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Editorial

The long-established Textile Museum at Neumünster in North Germany closed its doors for the last time at the end of December 2001, as Klaus Tidow, its Director, reports below. The Museum was born out of the immense enthusiasm among local people for documenting in a tangible form the textile past of their town, and under its first director, Karl Schlabow, it became internationally renowned as a centre for the study, reconstruction and publication of Schleswig-Holstein's rich corpus of archaeological textile finds, an academic role continued to the present day. Its demise is a tragedy. Plans for a new all-embracing industrial museum on a new site near the town centre are being prepared, but lack of finance means that no firm date can be set for building to start.

The Textile Museum was the home of the North-European Symposium for Archaeological Textiles, founded by Klaus Tidow and Lise Bender Jørgensen in 1981. NESAT became peripatetic; but its library remained in Neumünster. The library has been moved to the University of Freiburg in South Germany (*ATN* 28,29) into the care of Johanna Banck-Burgess, who is currently preparing an on-line catalogue of its contents. Additions - particularly offprints or copies of articles not easily accessible - would be welcomed (Institut für Vor- und Frühgeschichte, Belfortstr. 22, D-79098 Freiburg im Breisgau).

The lack of a central clearing bank in the Eurozone means that hopes that cheques drawn in euros could be sent across national boundaries without charge have been dashed - or at least this *appears* to be the situation. So far, cheques in euros arriving for *ATN* seem to have incurred no extra charges in the UK. Nonetheless, only euros given or sent as notes appear to be really trouble-free.

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Cover: Roman Matron at the 'Clothed Body' Conference (Photo: Lise Bender Jørgensen)

Features

Predynastic Textiles from Egypt: A Reassessment

Introduction

The Predynastic period in Egypt has yielded significant quantities of textile material from burial grounds and settlement sites.

The majority of these sites were excavated during the late 19th and early 20th centuries, but despite the good conditions for preservation afforded by the shallow pit graves in the hot, dry, desert environment, the textile remains were generally inadequately studied and recorded.

The Predynastic is the period before the formation of a unified state under one ruler, and spans from *c.*5500 BC to *c.*3050 BC. The period was divided into 3 main phases based on the seriation of grave goods by Sir William Matthew Flinders Petrie at the beginning of the 20th century. These divisions, Amratian (Early Predynastic), Gerzean (Middle Predynastic), and Semainean (Late Predynastic/Protodynastic) have been further refined and are more commonly referred to as Naqada I, II, III, with subdivisions within each (Kaiser 1957, 69-77, pls. 15-24). The Fayum and the early phases of the Badarian culture predate the Naqada culture.

Petrie and others distributed small samples of textiles from excavations to various museums in the United Kingdom, and it is mainly from published reports of these and a few accessible pieces in museums that our somewhat sketchy and sometimes contradictory evidence on Predynastic textiles is gleaned.

Early Studies

Microscopic analysis of Predynastic textiles from many of these sites was carried out by W. W. Midgley, the first curator of the Chadwick Museum in Bolton, in the early 20th century, and continued by his son Thomas, curator of the Bolton Museum until 1934. The work appears to have been effected with great skill, and the published photomicrographs are admirable for the time (Midgley 1915, pls. LVII, LVIII; Midgley 1928, pls. LIX, LX).

However, the analyses were carried out before the introduction of modern techniques of microscopy such as phase contrast, differential interference contrast (DIC) and electron microscopy, and the Midgleys' identification of the fibres remains inconclusive.

W. Midgley identified all of the Predynastic textiles from Gerzeh as 'rhamie' (Midgley 1912, 6; 1915, 50, Pl. LVIII.1). Although T. Midgley initially noted that the early, mid- and late Predynastic textiles from Qau and Badari were 'linen', he subsequently cast doubt upon this identification, stating that the Badari material 'is not made of flax' (Midgley 1928, 67). Finally he proposed that the fibre from this and other Predynastic (as well as some Dynastic) sites was 'hemp' (Midgley 1937, 145). This has resulted in continuing uncertainty in the literature about the types of vegetable fibres used in Predynastic textiles.

