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Cloth Qualities from 800 BC-AD 800 in Austria: Context - Development - Handcraft

Introduction

The analysis of Roman period textiles from archaeological contexts in Austria has been a neglected topic for a long time. This paper presents a short overview of the recent research into the subject. To understand Roman period textile production, a wider overview in the centuries before and afterwards is essential. Therefore information about cloth qualities from 800 BC to AD 800 in Central Europe has to be considered in order to explore the pertinent questions. For example, what was the cloth culture of the prehistoric population in the Iron Age and how (and if) did it change with the Roman occupation? Furthermore, what was the impact of the Roman Empire on the trade routes and production structures of the "Romanised" tribes in the Danube Provinces (especially Noricum)? The Empire with its centralised organisation controlled this region for at least 500 years. In the following Migration period (Early Medieval period), many of the cultural and economic achievements of the Roman period were lost and the organisation level of society changed from a centralised one to a more local tribal structure.

In terms of quantities of textiles preserved in Austria for the period in question, the following numbers can be summarised. From the Iron Age there are about 1000 textiles, primarily from the salt mines of Hallstatt and Dürrnberg, preserved in the salt in their organic state. Additionally there are mineralised textiles preserved in burial contexts (Grömer, forthcoming 2011). The collection of data on the Roman period resulted in approximately 150 textiles to date (Grömer, forthcoming), although the chronological distribution of finds is uneven. From the 1st and 2nd centuries AD there are only few finds, e.g. from the settlement of Magdalensberg, and cremation burials in Styria. Most of the Roman period textiles were found in graves dated to the 3rd-5th centuries AD. Finally, the Early Medieval cemeteries (6th-8th centuries AD) provided information about 230 textile finds.

Although these textiles derive from different contexts - graves, salt mines and settlements, they allow us to summarise the information on the cloth qualities and therefore the 'textile culture' that existed in Austria. It is hoped that the growing databases will eventually allow this general knowledge to be applied to special textile contexts and functions.

Various methods of research were applied to this material. For the quality of the textiles the basic aspects of textiles were recorded: the thread count, the yarn diameter, pattern, weave structure, twist of the yarn and colour. Fibre quality analysis was carried out with the help of the microscope. Organic fibres such as those from the salt mines were analysed using light microscopy, while mineralised objects from graves were analysed with the Scanning Electron Microscope. Dyestuff analyses of the salt mine textiles from Hallstatt were done using HPLC (Hofmann-de Keijzer *et al*. 2005).

Cloth Qualities in Iron Age Austria (800-15 BC)

The prehistoric textiles are a key source for understanding the development of the textile craft, because all main textile techniques known already during the Hallstatt period (e.g. different patterning techniques, band weaving, dyeing, twill weaving, various sewing techniques), were used through to Medieval times and even later. A distinction between Hallstatt Period (800-400 BC) and La Tène Period (400-15 BC) is necessary, because during the 1st millennium BC

