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On Norse padlocks – production and use
Examples from the Birka Garrison

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Archaeological excavations undertaken between 1877 and 2002 at the "Garrison" at Björkö in Lake Mälaren have produced, among a wealth of other artefacts, 41 padlocks of a type common to the whole Norse cultural sphere. This paper centres on the construction of these padlocks and suggests a possible method for making them by one-piece soldering. It also presents a more symbolic view of this artefact type often looked upon as merely functional, as a marker of power.

Keywords: Birka, brazing, ceramic, padlock, reconstruction, seal

Metal padlocks have been in use in the north of Europe at least since the Late Roman Period. The urge to signal ownership via locks could hardly had been a new phenomenon in the contemporary society, and it can most probably be traced back to an earlier tradition in which locks made from wood or some other easily perishable material served the same purpose.

During the excavations of the Helgö complex close to Björkö in Lake Mälaren, Sweden, a large number of padlocks were found. The archaeologist that surveyed and reported these locks, Jan-Erik Tomtlund, found three main types in the Helgö-material (Tomtlund 1970, 1978). Those of Type I featured a mechanism that was released by a rotating key (Fig. 1), those of Type II had a square or rectangular lock-case and a mechanism that was released with a sliding, spatula-like key (Fig. 2). The Type III locks also had a mechanism released by means of a sliding key, but the case was cylindrical or rounded-off in cross-section.

All the padlocks had the same basic three-piece construction: an outer case with a keyhole and an attached hasp sheath, a mechanism with small springs attached to a bent hasp, and lastly a key. To lock a padlock, the mechanism with wards and springs had to be fitted into a set of matching holes in the top of the lock-case. Simultaneously the free end of the hasp was slid into the attached sheath. When the mechanism was pressed down fully, the springs were released and engaged the inside of the case so that the mechanism could not be drawn out again other than with the key, which was either made to rotate and manipulate the springs through cutouts and protruding points on the bit (padlocks of Type I), or was spatula-like with a series of cutouts in the bit that fitted over the tips of the wards and springs of the mechanism to compress them (padlocks of Types II and III, cf. Fig. 3).

Padlocks of all three types can be found all over north Europe in archaeological contexts dating to the later part of the first millennium, from the British Isles in the west (e.g. Richardson 1959:81) to Russia in the

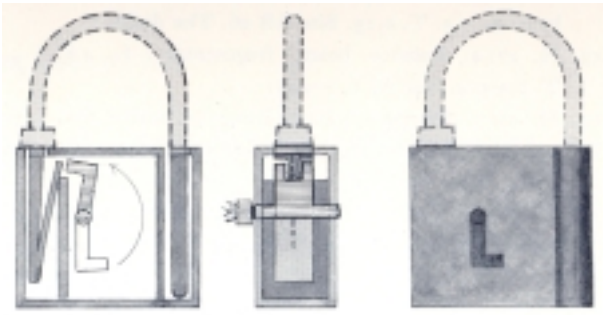

Figure 1. A padlock of Tomtlund's Type I (from Holmqvist & Arrhenius 1964).

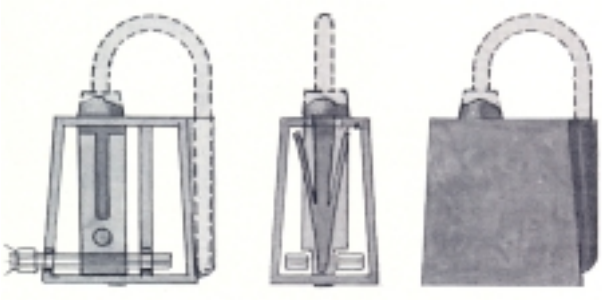

Figure 2. A padlock of Tomtlund's Type II (from Holmqvist & Arrhenius 1964).

