

# Creature Comforts at Vindolanda: Two Unique Wool Mats with Knotted Pile

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## ABSTRACT

*Fragments of two robust wool textiles with an unusual knotted blue pile were recovered from a Period I (late Flavian) fort ditch at Vindolanda. Their knotted structure — unknown hitherto in the western Roman provinces and only partially paralleled in the eastern — is discussed, together with questions about their possible production centre and actual function. The Supplementary Material available online (<https://doi.org/10.1017/S0068113X18000259>) contains technical details of the textiles, an investigation of the raw materials and a comparison of the wools used.*

**Keywords:** Roman textile; Vindolanda; sleeping mat; Ghiordes knot; fleece-type; wool; woad

The well-known leaf- and stylus-tablets from the early timber forts at Vindolanda owe their remarkable survival to some moisture-retaining anoxic contexts at the site. Less well known is the collection of over 650 wool textile fragments preserved in the same conditions.<sup>104</sup> Among them is a pair of exceptional items, without precise parallel so far anywhere in the Roman Empire: heavy-weight woollen fabrics embellished on one side by what was once a dense knotted blue pile.

## FINDSPOTS AND DATING

The four larger and four smaller fragments making up our Textile 1 are grouped under inventory nos TT/88/639 and TT/88/644. They were found in 1988 with other rags in the backfilling of the inner ditch of the Period I timber fort, sealed beneath consolidating layers laid down prior to the construction of the Period II *praetorium*.<sup>105</sup> Textile 2 is in two fragments, the larger of which (TT/85/030) was discovered in the same ditch backfilling in 1985, while a small scrap of fabric (TT/85/001/2) of identical character and presumed to be from the same textile turned up in the rubbish which had spilled from an external yard adjoining the Period III *praetorium* on to the surface of the contemporary *via principalis*.<sup>106</sup>

The backfilling of the Period I inner ditch took place in or shortly before A.D. 92, to judge by the local stratigraphic sequence and the dating of a damaged but unused consignment of South Gaulish samian which was jettisoned at the same time.<sup>107</sup> Most fragments of Textiles 1 and 2, therefore, were discarded in or just before A.D. 92, while the scrap of Textile 2 on the Period III *via principalis* may be regarded as a rubbish survival.

## DESCRIPTION OF THE TEXTILES

The fragments were in a parlous state when found: those of Textile 1 in particular were in the final stages of disintegration. The largest piece of Textile 1 measures only 15 cm by 8 cm overall, and that of Textile 2 18 cm by 22 cm. The unusual character of the finds was only recognised after they had already been examined twice, and on the third inspection only because the first writer had just encountered some much better-preserved pile

<sup>104</sup> Wild 1993.

<sup>105</sup> R.E. Birley 1994, 18, fig. 6 (section), 41, fig. 19 (plan), 19–25; 2009, 51.

<sup>106</sup> R.E. Birley 1994, 86.

<sup>107</sup> R.E. Birley 1994, 24; A.R. Birley 2009, 267. We have benefited from the advice of G.B. Dannell on the dating of the samian.

fabrics at the port of Berenike in the opposite corner of the Roman Empire — but those were of cotton and imported from India (see below).



FIG. 7. Selvedge zone of Textile 1 (TT/88/639/001) showing groups of thinner and thicker plied warp threads. (Photo by J.C. Batcher)

Textile 1, now uniformly dark brown (FIG. 7, ONLINE FIG. 1), has warp of 2-ply wool yarn, plied in S-direction (i.e. with a clockwise twist of the spindle) from Z-spun yarns (anti-clockwise twist) (for full technical details and analytical reports see online Supplementary Material).<sup>108</sup> Alternate warp threads are thick and thin, with a combined count of 5–6 threads per cm (FIG. 7). Pairs of Z-spun single yarns were used for the weft, at about 2 pairs per cm. Part of the original, structurally simple, selvedge survives (FIG. 8): in the selvedge zone there is a planned sequence of thick and thin warp threads. Reading from the outer edge there are 8 thick, 8 thin, 4 thick, 4 (or on another reckoning 3) thin threads, and then the ground weave in which single thick and thin warp yarns alternate.