significant changes took place.
From the Hallstatt Period, Austria has a rich body of textiles from the salt mines on the site of Hallstatt (Fig. 1). The textiles were found in the caves and tunnels of prehistoric mines, where they have been discarded (Kern *et al*. 2009). In the so-called 'heathen's rock', a mixture of salt and the deposit of mining activities (torch-wood, tool handles, leather items, carrying bags, *etc*.), the woven fabrics survived in a perfect organic condition. The salt even preserved the colours. Textiles have been recovered from various find spots within the salt mines. The oldest parts are dated via dendrochronology to the Middle Bronze Age. The majority of textiles however date to the Early Iron Age (Hallstatt Period). The fabrics from the find area "*Ostgruppe*" provide much information about the cloth qualities (Grömer 2005, 20-25). There is a variety of different thread counts and different yarn diameters. There are many fine textiles with 10-15 threads/cm, and even finer ones, for example, a basket weave with 40 threads/cm. The yarn diameter is generally medium-fine (*c*. 0.5 mm), but there are coarser and finer ones. The main fibre at Hallstatt is wool, but there are some rare examples of horse hair used as weft for bands. The Early Iron Age textiles come in a variety of different weaves: tabby, basket weave, different twill variants. There are also many different patterns of stripes or checks created during weaving. Spin patterning was very popular and the change of s- and z-spun yarn was applied in more than 50 of the textiles. It was used in tabbies as well as in twills and basket-woven fabrics. Sometimes there are even combinations of spin patterns and colour patterns. Dyestuff analyses demonstrated the use of woad, madder and several unknown yellow and red dyestuffs. There are indications that different dyeing techniques were used: dyeing the fleece, dyeing the yarn or piece-dyeing the woven cloth (Hofmann-de Keijzer 2010).
For the Hallstatt Period, we know products of different loom types, exemplified again by the salt-mine textiles from Hallstatt. There are narrow rep bands, which were probably made with heddle rods or a rigid heddle. Other band weaves are tablet-woven ribbons and broader bands of 8-15 cm in width. The repp bands and tablet-woven borders are patterned: different colours were used to create stripes, checks and even geometric motifs such as triangles, meanders and so on. The loom used in the Hallstatt Period for larger weaves is of the warp-weighted type. This is indicated by the starting borders and numerous loom weights found on Hallstatt settlements and even in graves (cf. Belanová Štolcová and Grömer 2010, 15-17).
Interestingly, most of this textile creativity is mirrored in contemporary grave finds (due to preservation it is impossible to judge the dyes and colour patterns). Thus, the variety of weave types, thread counts and spin patterns can be found in the grave material from Austria (Grömer, forthcoming 2011), as well as the surrounding countries (e.g. Bender Jørgensen 1992; Banck-Burgess 1999; Rast-Eicher 2008). It is noteworthy that there is a distinction between Eastern and Western Hallstatt culture in some details, such as the use of single and plied yarn. At Hochdorf and Hohmichele in Germany (Banck-Burgess 1999, 55-62) we know of textiles with the "flying thread technique" (*Fliegender Faden*). They are dated to the late Hallstatt Period/early La Tène Period.
To sum up, for the Hallstatt period there is evidence of many different cloth qualities with a wide range of different patterns, structures, thread counts and yarn diameters. Some of these textiles could be the products of specialists (for theoretical implications see Grömer 2010, 223-239). This specialised production is also discussed for the contemporaneous textiles from Italy, from the Pre-Etruscan and Etruscan cultures (see Gleba 2008, 193-194).
From *c*. 400 BC onwards, in the La Tène period, changes in textile quality are discernible (Stöllner 2005; Grömer, forthcoming 2011). There are over hundred La Tène period textiles from Austria, mainly from the salt mine on the Dürrnberg near Hallein (Catalogue of K. von Kurzynski in Stöllner 2002; Stöllner 2005) and some from graves. At Dürrnberg, the textiles were embedded in the salt deposit and, similar to Hallstatt, the textiles were preserved in their organic state with bright yellow, red and blue colours.
Although the context and the preservation are very similar in Hallstatt and Dürrnberg, the cloth culture of the latter presents a completely different picture (Fig. 2). The dominant type of weave in the La Tène period is tabby, with twill used less frequently and usually of the 2/1 variety. The more complex weave types like the zig-zag, herringbone or lozenge twill have almost disappeared. Some patterned weaves do exist from Dürrnberg, but not in the numbers known for the Hallstatt period. Spin pattern is not common among the Dürrnberg material. In terms of fibres there appears to be a change from the use of wool as the main fiber to predominantly flax.
Grave material from the Middle and Late La Tène indicates that most fabrics were produced in tabby weave, and there are only a few examples of twill (Belanová 2005). This shift to a common use of tabby is visible also in southern Germany and Switzerland (Rast-Eicher 2008). Generally from the La Tène period

Fig. 1. Textile mosaic from Hallstatt. © Karina Grömer.