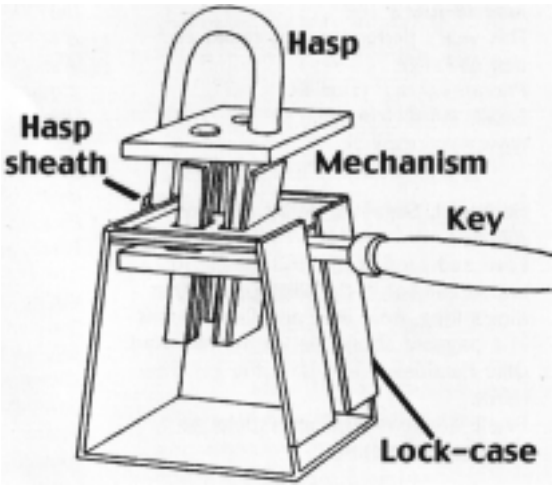

Figure 3. The parts of a Type II padlock.

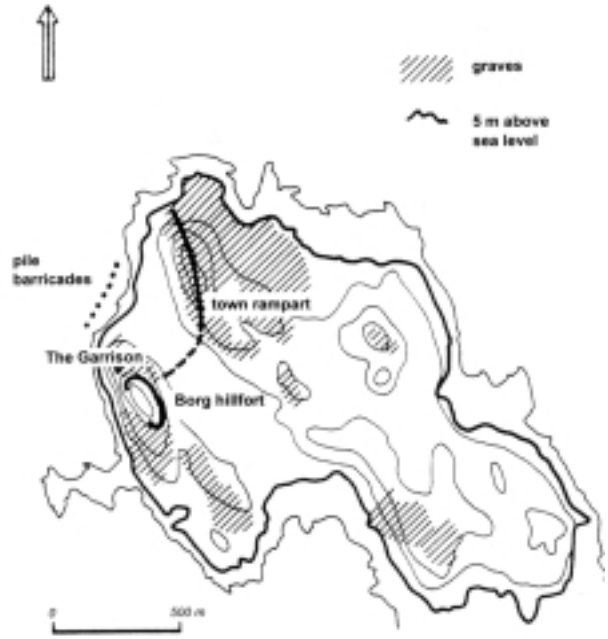

Figure 4. Björkö (after Holmquist Olausson 2002).

east (e.g. Eding 1928:44), but those of Tomtlund's Type II seem to be very closely tied to the Norse culture and its descendant cultures – in Europe that is – padlocks of the same construction are still common in East Asia. The connection has never been thoroughly investigated by modern scholars, so it is hard to tell who inspired whom in terms of cultural influences, or whether the similarity can be seen as a case of analogous solutions to a problem common to all mankind.

The 41 padlocks from Björkö were found in an area called the Garrison, just south of the former town, between 1877 and 2002 (Fig. 4). Seventeen of them could be classified with certainty as Type II locks, while seven others most probably belong to Type II as well. The remaining 17 are too fragmentary to be classified. Two more padlocks were found during excavations in 2003, but, due to their novelty as finds, they have been left out of this survey.

Most of the padlocks have been found in, or in the immediate context of, the longhouse (Gustafsson 2003:16f), popularly known as "The Hall of the Warriors", that stood on the site during the middle part of the century (Holmquist Olausson & Kitzler Åhfeldt 2002) (Fig. 5). The fact that so many locks have been found in such a confined locality is quite intriguing, at least by comparison with the total number of padlocks found elsewhere at Björkö, for instance only a total of 11 locks were found in graves, (Tomtlund 1989:133). As stated above, padlocks of the same type have also been found in other Viking-Age centres, e.g. Haithabu and York (cf. Westphalen 2002; Richardson 1959), but the numbers from these sites do not come anywhere near the wealth of locks from the Garrison at Björkö.

The padlocks from the Garrison can be divided into three simple subgroups on the basis of the statistical ratios of their outer dimensions, i.e. the sizes of measurable side-plates (18 plates in all): small, medium-sized and large. Since the ratios are based on the Euclidean distances between the length, width and height of each side-plate, it is hard to specify the subgroups more than in the simple fashion stated above. The larger padlocks have without doubt served a purpose as locks, whereas the smallest locks in particular could be questioned: their weak construction would rule them out as effective locks. This feature and a possible interpretation of it will be discussed below.

