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The use of two or three giant loom weights: A solution through a loom construction experiment and tests in weaving

Lorena Ariis

Abstract

This chapter deals with the process of weaving with two or three big loom weights, often found in the Roman settlements of North Piedmont, Italy. In the particular case of Fara Novarese, three weights were found *in situ* inside a textile activity area, and provides the opportunity for an experimental reconstruction of a vertical loom which combines the technologies of both warp-weighted loom and two beam loom, a local variant recorded from the Early Middle Ages.

Keywords: Roman period, large loom weights *in situ*, warp-weighted loom, two-beam loom, reconstruction technology, weaving, warping

8.1. Introduction

Three large loom weights were found in a Roman rustic villa, dating from between the 2nd and 3rd century AD in the territory of Fara Novarese in northern Piedmont, Italy. The loom weights were found *in situ* in the remains of a room, placed together near the outer wall. It is likely that the loom was used outdoors (Figure 1). The area was likely used for textile activities until the 2nd century and possibly later. Five spindle whorls and fragments of alum amphorae, commonly used in the fibre dyeing process, were also found in the same context.

In the northern Piedmont area, large loom weights are usually made of refractory ceramic or ceramic similar to Roman brick. Almost all weights are sporadic finds originating from old excavations and are deposited in museum collections with little information. The three weights from the 2013 excavation were unique in that they are the first to be well-documented archaeologically, and their stratigraphic relation was related to a context of use or deposit (Courtesy of the Soprintendenza Archeologica BAP Province di Biella Verbano Cusio Ossola e Vercelli, Italia. About the excavation: Spagnolo Garzoli and Gabutti 2015; Garanzini 2021).

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Figure 1. The replicas of the loom weights from Fara Novarese (left). (Photograph: L. Ariis) The loom weights were found in a room interpreted as a zone for textile activities (right). (Originally published in Garanzini 2021: 162, Fig. 129; Ariis 2020)

8.2. Sources for the reconstruction

Previously large weights in the collections were regarded with uncertainty; the poor excavation documentation tended to classify them as loom weights due to the unequivocal shape. These uncertainties often led to alternative interpretations for such weights, suggesting they were used not for weaving but used in the home as some sort of support or support bases. The use of single, often broken specimens as bricks in the walls or as cobbles in rustic paving contributes to these misleading interpretations. In rare cases, as many as two or three weights were found in the same excavations, but never within the same archaeological layer. Such uncertainties associated with interpreting these artefacts has relegated them as poorly classified, uninteresting, and unworthy of significant study within archaeological research (Garanzini 2015). Two main concerns when addressing these misconceptions are whether or not they should be classified as loom weights, and if so how it was possible to weight a loom with only two or three weights at most.

Overall, these materials include the following characteristics: the considerable weight – they are almost all included in a range that goes from 1200 g to 1700 g – the shapes are irregular discoid, doughnut, disc but with a flat side, or rather a flat disc. Even if found in pairs of two, the shapes are not similar, such is the case at Fara Novarese, where three different weights varied in shape, and included a doughnut, flat-sided disc, and biconical disc.

The shape differences are important; when hung side-by-side, the three weights of Fara are unstable, bulky, unbalanced, and have tendency to sway. This was particularly evident when working with the replicas in experimental contexts. After creating the replicas, I began by hanging them from a rope to see how they moved. Overall, they were unstable, which made me think that weights could not have hung from the frame side-by-side in a classical manner. During weaving, abrupt and unstable weight movements would compromise all work when moving the heddles.