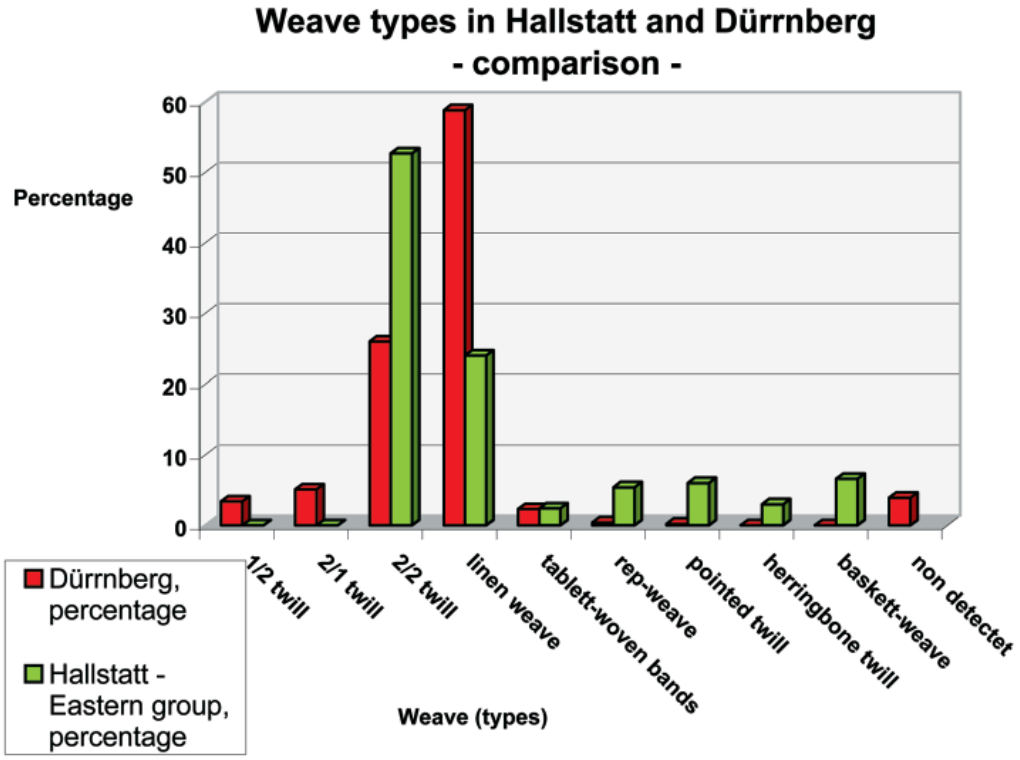

Fig. 2. Statistics about weave types from Hallstatt and Dürrnberg (e.g. Stöllner 2005)

onwards there is a more reduced repertoire of cloth types, but still in good quality. The textiles look standardised with yarn diameters of 0.3-0.6 mm.
If we look at La Tène tools (Belanová Štolcová and Grömer 2010), there is a similar change from the Hallstatt to La Tène period. Hallstatt period spindle whorls are well made tools, they have varied shapes and are heavily decorated, mirroring the creativity of the producer or owner/user. In contrast to these carefully produced Hallstatt whorls, the Middle and Late La Tène whorls appear standardised and are often made of reused potsherds. This kind of "recycling" is an indication that the design was of no interest. The beauty of a tool, the pride in working with it seems to have diminished. The spindles were just intended to be efficient for a maximum output, which is a completely different way to think about the craft. Furthermore, during the La Tène period the number of loom weights found in settlements diminishes compared to the Hallstatt period. It is possible that a two-beam loom or some other loom type without weights was used beside the warp weighted loom. This evidence gives us a hint of the organisation of textile handcraft in the La Tène period. The uniform textiles and the standardisation of tools could be seen in connection with an incipient mass production (serial workshop production) during the La Tène Period (von Kurzynski 1996, 36; Grömer 2010).
In connection to this issue, later written sources are of interest. Livy (Liv. 21,31,8; cited after Timpe 1981, 54) writes, that the Allobroges, a Celtic tribe inhabiting parts of present-day Eastern France (between the Rhone, Isère and Genfersee) supplied textiles to the soldiers of Hannibal during the Second Punic War (218-201 BC). Such a system, to supply goods for the army, requires more than household activity. Production of such a mass of textiles requires more advanced organisation structures.

Cloth Qualities in Roman Austria (15 BC to the 5th century AD)
During the 1st century BC, the Romans added the areas north of the Alps to their empire as the new provinces Noricum, Pannonia, Raetia and Germania. In the archaeological record of Central Europe new types of tools appear in the Roman period: the wool comb and new types of distaffs and spindles (with spindle hooks: Fig. 3). Examples of these tools have been found in Austria, *e.g.*, at the site of Magdalensberg (Gostenčnik 2009, fig. 5 and 7). Those new tools indicate different techniques of preparing the wool and spinning it: with a fine wool comb it is possible to produce a very regular wool fleece, which can be spun into a high quality thread. The spindle hooks