The pile covering the ground weave (on one side only) is formed of rows of individual symmetrical ('Ghiordes') knots (FIGS 8 and 9). Each knot is anchored by two adjacent thin warp threads (i.e. the thick warp thread between them is ignored). One shot of plain paired weft separates the rows of knots, while the knots of each successive row clasp the same two thin warp threads as their predecessors. The pile consists of pairs of weak Z-spun yarn and in one place still projects *c.* 13 mm from the cloth surface.

Textile 2 shows a marked family resemblance to Textile 1, but there are a few differences (FIG. 10). As in Textile 1, there are two types of 2-ply warp thread in Textile 2, one thick, the other comparatively thin (combined count *c.* 8–9 threads per cm); but the thick warp is light-brown in colour, the thin warp visibly darker. The weft in Textile 2 is soft brown 3-ply yarn (*c.* 3 threads per cm) rather than a pair of 2-ply yarns. The selvedge zone, free of pile, exhibits a sequence (counting inwards) of 8 dark (thin) warp threads, 8 light (thick), 4 dark, 7 light, and thereafter dark- and light-brown warp threads alternate in the ground weave (FIG. 11). As in Textile 1, the pile knots clasp adjacent pairs of the thinner, dark-brown warp system, but the knots themselves incorporate 6 single weak Z-spun yarns (possibly once 3 pairs) and not just one pair. The visible colour-contrasts in the bare warp stripes close to the selvedge are augmented by a parallel stripe formed of dark-brown pile at the edge of the ground weave, standing out from the rest of the light-coloured pile. Today, the fabric is almost literally threadbare on both sides (FIG. 12).

<sup>108</sup> Wild and Walton Rogers 2007.



FIG. 8. Diagram of selvedge and knotted pile structure of Textile 1, showing overall structural scheme (above) and detail of Ghiordes knots (below). Thicker vertical lines represent dark warp threads, thinner lines light warp threads.  
(*Drawn by J.P. Wild*)



FIG. 9. Remains of rows of Ghiordes knots in Textile 1 (TT/88/639/001), each clasping two warp threads of one warp sheet. (*Photo by J.C. Batcheller*)



FIG. 10. Textile 2 (TT/85/030/001) showing selvedge on left-hand side. Warp runs vertically. (Photo by J.P. Wild)

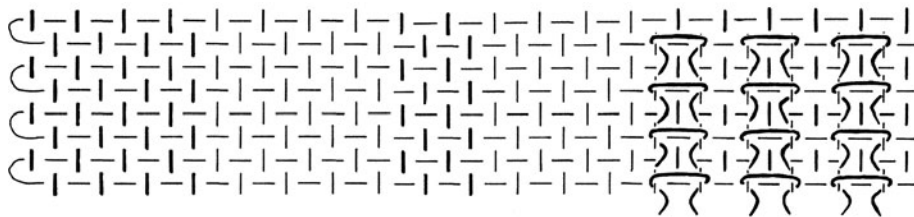


FIG. 11. Diagram of selvedge and knotted pile structure of Textile 2. Thicker vertical lines represent dark warp threads (warp A), thinner lines light warp threads (warp B). (Drawn by J.P. Wild)

#### FIBRES AND DYES

Examination of the wool fibre types and residual dyestuffs was undertaken for Textile 1, and of the wool fibres alone for Textile 2 (see online Supplementary Material).<sup>109</sup> In Textile 1 the wool used for the thick warp and the paired weft yarns can be defined as of Hairy type according to M.L. Ryder's standard classification.<sup>110</sup> These wools, often termed 'carpet wools' in the textile trade, contain a high proportion of coarse fibres or 'hairs'. The thin warp is of Hairy Medium type and the pile yarn of Medium wool. These two are hard-wearing wools and the long fibres of the Medium type are particularly resistant to felting. With regard to fleece colour, only the weft has any natural pigmentation, giving it a mottled brown and white effect, although this would have been invisible beneath the warp and the pile. All the

<sup>109</sup> Wild and Walton Rogers 2007.

<sup>110</sup> Ryder 1983, 45–9; Walton Rogers 1995, 400.



FIG. 12. Detail of Textile 2 (TT/85/030/001) showing extent of wear. (Photo by J.P. Wild)

wool of the warp had come from white fleeces; but the pile was dyed blue, the detectable component being indigotin, which indicates woad or indigo as the dyestuff. The alternating stripes of thick and thin warp in the narrow selvedge zone were not dyed, but relied for decorative effect on their contrasting textures; they may also have helped the edge to lie flat.