Flax and hemp, both members of the bast family, are difficult to distinguish from each other even with modern microscopic equipment because of their similar morphology. Other tests such as the 'drying twist test' (Newman, Riddell 1954), staining tests and preparation of cross sections are not always possible to apply to brittle, desiccated archaeological textiles, so that it is not surprising that difficulties in identification were encountered.

Thread counts, some thread diameters and details of weave are noted by both analysts, but not the direction of the spin of the yarns.

The oldest preserved example of woven linen from ancient Egypt comes from the Neolithic settlement site of the Fayum (*c.*5000 BC) (Caton Thompson, Gardner 1934, 46, pl.XXVIII,3) (Petrie Museum of Egyptian Archaeology UC 2943, British Museum EA 5875, Bolton Museum 56.26.109). The textile is loosely woven from z-twisted, S-plied yarns (see below). This is in the opposite direction to the single, s-spun yarns and s-spun, 2 S-plied yarns typical of Dynastic Egyptian weaves for 3000 years and beyond. The observation has been made that the early yarns were non-spindle yarns, made by rolling the fibre first in one direction and then combining two yarns together in the

other. It is proposed that the change from 'plied' yarns took place at some time around the end of the Early Predynastic and the beginning of the Late (Granger-Taylor 1998).

The textiles from Naga-ed-Dêr (Naqada IIa-b, *c.*3500 BC) are possibly the best documented of all Predynastic material. (Lythgoe 1965). Published some 60 years after the original excavations from field notes by Lythgoe and anatomical notes by Dr Grafton Elliot Smith, the exact position of the textiles as found on the bodies in the 634 excavated graves is described. A pattern emerges of bodies contracted in foetal position, wrapped from head to foot in two or more qualities of a large fringed textile (referred to as 'garments') with the inner layers generally finer than the outer. Some bodies were further wrapped in animal hides or pelts. The males were buried wearing penis sheaths either of textile or animal hide, with remnants of ties, cords or thongs wrapped around the waist. Some had an apron-like 'shield' in front of the sheath, and remnants of textile 'kilts' are reported. The sheaths or 'protective pouches' are well documented and photographed; perhaps this is not surprising in the light of what we have since learned of Dr Elliot Smith's predilection for collecting that particular part of the human anatomy!

Unfortunately, no technical analysis of the textiles appears to have been carried out. All of the 'garments' are described as linen, with one cabled cord described as being of hemp. The description of the weaves is limited to 'fine', 'medium coarse' and 'coarse' and no thread counts or spin directions are given. It is possible to establish from some of the photographs that the textiles comprise s-spun, mostly single yarns, with some s2S-plied yarns.

The use of large quantities of textiles in the funerary context suggests that it must have already been a well-established industry during the Predynastic period, but many important questions regarding the development and technology of textile production during this early period still remain unanswered.

Precisely at which stage did the change from z- to s-spun yarns take place in Predynastic Egypt? Was the early direction of spin influenced by other cultures, where 'Z' spinning predominated? Or do the Predynastic z-twisted yarns represent a developmental stage in technology, before it was observed that the woven textile is stronger if the fibre is spun in the direction of its natural rotation, i.e., in the 'S' direction? And what is the predominant vegetable fibre used in Predynastic textiles?

Current Textile Research at Predynastic Sites

Abydos

During the 1999-2000 excavation season at Abydos by the Deutsches Archäologisches Institut Kairo (DAIK) under the direction of Dr Günter Dreyer, study began on the textiles from the Predynastic Cemetery U and the Early Dynastic royal tombs on the Umm el-Qaab (Jones 2002). The vast Predynastic Cemetery spreads southwards towards the tombs of the first kings of Egypt, and suggests unbroken use by the élite from the Early Predynastic (Naqada I) period. Unfortunately, conditions for preservation of organic remains such as textiles and matting are poor, and only three textiles were available for study from Cemetery U. However, they provide evidence for a range of techniques in the development of spinning and weaving from the early Predynastic period to its end.

