 (Wikström et al 2011). Photo: Gabriel Hildebrand.

990–1010 (Söderberg 2008:120ff) along with house A79 on the Urmakaren site that produced them from c. 1000 to 1025 (Söderberg 2011:14ff).

For the Trädgårdsmästaren site we can also see second peak during phases 8 and 9, at the end of the 12th century and the beginning of the 13th. What's interesting about this, is that a large jeweller's workshop was situated there throughout most of the 12th century and into the early 13th, a workshop that also shows a find of yet another imprint from a coin die; here from the mint of king Knut Eriksson (1167–1195/1196), responsible for the second Swedish minting period (*fig. 6*). We know that Sigtuna was one of the minting sites at this time, and this workshop may have actually served as a mint – or it may have been run by a goldsmith assigned as a mint master by the king, with the commission to cut dies for the minting. This workshop also shows finds of bone-ash hearth lining as well as large litharge cakes, cakes of lead oxide deriving from large-scale cupellation containing smaller amounts of silver, that perhaps was intended for re-use (Kresten & Larsson 1996, Söderberg & Gustafsson 2007:32ff).

Sigtuna's earliest fragments of cupellation material of bone ash/clay is from the Humlegården site, phase 2b, c. 1030–1050, from the Trädgårdsmästaren site, phase 5, c. 1075–1100, and from Urmakaren phase 5a, c. 1125–1150. The earliest fragment that is complete enough to identify as a bone ash cupel used in small scale cupellation belongs to the jeweller's/minting context on the Trädgårdsmästaren site, phase 8, c. 1175–1200.

Another interesting observation is that the 10th–11th century scorifiers from Sigtuna, Fyrkat, Trelleborg, Oostveteren, Prague, Novgorod and several other sites are visually similar to scorifiers that have been found together with cupels, retorts and other analytical equipment from the remains of a 16th century alchemist's workshop in Schloss Oberstockstall, Austria (Martinón-Torres & Rehren 2005). We recognise the glazed slag layers on their surfaces and the depressions where the molten lead, being extremely corrosive to ceramics, has etched itself deep into the material (*figs. 7 & 8*).



Figures 7 & 8. Scorifiers from the 16th century alchemist's workshop in Schloss Oberstockstall, Austria. Photos published with kind permission from Marcos Martín-Torres.

Was king Olof's mint a mint?

In this respect – do we know for certain that “king Olofs mint”, i.e. houses A89 and A79 on the Urmakaren site, really was “the mint”? We do know that coin dies were cut there, that weights were produced there, and that silver was processed in this workshop. We also know that walrus ivory was carved there, the earliest occurrence of this craft in Sigtuna, and we know that glass-bead makers frequented house A79 and built a furnace in it. This is what we know, which is a considerable amount. These workshops with the high-status crafts that were performed in them, were certainly connected to the king's court. But the different stages of the minting process – the storage of silver, melting and refining, cutting of dies, hammering of silver blanks and the striking of coins – may have been spread throughout several different workshops in the town. Very little is yet known about this production process in Sigtuna and we can only hope that future excavations and future research will provide more information.

The Sigtuna scorifiers, that usually contain silver but in a few cases also contain gold droplets, are not in themselves definitive evidence for minting, even if the connection seems strong. They could also have been used in the wider context of precious-metal smithing and jewellery manufacture. This is the tricky part in drawing accurate conclusions, as these different crafts are intimately intertwined with each other.

What we do know is that the Urmakaren workshop as well as the Trädgårdsmästaren workshop both were closely connected to minting, an activity with high demands for the control of silver purity.

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Sammanfattning

Artikeln redovisar kortfattat kontexterna till de analyserade degelskärvor från ”Kung Olofs myntaretom” som Wallace redovisar i sin artikel på annan plats i denna utgåva av *Situne Dei*. Analysresultaten ställs mot andra analyser av liknande degelmateriell från Prag, Västflandern och Novgorod, och värdena från de olika analyserna korresponderar väl med varandra. Denna sorts deglar, skärklar, tolkas idag tämligen samstämmigt som deglar använda vid testning eller småskalig raffinering av silverprover. De hör på så vis både funktionellt och kontextuellt samman med myntning i Sigtuna, troligtvis både under Olof Skötkonung vid 1000-talets början och under Knut Eriksson vid 1100-talets slut. Fynden korresponderar kronologiskt väl med dessa perioder. Att en anknytning till guldsmede även funnits kan dock inte uteslutas. Myntning, gravering av myntstampar och guldsmede hänger samman.