Several keys have also been found at the Garrison, but these were not included in the present survey. A special type of ornamented key was studied by Marita Westerholm in her M.A. thesis in 2001 (see below), but since keys and padlocks ought to be seen as parts of the same

entities, they and their connections with the locks deserve to be examined more closely in the future.

Lock making on Björkö

There is very strong evidence for lock making in Birka. During the excavations in the Black Earth area in 1990–1996, more than 5600 severely burnt and imprinted ceramic shards were recovered (Jakobsson Holback 1999:7), and by further analysis several of these shards where shown to be debris from padlock production. Some of the shards could be refitted into whole pieces quite similar to casting moulds, although they only showed moderate amounts of tempering elements such as quartz. The clay in them was generally severely burnt, as stated above, and on the verge of being vitrified. The imprints on the insides of the shards, which ranged in thickness between 5 and 15 mm, were of several types, but some of them could clearly be associated with existing artefact types. One type of imprint showed flat surfaces interrupted by twisted, rod-like imprints crossed by thinner grooves. These correspond closely to perfectly with padlocks of Tomtlund's Type II.

During the survey of the find material from the 2002 excavation at the Garrison, three shards initially thought to be ordinary slag were brought for closer examination. They had been found in the vicinity of the forge discovered at the Garrison in 2001, and all three showed imprints that could not have been created by natural processes, e.g. slag solidifying over burning charcoal. The latter will also leave imprints in the slag, but with a distinct, negative "charcoal pattern". The three pieces from the Garrison, finds nos. 3313a, 3313b and 3511, were all notably heavier and darker than the shards from the Black Earth, but they nonetheless showed very specific imprints clearly connected with the padlock types found in the area.

Three fragments might not be enough to prove that padlocks were produced at the Garrison's forge, but when the many padlocks found there are taken into account along with the shards, they do speak in favour for such an interpretation.

The imprints on the refittable shards from the Black Earth show that the lock-cases were indeed brazed together in one single process, and that the plates in a lock-case were mounted together as a whole piece prior to the application of the clay. That is the only possible explanation for how the imprints were formed on the insides of the ceramic shards. Furthermore, fragmentary locks in which the inner faces of the lock plates are visible often show a knotty layer which,

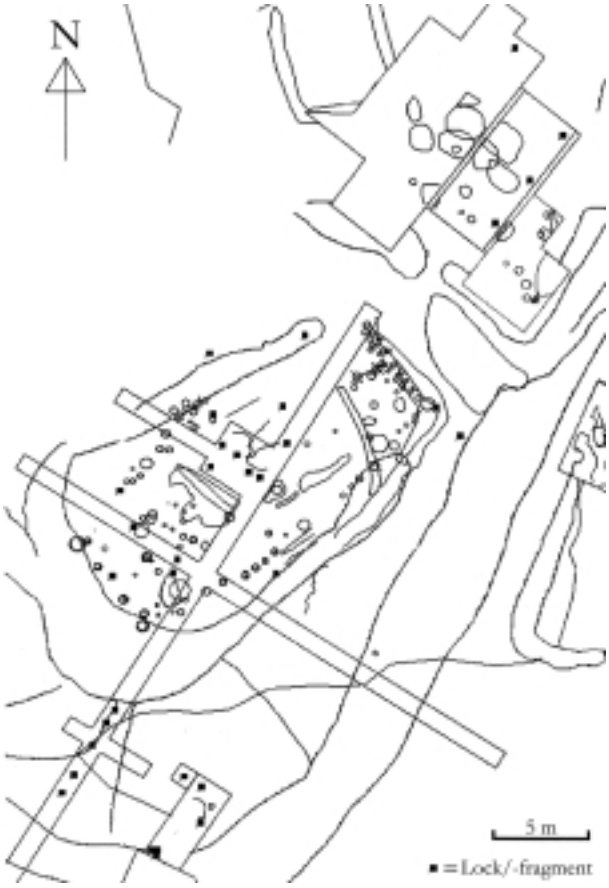

Figure 5. Padlock finds up to 2002, plotted on a map of the Garrison.