The weight of the loom weights raised other reflections. Roman fabrics woven with a vertical loom were at least 30 to 70 cm in width (Broudy 1993: 27, 46–47; Olofsson et al. 2015: 88–92). While it is possible to distribute the warp yarns by attaching them to two weights, this is more difficult and risks inconsistent thread tensions, different inclinations, and yarn breaks. While using wool increased the likelihood of breakages, attaching many thin linen yarns to two large, bulky, swaying weights compromised the weft with holes, waves, incorrect lateral tensions, and twists. The warp yarns should be divided between the front and back of the shed, with the help of a lower shed rod, with one weight behind the loom and one in

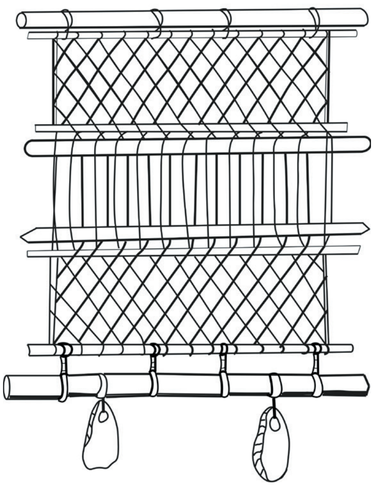


Figure 2. Loom for making sprang. (Drawn by M. Kuusisto after Melis 2014, originally published in Alfaro Giner 1984)

Figure 3. Loom painted on the Hypogeum of Aurelii, Rome. (Drawn by M. Kuusisto after Broudy 1979: Fig. 3.13)

front. It would be really uncomfortable and nonfunctional to not have a set of at least eight loom weights available, the minimum number for a correctly working a vertical loom, with four weights in front and four behind. After checking various experiments and theories on the use of loom weights on vertical looms, including important experiments concerning the weight shape, thicknesses, and number of threads per weight (Schierer 2005; Belanova et al. 2005; 2010; Mårtensson et al. 2009; Andersson Strand 2012; Štolcová and Zajonc 2015; Olofsson et al. 2015). I was unable to find a solution for hanging two large loom weights directly on the warp. While there are experiments addressing the use of giant loom weights, such as the one with weights from the Czech Republic, a set of 16–17 weights of 1300 g (Štolcová and Zajonc 2015), or work based on the set of 2000 g weights found in France (Penisson et al. 2015), in both cases the experiments were done with sets of more than eight Bronze Age weights, while in the case of Piedmont we have only two or at most three weights from archaeological excavations, generally dated between the 2nd and – at the latest – the 4th centuries AD.

8.3. The loom construction experiment

After viewing the loom types in use from the pre-Roman, Roman, and Early Medieval periods, I took inspiration from a weaving experiment from Orkney Hood, Scotland, where the weights were threaded onto a stick suspended with ropes from the lower beam, on which the yarns are hooked (Wood 2003: 171–175; previously the loom was dated to the Viking Age, but recently it was attributed to the Late Iron Age, Wincott Heckett 2012: 439). I was also inspired by the design of a loom intended for sprang technique (Alfaro Giner 1984), where two large weights weigh down the beam that carries the warp yarns and are arranged sideways. Similar loom weights were found in Sardinia, Italy, dated to the Late Iron Age and Roman period (Figure 2, Melis 2014).

To construct the loom, I started with the shape of the Roman two-beam loom as illustrated in iconography, stone reliefs, frescoes, and drawings, including the Hypogeum of the Aurelii (Figure 3, 3rd century AD), Forum of Nerva (1st century AD) in Rome, and in the Utrecht Psalter (5th–6th century AD, Broudy 1993: 48, 58). While the beams and crossing poles (uprights) are fixed to each other in these vertical looms, I decided instead to make the lower beam movable, and hook the two large weights to the sides of the warp (Figure 4).

Figure 4. The loom measures 165 x 120 cm, with the base measuring 30 x 30 cm. Two loom weights hang from the sides of the warp, with the third one on the back beam to increase stability. The tubular tabby was started at the top. The lower beam sits on the supports in a "rest position" while work is paused. The bases are connected by a crossbar to fix distance between the poles and to give stability. (Photograph: L. Ariis)

The upper beam is only supported on the vertical supports, while the lower beam must be moved from the supports during the weaving phases: during the warping phase the lower beam is placed on the supports, while during the weaving phase it is moved under the supports so that the warp yarns are weighed down by the weights. The beam is moved back to the support during the final phase of work, to avoid interfering with the warp yarns too much (Figure 5, right).