The warp of Textile 2 was all of Hairy Medium wool, while the weft was of a borderline type between Generalised Medium and Semi-Fine: the pile was of Generalised Medium wool. The Generalised Medium and Semi-Fine are softer, finer wools than the hairier types and more prone to felting. Textile 2 would therefore have felt quite different to the touch from Textile 1 and would have had less resistance to wear. Although no dye analysis was possible for Textile 2, there were indications under the microscope that its dominant pile was a pale colour and may also have been blue. The darker thinner warp in the selvedge zone showed up as possibly red.

Whatever their function may have been (see below), these two robust fabrics would have caught the eye with their blue pile and striped borders. To gain a tangible sense of their character and properties, Caroline Thomson has woven a replica of Textile 1, copying so far as was practical the wool types, dyestuff and production methodology of the original (ONLINE FIG. 2).<sup>111</sup> She assumed, quite reasonably, that the original was rectangular in shape and may have ended in warp fringes, but it is uncertain how large the object actually was. The exercise has reinforced the conclusion that the two fabrics were in every sense outstanding textiles, which must have been prized possessions.

<sup>111</sup> Thomson 2013; the cut pile on the unworn replica mat has curled back upon itself, giving the misleading visual impression of being looped.

## KNOTTED PILE FABRICS IN THE ROMAN WORLD AND BEYOND

The distinguishing feature of the two textiles and hence the starting point for discussion of their broader significance is the symmetrical — traditionally termed ‘Ghiordes’ — knots. Today, and arguably in antiquity, the weaver creates the knots in a continuous series on a vertical loom by inserting the end of a separate pile yarn between two warp threads, around them and out again — at which point the pile yarn is severed, with a knife, leaving the knot ends standing proud of the surface. Only autopsy, or possibly a video in slow motion, can capture for the modern observer exactly what the weaver is doing.<sup>112</sup>

The enhancement of a fabric’s surface by the addition of pile knots was an art already known in Europe before the end of the Neolithic. The weaver of a lime-bast textile from Zürich-Mythenschloss, dated by dendrochronology to 2,680 B.C., inserted rows of Ghiordes knots made of untwisted lengths of lime bast.<sup>113</sup> Much more widespread, however, was the insertion of pile into finished cloth with the aid of a needle, as in the bast-fibre hats from Neolithic Switzerland and wool caps from the Bronze Age of North Germany. Pile continued to be made in this way well into the Middle Ages in northern Europe.<sup>114</sup> The Vindolanda textiles by contrast owe their pile to the weaver(s) inserting knots from a continuously spun yarn while the cloth was being woven on the (vertical) loom. No needle was used for the insertion, only fingers, as in modern craft and ethnographic practice. The Vindolanda fabrics are so far without parallel in the western Roman provinces.

By contrast knotted pile is a regular feature of the textile culture of the eastern Roman provinces and of vast swathes of contemporary western and central Asia (FIG. 13).<sup>115</sup> The most famous artefact which exemplifies the eastern tradition of knotted pile is the so-called ‘carpet’ from Pazyryk in the Altai mountains, radiocarbon dated to 328–200 B.C. and patterned with symmetrical Ghiordes knots.<sup>116</sup> Exploration of Han-period sites around the Tarim Basin in north-west China unearthed numerous scraps of polychrome wool carpets, exhibiting a variety of knot-types.<sup>117</sup> A group of similar finds made by a Japanese team in the At-Tar burial caves near Kerbala in Mesopotamia, disputed territory between Rome and Parthia, provided the incentive to map the distribution of ancient knot-types (FIG. 13).<sup>118</sup> While the symmetrical Ghiordes knot is almost universal among western and central Asian weavers, other, asymmetrical, forms tend to be preferred by Roman weavers.