when polished, gives a dark gloss. The outer faces of the lock-cases never show such a layer. One possible explanation is that the lock-cases were heated not only from the outside but also from the inside, by inserting some type of combustible material *inside the lock-cases* to be ignited by the heat during the brazing. The heat would then cause the inner surfaces to react differently from the outer ones, which were protected to some extent from direct contact with the heat by the clay.

What would the stages in the making of a lock-case be? A hypothetical reconstruction of the procedure could be as follows:

(1) An inner jig, just a little smaller than the final lock-case is intended to be and trapezoid in shape, is made from some kind of combustible material such as leather, fabric or beeswax.
(2) The lock-plates and hasp sheath are fastened to the jig by lacing with thin threads. Thin copper alloy rods, the solder, are applied at the joints between the jig and the plates.
(3) The whole piece is baked in wet clay, which is then allowed to dry – forming a "brazing package". Po-

tential dry cracks are mended with more wet clay.

(4) The package is then put into a furnace. If cracks appear, they are covered with wet clay. The package is turned regularly to allow an even distribution of the heat. When the outer surface has a "shiny", vitrified appearance, the piece is taken from the furnace and allowed to cool somewhat.

(5) The brazing package is then put into water to cool thoroughly, after which the now vitrified ceramic shell is broken open and the brazed lock-case is taken out.

(6) The inner jig, fragile and carbonised by the heat, is removed from the case via the key and mechanism holes, after which the lock-case is ready for use.

Such a production procedure would generate severely burnt ceramic shards and brazed lock-cases with traces of direct exposure to heat on the inside. The technique of using clay to cover pieces of metal when brazing or welding them is described by the German friar Theophilus in his book on metal-working, part of the larger work *De Diversis Artibus* (On the Divers Arts) – dated to the first half of the 12th century. In chapter XCII "De Solidatura Ferri" (On the Brazing of Iron) he wrote as follows (from the English translation of 1961):

> "At the point where they [the pieces of metal that are to be joined] join, thin copper is wrapped round and a little clay smeared round. When the clay is dry, it is put under the coals in the front of the fire and blown and, when it is red hot, the copper immediately melts and flow round and brazes." (Theophilus, transl. Dodwell 1986:165)

Theophilus also gives instructions for the making of brazing metal from pulverized copper, tin, wine stone and salt. The two latter ingredients may have served as flux agents. Even though Theophilus lived more than two centuries after Birka fell into decline and vanished, there is no reason to believe that the methods he described were unknown to the people of Iron Age Scandinavia. Neither were they unknown in later workshops. Padlocks were made by the same technique in some parts of Sweden up until the 19th century – and cattle bells still are (Björklund 1982:342).