The warp runs around the two beams as in the tubular warping around a transverse cord in the back system. Obviously, the chained spacing cord is not needed in the Roman two-beam loom, and the heddle roads move along the central support.

8.4. The loom weight replicas

The first phase of the experiment was to make replicas of the weights. According to the general Roman compositions, I used refractory clay composed of 85% red clay and 15% crumbled brick and fine sand, (Cuomo di Caprio 2007; Ariis 2020 for the replica processing). They were dried and not fired, as firing could not be ascertained in the originals. The three loom weights have very different weights – 1200 g, 1320 g, and 1580 g – and the replicas were modelled on a potter's wheel (Figure 1). The loom weights are of different shapes: a low biconical weight with a flat side and traces of sand, a doughnut weight with very rounded edges, and a discoid weight with a slightly flat side and traces of sand. This characteristic depends on the fact that they were modelled on a lathe, detached, and then left to dry on a flat, sanded surface. In copying the loom weights, I sought to replicate the original weight and shape as closely as possible to (1) have the tactile perception of irregularities, (2) better understand their stability or movement, and (3) to test how they behave and balance when hung. These observations confirmed the perception that they are unstable, they are bulky when placed side by side, and – having different circumferences and a central hole at differing heights – they cannot be aligned close to each other. The different thicknesses (4.2 cm, 5.3

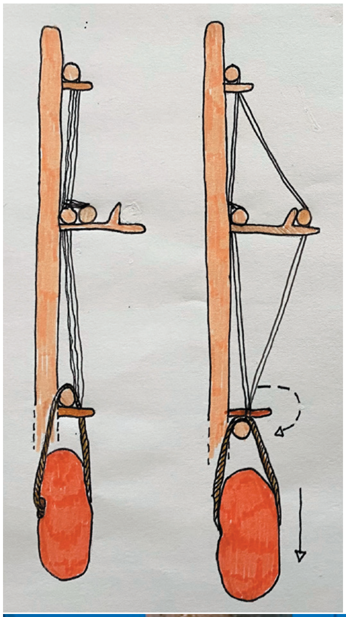
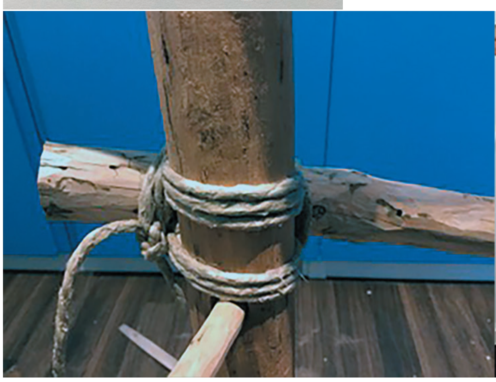


Figure 5. The back beam is fixed with a rope, and the support for the lower beam is inserted on the pole (left below). The lower beam remains against the support during warping (right below). The lower beam was moved up the support during warping and working pauses, and moved below the support during weaving (left). (Photographs: L. Ariis)



cm, and 6.3 cm) are another characteristic that distinguishes them from sets of consistently-sized warp-weighted loom weights found at excavations. After all, thickness is fundamental to maintaining tension when weaving balanced fabric (Olofsson et al. 2015: 88–92).

8.5. The construction of the loom and the weaving tests

The reconstruction of the loom was carried out entirely by hand. It was a question of using natural materials, including types of wood present in the Piedmont region and used during the Roman period. The materials were selected based on their characteristics of resistance, elasticity, and easy processing, such as ash, acacia, and pine (Ariis 2020, environment and wood processes). The measurements for the loom were obtained based on the proportions in the iconography of the Roman loom: the vertical poles (pilars, crossing poles) were 165 cm tall and the beams measured 125 cm tall, while the bases measure 30 x 30cm (Figure 4). The poles were drilled to insert the supports.