In Roman Syria and in Central Asia weavers inserted their knots around adjacent warp threads of the complete warp sheet as set up on the loom, while those in the Nile Valley added the knots after a shed had been opened dividing the warp into two sheets, back and front. This meant that they skipped the warp threads of the rear system, as did the weavers of the Vindolanda fabrics.<sup>119</sup>

## PLACE OF PRODUCTION

Where were the Vindolanda knotted-pile textiles woven? With the exception of Vindolanda, no sites in the Roman Empire west of the Nile Valley have yielded textiles with Ghiordes knots, so far as we are aware. The Z-spin of the yarns in the two Vindolanda pieces is characteristic of the western rather than the eastern Roman provinces, a feature that is fundamental.<sup>120</sup> Britain seems unlikely, since the Hairy wool used for warp and

<sup>112</sup> Tattersall 1949; for a demonstration see for example: [www.youtube.com/watch?v=6vDodWi9kiE](http://www.youtube.com/watch?v=6vDodWi9kiE) (Accessed 10.10.16)

<sup>113</sup> Rast-Eicher 1992, 57 Abb. 1–2, 58 Abb. 3, 60 Abb. 7; Rast-Eicher and Dietrich 2015, 116 Abb. 288 (reconstruction), 117–18, 159 Kat. Nr. 1001, Taf. 107. Dr Rast-Eicher very kindly discussed this piece with us; for the only parallel so far see Cardon 1998, 15, fig. 19, 16.

<sup>114</sup> Wild and Walton Rogers 2007, 72 (with literature); Rast-Eicher 2015, 22, Abb. 10.

<sup>115</sup> Wild and Walton Rogers 2007, 72–3.

<sup>116</sup> Barkova 1999; Rudenko 1970, 298–304, figs 141–5, pls 174–5.

<sup>117</sup> e.g. Stein 1921, 250, 433, 438, 445, 711, pls XXXVII, XLIX; Iyer 2015.

<sup>118</sup> Sakamoto 1985; Wild and Walton Rogers 2007, 72–3.

<sup>119</sup> Wild and Walton Rogers 2007, 73.

<sup>120</sup> Wild 1970, 38; 2002, 10.

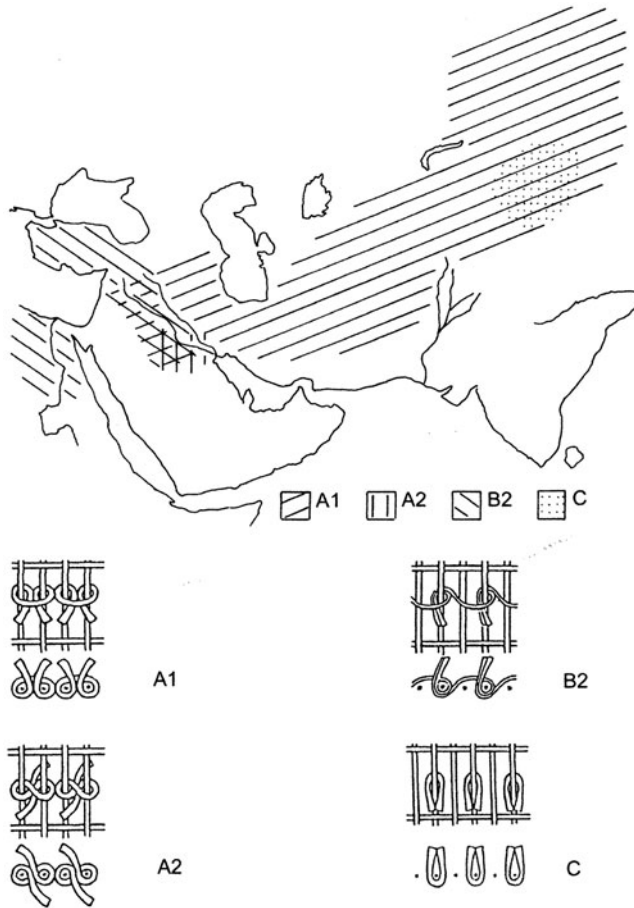


FIG. 13. Distribution map of types of pile knot in the ancient world. Type A1 is Ghiordes knot. (Drawn by J.P. Wild, after Sakamoto 1985)

weft in Textile 1 has not so far been recorded in Britain before the Viking period.<sup>121</sup> The dyestuff is not diagnostic, for woad is a common source of blue dye throughout the Roman world and, in any case, its chemical signature cannot be distinguished from that of the indigo species which have an eastern habitat.<sup>122</sup> One day stable isotope analysis may give more positive indicators of where the sheep roamed that gave the wools; but for the present, *faut de mieux*, one can merely glance at the possibilities.