Traditional technical analysis of thread count, spin, and weave was facilitated by using a stereomicroscope (6.3x to 60x magnification) and identification of the fibres was achieved by light microscopy at higher magnification. Despite the obvious limitations imposed by working in the field - one cannot take advantage of the scanning electron microscope (SEM)! - the stereomicroscope provided information on the condition of the fibre, and the presence of resins, pigments and salts that would not have been visible to the naked eye. The insertion of a calibrated grid graticule in the eyepiece made it possible to assess the thread count in areas smaller than 1.0cm, and a linear graticule facilitated the recording of the diameters of extremely fine threads. The results were entered into a database, with accompanying photomicrographs.

A textile wrapped around a lump of raw

malachite, held in the left hand of an imposingly tall male in a well-provisioned, intact burial in Cemetery U dated to Naqada Id (*c.*3600 BC) (Hartung 2000) provides the only comparison to the much earlier Fayum weave known to the writer. It is probable however that the yarn of the early Badarian textiles in the Bolton Museum described as 'plied' was prepared in the same way (Midgley 1928, 65).

The component yarns are also z-twisted and S-plied throughout (z2S), but the Abydos textile is finer and more evenly woven. It is a plain weave, with a thread count of 18 x 18 per cm^2; the threads have a mean diameter of 0.25mm and a maximum of 0.5mm (Fig.1). The Fayum textile has an average thread count of 10 x 12 per cm^2, and the diameter of the threads varies from 0.75 mm to 0.9mm, with marked variation within the one yarn. The angle of twist in both textiles is loose.

The inclusion of malachite (copper oxide) amongst the grave goods is not unusual in Predynastic burials. It is the source of green eyepaint, and is often enclosed in small textile or leather bags and sometimes accompanied by the slate cosmetic palettes and stones used to grind it. An intricately woven fragment of textile found in the multi-chambered, élite tomb U-j dating to Naqada III (3250 BC) also suggests such a function.

The fragment is gently curved, and on the concave, underneath side traces of malachite embedded in the threads are visible at low magnification (20x) (Fig.2). It is woven of very tightly plied and cabled threads, in 3 different colours: dark red, dark brown, and a light, natural flax colour. A continuous, diamond-shaped pattern is formed by a system of tightly packed, floating dark red weft threads; these rows alternate with a similar pattern executed in the light colour. The warp threads consist of 3 s-spun, 2S-plied threads very tightly cabled together (sS2[Z]3) from the dark brown fibre, with occasional threads cabled in a combination of light and brown. The thread count is 6 x 14 per cm^2; the diameter of the warp ranges from 0.9mm to 1.0mm. The natural-coloured cabled weft threads range from 0.5mm to 0.65mm, and the red are a uniform 0.75mm; the angle of twist is medium to tight.

Although the use of fugitive mineral-based dyes is reported in some Predynastic textiles, (Midgley 1928, 64) there are very few extant examples of coloured cloth before the Middle Kingdom (*c.*2000 BC). The colours in the fragment from tomb U-j were assessed visually; under microscopic examination the dark red threads clearly show granules of iron oxide adhering to pale coloured fibres. It has not yet been determined whether the dark brown threads were also dyed, or whether the colour is inherent to the fibre.

Large numbers of inscribed ivory tags, which had probably been attached to bolts of cloth stored in wooden boxes, were found in another chamber of tomb U-j. Some of these were stained in shades of red, brown and green, suggesting that they had been in contact with coloured textiles (Dreyer 1998).

This unique textile is a fitting inclusion in a Predynastic king's tomb; we can only wonder at the other textiles that were placed there as part of his equipment for the afterlife.

The third textile from the same cemetery, comprising 9 fragments of a pale golden-brown, plain, open weave from Tomb U-w is dated to Naqada IIIa-b (*c.*3050 BC). The thread count is 26 x 13 per cm^2, a ratio of 2:1, which anticipates Early Dynastic linen, as opposed to the ratio of 1:1 more common during the early-mid Predynastic. The yarns are single, s-spun, with some 2-plied threads; spliced joins are visible. The average diameter of both the plied and single threads is 0.3mm, and the angle of spin is medium.

The fibres of the three textiles have been identified as flax, by microscopic examination at 165x magnification in polarised light (Fig.4). The ultimate fibres appear as long, cylindrical tubes with a narrow central lumen (canal) with characteristic transverse dislocations (or nodes) forming an 'X' at intervals along the length of the fibre (The Textile Institute 1975, fig.55).