An additional beam was affixed with a rope to the back of the loom for greater stability (Figure 5, left). The two bases were locked in position by a small joining bar, which fixed the distance between the poles (Figure 4). The original loom was likely portable, so I considered the structure's mobility and also whether it would be possible to widen the space between the poles and possibly add a third loom weight in the middle to likewise obtain wider fabric.

Once the loom was built, I attached the loom weights and made the warp using the tubular warping around the transfer cord system (mentioned above). Two heddles were hooked to the warp to make a 1/1 tabby fabric with 2–4 mm thick hand-spun plant-dyed wool yarn. During the warping phase, the lower beam was positioned in the resting position above the supports (Figure 5, right). During weaving, which proceeds from top to bottom, the lower beam was moved under the supports so as to be weighed down by the weights, in order to put tension on the warp yarns. The heddles moved easily with the support of the heddle rod, and the shed opened easily (Figure 6).

The resulting fabric was 34 cm wide, with ca. three yarns per cm. The yarns were irregular in thickness. The fabric has a regular texture and is balanced in tension, with no waves or interruptions. Overall, this material was easy to weave. As with a classic warp weighted loom, it was not possible to calculate the tension, as the yarns are wrapped around the beams rather than putting the full weight of the loom weights on the yarns.

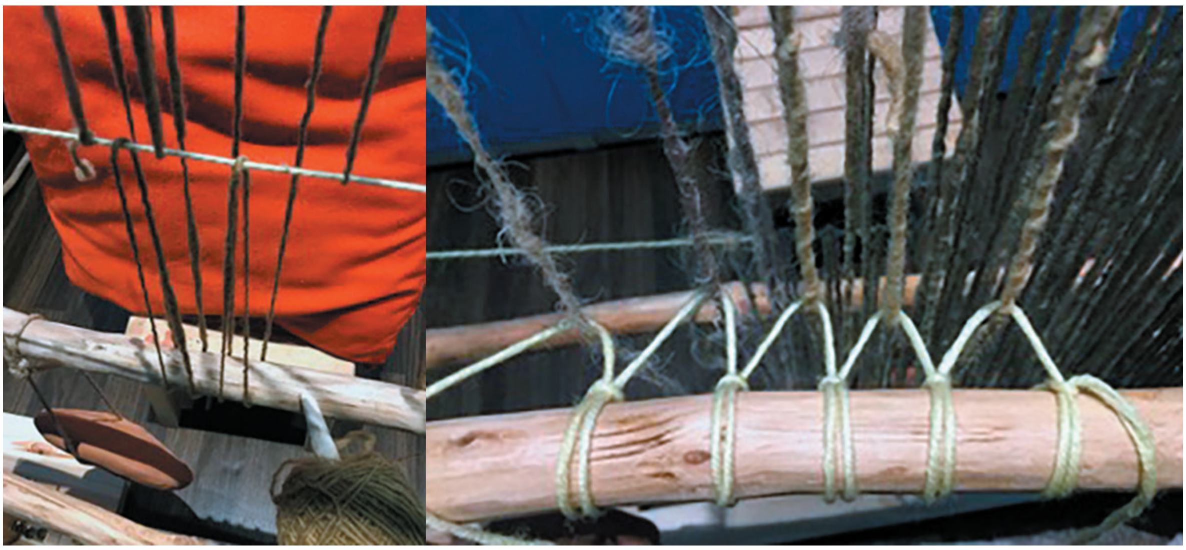


Figure. 6. Tubular warp around the rope (left). Attaching the rod heddle to the warp (right). (Photographs: L. Ariis)

Another weaving experiment is in progress. The yarns are regular, with a thickness of 1 mm. The warp is 53 cm wide with 158 yarns. A horizontal decorative border was created during warping using the band weaving technique with a rigid heddle, to demonstrate the loom's versatility. The experiment will continue by testing the loom's performance when using three or four heddles to weave twill fabric (Figure 7).