It is obvious from their condition that the textiles were far from new when they reached Vindolanda, in c. A.D. 85 at the earliest. (That they were still complete objects at that date is only an assumption.) Manufacture within the Claudio-Neronian period, however, seems probable. Their final owner is likely to have been a member — arguably an officer — of the First Cohort of Tungrians who were in garrison at Vindolanda in Period I and the earlier phase of Period II.<sup>123</sup> They might have been acquired in the Tungrian homeland in the Maas Valley.<sup>124</sup>

<sup>121</sup> Wild and Walton Rogers 2007, 77–8.

<sup>122</sup> Cardon 2003, 259–60.

<sup>123</sup> A.R. Birley *et al.* 2013, 287–300, esp. 291–3.

<sup>124</sup> *Tab. Vindol.* II, 254 (Period III) has been thought to refer to clothing acquired in Gaul for the fort garrison; but the wording is not explicit. We are grateful to Professor A.R. Birley for discussing this document with us.



FIG. 14. Detail of cotton mat with knotted pile from Berenike (BE99 1597). (Photo by J.P. Wild)

Admittedly, that is not a very likely production centre for such sophisticated textiles, so somewhere else in Gaul might be preferred. There is always the possibility, however, that a migrant craftsman, skilled in the weaving of knotted pile fabrics and with the incentive of a discerning military-led market for exotica adapted his methodology to locally available yarns. The putative East Mediterranean potter responsible for the exotic lead-glazed wares at the legionary works-depot at Holt might be a parallel.<sup>125</sup> For the moment, however, all this must remain speculation.

<sup>125</sup> Greene 1977, 124.





FIG. 15. Replica by Lena Hammarlund of knotted pile mat from Berenike. (Photo by J.P. Wild)

#### FUNCTION OF THE TEXTILES

The final, and in some respects the most obvious, question to ask is: what was the function of Textiles 1 and 2? The heavy-duty textiles with Ghiordes knots found at the Roman Red Sea port of Berenike have been mentioned already and they may offer a clue to the answer. They were entirely of cotton, undyed and, to judge by their structural and material characteristics, they were made in India (FIG. 14).<sup>126</sup> They were the private possessions of the Indian sailors who crewed the vessels trading across the Indian Ocean and (we have argued) served them as on-board sleeping-mats — handy, too, when their owners were resident in Berenike.<sup>127</sup> Replicas of these textiles have been woven by Lena Hammarlund and these add plausibility to the hypothesis (FIG. 15). The excavators of the second- to third-century burials in the At-tar caves in Mesopotamia recorded corpses laid to rest on knotted-pile ‘carpets’,<sup>128</sup> while the same practice has been observed in high-status early medieval graves at Qasr Ibrim in Lower Nubia.<sup>129</sup> Evidence from the West is meagre: but when the Boudiccan rebels burnt Colchester, they destroyed a mattress which lay on the floor in a former barrack room occupied (it is presumed) by a legionary veteran. It had a diamond twill cover in wool and some kind of stuffing.<sup>130</sup> While it had no pile, it seems probable that the veteran slept on it.

In its ultimate threadbare state, however, Textile 2 would hardly have offset the discomfort of a hard bed. The knots had been worn down to the point of vanishing (FIG. 12). One wonders: had they actually been trodden underfoot? Floor mats *per se* are not attested in the Roman period — but could that have been the fate of Textile 2?

<sup>126</sup> Wild 2013, 74–85.

<sup>127</sup> Wild and Walton Rogers 2007, 73–4; Wild 2013, 83.

<sup>128</sup> Fujii *et al.* 1989, 128; Ogawa and Naruse 1976, 127, pls 198–9.

<sup>129</sup> Crowfoot and Adams 2011, 13, 17.

<sup>130</sup> Crummy 1984, 42–7.

## SUPPLEMENTARY MATERIAL: CONTENTS

For supplementary material for this article please visit <https://doi.org/10.1017/S0068113X18000259>

Note: the Supplementary Material includes ONLINE FIGS 1–2 and ONLINE TABLES 1–2.

APPENDIX 1: Technical description of Textile 1 (TT/88/639 with TT/88/644) *By* John Peter Wild

APPENDIX 2: Investigation of the raw materials of Textile 1 *By* Penelope Walton Rogers

APPENDIX 3: Technical description of Textile 2 (TT/85/020 with TT/85/055/001/2) *By* John Peter Wild

APPENDIX 4: Wool used in TT/85/030/001-002 compared with TT/88/639 *By* Penelope Walton Rogers and Isabella von Holstein

Bibliography

Supplementary illustrations

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