Fig. 3. Spindle hooks from Magdalensberg (e.g. Gostencnik 2009).

suggest a different way of spinning (Fig. 4). Thus, while iconographic evidence from the Iron Age depicts a type of low-whorl spindle where the whorl is fixed on the lower part of the spindle shaft, a spindle hook is used on a high-whorl spindle, as known from the eastern and southern Mediterranean area (e.g. Egypt; Barber 1991, Fig. 2.6 or 2.40), where those tools may have originated. The way of spinning differs between a low-whorl and a high-whorl spindle. The former is turned with the fingers on the top of the spindle shaft, while the latter is rolled along the thigh. This is depicted for a sitting position as well as for a standing one (Barber 1991). Spinning technique, learned by tradition from childhood, is sort of 'embodied knowledge', and would not change (if there is no significant reason). Both techniques produce the same kind of threads. This suggests that the new spinning tool arrived with the people from other parts of the Roman Empire, who settled in the new provinces next to the native populations.
In contrast to this interesting tool evidence the extant Roman period textiles from Austria found in graves and on settlements (Grömer, forthcoming) do not demonstrate many new characteristics. In terms of weave types, the picture is similar to Late La Tène period textiles. Tabby is the main weave type from the 1st to the 4th centuries AD. Sometimes, we found repp and basket weave. Twill is very uncommon and appears mainly in the 5th century AD. The yarn diameter is usually 0.2-0.3 mm, which is on average finer than is known for the Iron Age. There are just a few coarser fabrics. As yarn diameter, the thread count is standardised ranging between 15 and 20 threads/cm. The textiles are of a fine and high quality. The raw material includes both wool and bast fibre, presumably flax.
In terms of patterning there is not much evidence. Unfortunately we do not know of colour patterns from the grave finds, because the textile fragments are mineralised. Spin pattern has almost disappeared. The textiles from settlements like Magdalensberg (Grömer 2009, fig. 1) survived under waterlogged conditions and have darkened in colour (Fig. 5).
There is just one Late Antique textile from Austria with surviving colour. It is a large piece of cloth (45x26 cm) which was kept at the Basilica of Lorch in Enns as wrapping for the relics of St. Florian, who was martyred on the 4th of May AD 304. It is a medium-fine linen tabby with blue stripes, crossing each other (Ubl 1997, 223, Kat.Nr. IV/S-1). The estimated date of the textile (based on the context) is the 5th century AD (not yet proven by ^{14}C-analysis).
Recently, an interesting find came to light from the excavations at the Archaeological Parc Carnuntum. It is a sarcophagus burial of a woman from the Roman municipio (Rauchenwald 2009). On her upper body gold threads and other fibres (maybe silk) were found. Further investigation is necessary on this extraordinary find, but it demonstrates that the highest quality textiles were known in Roman Austria, especially for the Roman upper classes. This differs substantially from the very simple cloth types of the local people in the Danube region which are similar to the Middle and Late La Tène textiles.

Cloth Qualities in Early Medieval Austria (Migration Period, 6th-8th centuries AD)
With the arrival of different tribes and the breakdown of the Roman Empire, the "textile culture" in Austria changes. The Bavarians and Alamans in particular used a rich variety of textiles. Fom Austria the Bavarian cemeteries Rudelsdorf (Hundt 1977) and Schwanenstadt (Hundt 2002) are representative of this phenomen. Beside the simple tabbies, different twill variants reappear, including newly introduced *Rippenköper* and *Kreuzköper*. Spin and other patterns are also found. There is a reappearance of patterning techniques with floating threads, as is known from the Celtic burials like Hochdorf. Early Medieval examples have been found at Rudelsdorf.
Thus, from the 6th century onwards, Austria sees the return of the Iron Age creativity in weave structures

Fig. 4. Low whorl and high whorl spindle and their use (ethnographic exsamples from Bulgaria and Saudi Arabia). © Karina Grömer.

and patterns. Even the textile cloth qualities range in the way seen during the Iron Age. The average yarn diameter is about 0.3-0.5 mm, *e.g.* from Schwanenstadt (Hundt 2002).
A different cloth culture can be recognised among the Avars, who entered Eastern Central Europe from the Asian Steppes in the 6th century AD. Here we find a reduced repertoire of weave types. As exemplified by the Avar graveyard Zwölfaxing (Grömer and Müller 2008), we usually have tabby, seldom basket weave and repp. There is linen tabby and wool cloth of finer quality with 0.2-0.3 mm yarn, with coarser ones with yarn diameters of 0.5-0.8 mm yarn being less frequent. In Zwölfaxing, there is a textile with a pattern made with floating threads.