8.6. Conclusions

The proposed loom is inspired by two loom types: the warp-weighted loom and the two-beam loom, which were both used during the Roman period in Italy (from the 2nd to the 3th century AD). I combined the two technologies based on local variants from previous traditions, considering that this period saw an intense trade in and circulation of textile products (Gleba 2013; Jinyu 2013).

While both the raw materials (wool and linen) and a clear textile market were present in the Piedmont region, sets of pyramidal weights have not been found. As such, the existence of the classic frame with a set of weights must be excluded. The presence instead of the giant weights in groups of two or three suggests a different weaving tradition, which does not exclude a different type of loom. However, this aspect of different textile cultures and different weaving methods pre-exists the Roman period in North Italy, and is visible in the famous rock engravings with seven loom designs from Val Camonica (Bazzanella 2012: Fig. 8.15). These suggest a very early existence of different models of vertical looms, with many weights or with a few weights, and with differences in the proportion and shape of the frame.

While this accounts for the evidence available, it cannot be applied to every giant loom weight find. Some sets include ten or even more weights, found closer together. This would imply that there was a warp-weighted loom for the manufacture of large fabrics. While various ways of attaching the weights to the loom are proposed in experimental archaeology and in the reconstructions of looms in museums and exhibitions, no comparisons can be found for giant weights. Proposed methods to hook warp threads to weights of other shapes include the triangular weights of Danebury, UK (Beamer 2021) which have a series of holes, and are hooked to the base or an inverted hooked at the tip. Another example, the weights found in the excavation of northern France (Penisson et al. 2015), are two sets of eight to ten weights in the shape of a 'cocoon' and low or flat cylindrical shape, with a medium weight of 2 kilograms. In this experiment, the warp yarns are applied to two bars of weights rather than to the weights themselves; however, this example uses sets while my source material only has two to three weights, irregularly shaped and unbalanced which cannot be hooked to two parallel bars. Another example are the big pyramidal weights from an excavation in Slovakia (Štolcová and

Figure. 7: The tabby weave, using the sword to beat the yarns (left). The next experiment with the loom is in process (center). Here I tried a band-chain decoration in gold and red, with the aim of having a consistent distance between the warp yarns (right). (Photographs: L. Ariis)

Zajonc 2015), with a total of 91 loom weights of 1300 g, arranged on the ground across about 4 meters in length on the ground, which if used simultaneously, could apply almost 100 kg across the warp, a considerable weight. Perhaps this is more than one set on the ground, or perhaps the weights would have been on a massive loom to run heavy textiles like large carpets.

Overall the type of loom that I have experimented with can only be valid in the particular situation in which a few large loom weight specimens are discovered from the same excavation context; such is the case in the northern Piedmont, where there are always a small number of large weights up to 1300–1700 g. Usually two or three loom weights are excavated in the same layer or nearby, as in the case of Fara. These are sporadic finds and the scattered fragments that can be reconstructed, some of which were reused later as building material. Generally, to identify a loom set, we rely on intact and fragmented weights which are associated at the stratigraphic level, as in this case three whole weights from the same excavation position. If four related loom weights were found, I would propose a larger loom, perhaps twice the size considered here, with a more robust structure and poles and worked by more than one weaver. Generally the looms were mobile and could be reassembled, and could be moved outdoors depending on the season. This would explain the finding of three loom weights of Fara along the outer wall of the textile activity area. The reconstructed loom could also be reconfigured to add larger beams to hook the weights. The experiment has shown that you can have a vertical loom with two weights, the positions which create the shed, how two heddles can be used, and a tubular fabric is obtained as one would with a two-beam loom.

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