Locks or seals – to confine access

This discussion of the padlocks from the Garrison has so far centred on technical aspects – which are indeed quite important and to some extent resolvable. Other aspects that are not so easily understood have to be taken into account, though. Padlocks have a clearly defined purpose in modern Western society – they prevent access to spaces that for some reasons cannot be locked with standard fixed locks. This simple definition proves to be not so simple when looked at more closely. The action of sealing a space from others is dependent on a common social code that dictates that some people have the right to restrict others' access to certain objects or spaces. In modern society the cornerstone for this line of thinking is mainly the concept of private ownership, but it is also quite possible for a smaller yet powerful group, a corporation, or a parliament, for that matter, to decide to exclude the vast majority of the population from certain objects or areas. The reasons may vary, but it is still a common feature of modern society. There is also still a juridical distinction between unlawfully entering an unlocked versus a locked space, the resulting sanction being considerably milder in the former case. This distinction between locked and unlocked was already apparent in the Swedish medieval Provincial Laws – and conversely to the discussion above, a crime, e.g. theft, was seen as more severe if the stolen goods were subsequently locked in a house, room or chest owned by the accused and to which he or indeed she had the key (see Holmbäck & Wessén 1979a:89, 1979b:92ff, 1979c:84f). Hence to put a lock on something implied both a privilege and a responsibility – the lock symbolized the locker in both positive and negative respects. With the locking, or more accurately – the sealing, a person signals that he or she will take certain measures to deal with whoever who breaks the lock, but conversely, he or she takes responsibility for the items that are locked up. It may well be that the padlocks from the Garrison at Birka ought to be interpreted in such a cultural context. Many of the 41 padlocks or padlock fragments examined were of a notably weak construction. They were small, the iron plates in the lock-case were thin and the bent hasp was so thin, less than two millimetres in some cases, that it would not provide any resistance even to the slightest attempt to break it open. Despite this, the mechanisms, the lock-cases and the keys of these "miniature" locks were just as elaborate as the ones in larger, tougher locks. A modern parallel that comes to mind concerns the padlocks that are to be found on some diaries – small and weak, but yet functional and put there for the purpose of restricting access. Such locks are purely symbolical – a feature that is quite probable for their Iron Age "counterparts" as well. The lock is not so important – it is the sealing that matters. The thought of padlocks as "mobile seals" is not new – Jan-Erik Tomtlund suggested it in his survey on padlocks from Helgö in 1978 (Tomtlund 1978:13). In her paper of 2001 on ornamented padlock keys from the Garrison area, Marita Westerholm put forward a theory of keys as markers of rank within the Garrison. Certain

high-ranking "officers" were given keys (and, of course, matching padlocks) as a token of their position in the local social structure. The designs on the handles, in many cases in the shape of striking birds-of-prey, are also, according to Westerholm (2001:34f), an important feature, which may have both religious and proto-heraldic meanings. These special keys are without doubt meant for the largest padlocks of Tomtlund's Type II, a group that he chose to call Type IIb in his analysis of the padlocks from the graves at Björkö to separate them from other, smaller locks of Type II. They are much tougher and can be seen as padlocks both technically and practically – it would take some effort to open them by force. It would be an interesting task to match keys with padlocks from the Garrison, but since both are severely corroded, it is highly unlikely that such a study would yield much. In all, some 20 padlock keys have been found at the Garrison to date, of which 16 are of the type discussed by Westerholm in her thesis.

The state of the padlocks arouses a new question: why had a significant proportion of the locks been broken open, i.e. they were found with their mechanisms still in the cases? It must be regarded as rather unlikely that so many locks were broken open on account of lost keys. Padlock keys have been found in the same cultural deposits, but they were apparently not used to any great extent. This could, of course, be the result of normal taphonomic processes in the soil, or of a "get-to-it-fast" approach on the part of the besieging force that appears to have captured the Garrison by the latter half of the 10th century, but it could equally well be a trace of a more profound cultural practice – that the power of the former occupants was destroyed through the destruction of its symbols. By breaking the "seals" on the Garrison, the conquerors showed that they were the new masters. A later but nonetheless related phenomenon might be seen in the medieval custom of breaking the personal seal stamp of a deceased individual. The broken seal was then put in the grave along with its owner (Norberg 1970:194). The custom of placing padlocks in some of the wealthier graves at Björkö might be an early variation on this theme. The padlocks in question were not attached to anything in particular, but acted as grave offerings in their own right. Some were even broken – deliberately or not – when they were placed in the graves (Tomtlund 1989:133f).

When padlocks and their keys are found in archaeological contexts, it is of course the more practical aspects that can be taken into account. This article does not aim to "symbolize" padlocks or assign them values that can neither be proved nor disproved. The aim, instead, is to present an extended view of an intriguing and complex piece of Iron Age technology that has been undeservedly overlooked in archaeological research. Much is yet to be said on padlocks.

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