Conclusions
To conclude, in Hallstatt period Austria there is a very creative textile art with different weaves, patterns and cloth qualities. From the Middle La Tène period on (earlier at the site Dürrnberg), the textiles and even tools become more standardised, indicating mass production or serial workshop production. As mentioned above, the written sources indicate that the Allobroges traded textiles with other tribes as well as with the army of Hannibal in the First Punic War. That means that the mass production in this region did not start with the Roman occupation. Rather, when the Romans came, they found these structures in the organisation of textile handcraft in place and used them.
In Roman times, the cloth culture changes little - there are uniform and easily produced weaves like tabby in standardised, but fine qualities. The period sees an introduction of new tools, perhaps in connection with people arriving from the Mediterranean parts of the Roman Empire. Remarkable are textile finds with gold threads and silk, illustrating the new Roman fashion and extensive trade routes.
After the collapse of the Roman Empire, the variety known in the Iron Age textile culture returns. Especially the Germanic tribes like the Alamans or Bavarians used a wide range of textiles, including a wide range of weaves, twill variants, spin patterns, patterns with floating threads etc.
This quick overview of cloth cultures in Austria demonstrates that the history of textile craft is not just a development from simple weave types to

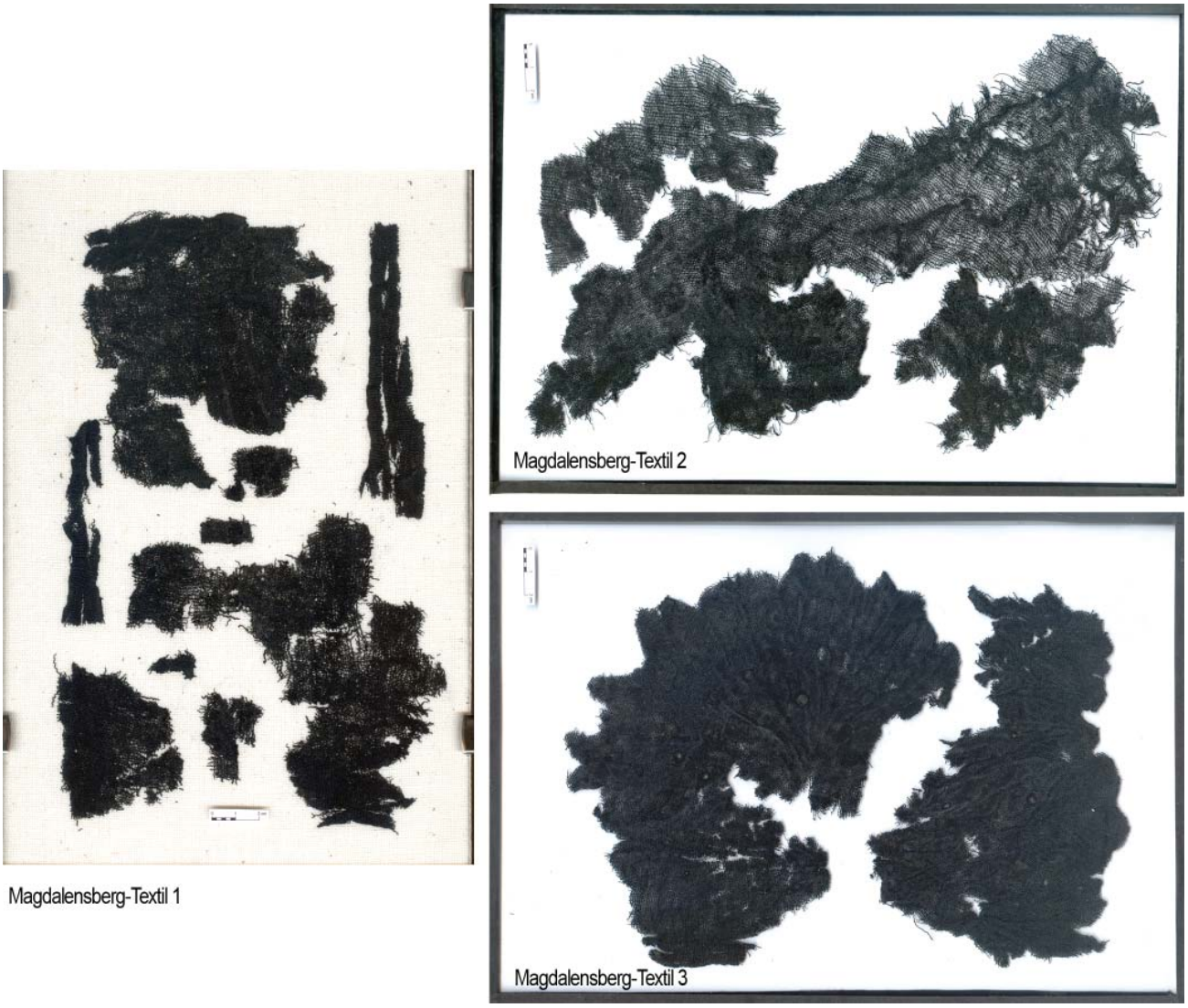

Fig. 5. Textiles from Magdalensberg, Carinthia. © Karina Grömer.

complicated ones. It also follows other dynamics; it is a matter of tradition and innovation, as well as the level of production organisation. It is influenced by the contact between different peoples and cultures. Once the collection of data is completed, the next lines of inquiry will involve the investigation of cloth qualities according to different contexts (graves, settlements, working areas like salt mines) as well as according to gender and age of their wearers (in graves) and according to the function of the objects (clothing, wrappings and shrouds in graves, "recycled" textiles etc.).

Acknowledgements
The Roman period textiles and part of the Migration period textiles were analysed within the framework of the DressID Project, Study Group 3 (Quality) (www.dressid.eu). Fibre analysis of the Austrian material from Roman Period was carried out within the DressID Project by Sylvia Mitschke, Centre for Archaeometry, Reiss-Engelhorn Museen Mannheim.

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Richard Firth

Fulling Agents Supplied to a Fuller's Workshop in Garšana

The aim of this note is twofold. Firstly, it sets down the fulling agents supplied to the workshop of a fuller in Garšana (2032-2026 BC), which was a town in the Umma district of Mesopotamia in the Ur III period. Secondly, it considers the role of these fulling agents within the work of the fuller.

The fulling agents are recorded on the Neo-Sumerian tablets published by Owen and Mayr (2007). Many of the Ur III tablets were not excavated using archaeological procedures and were sold as antiquities and, as a consequence, there is now even doubt about the geographical location of Garšana. Thus, it is most unlikely that the list of records described is complete. Nevertheless, there is a sufficient number of tablets to give a clear indication of the fulling agents used by the fuller of Garšana. The aim of this note is to make this information more readily available to students of ancient textiles.

The Sumerian term for fuller is ^{lú}ázlag, which can be literally translated as 'textile man'. The name of the fuller of interest at Garšana is |PÙ. ŠA|-a-ku-um and his name appears repeatedly in connection with the receipt and dispatch of textiles and with the receipts of fulling agents and equipment for fulling.[1] This particular fuller has been selected from the inscriptions of the Ur III period because of the extent of preservation of the records dealing with his supplies and their lack of ambiguity.

Table 1 is a summary of the 20 records of supplies of fulling agents to |PÙ. ŠA|-a-ku-um. These records extend over the 7 years, from the 6th year of the reign of Šu-Sin to the end of the 3rd year of the reign of Ibbi-Sin (*i.e*. 2032-2026 BC). The dates are given according to the year of the reign of Šu-Sin and his successor, Ibbi-Sin; the Roman numerals record the month.

It is important to emphasise that these impressive quantities of fulling agents were supplied to a single fulling workshop during the course of only 7 years. Furthermore, as already noted, these form only part of the total used because of the nature of the excavation and preservation of these records.

In addition to these agents for fulling, this fuller received reed baskets, a 30 litre trough (CUSAS 3, 595), a hand mill (CUSAS 3, 601) and an eight-runged ladder (CUSAS 3, 808). There were also mid-ribs of palm-fronds, poplar branches, charcoal and wooden planks (CUSAS 3, 779), at least some of which would very probably have been used as fuel.

The next step is to give a brief description of the