Hierakonpolis

The mid-Predynastic cemetery HK43 (Naqada IIa-b, *c.*3500 BC) at Hierakonpolis,

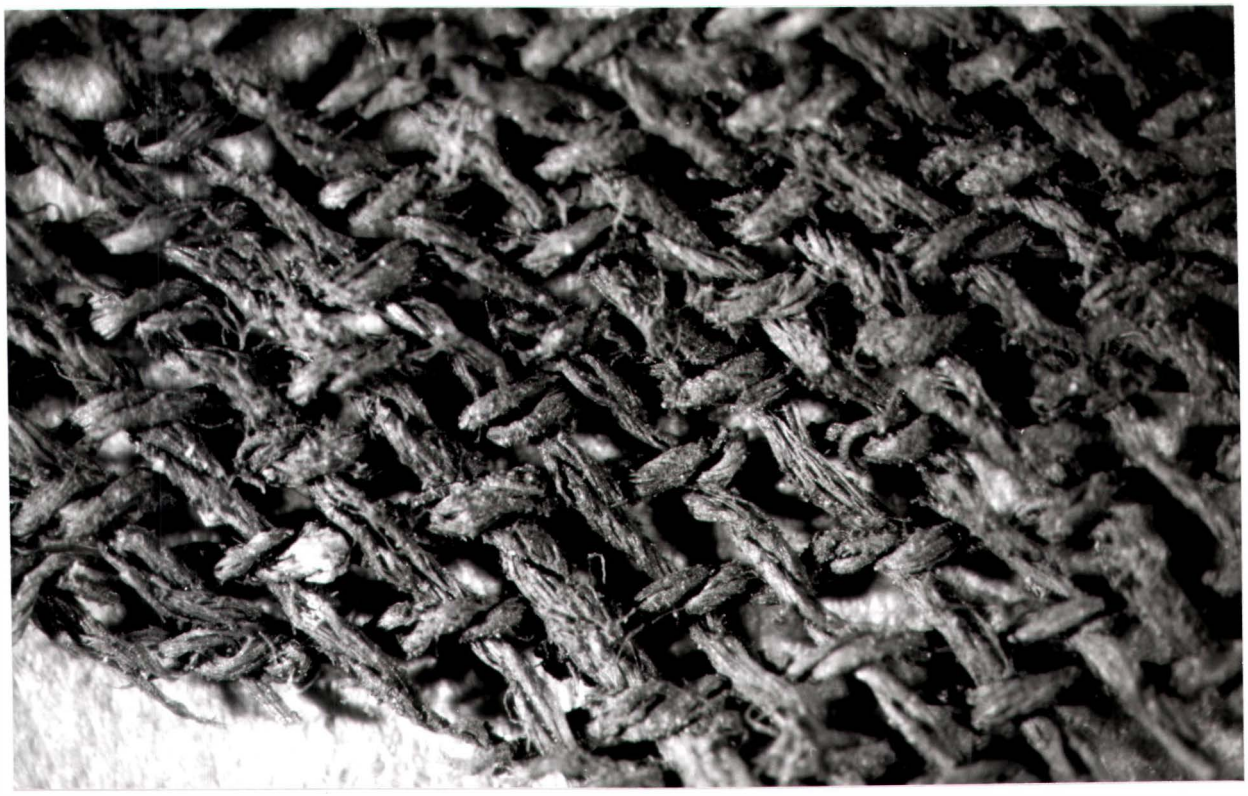

Fig.1 Z-spun, S-plied yarns in textile wrapped around malachite. Abydos, c.3600 B.C. Photomicrograph 20x (J. Jones)

and the slightly earlier settlement site HK11 is currently under excavation under the direction of Dr Renée Friedman, Heagy Research Curator, British Museum (Friedman *et al.* 1999).

Analysis of the textiles during the 2001 season has provided intriguing information on the manner in which the 'working class' were bound in resin-impregnated linen bandages almost 1000 years before the practice of artificial mummification is thought to have commenced, and potentially valuable evidence for the development of 'S' spinning (Jones 2001).

The cemetery at Hierakonpolis is contemporary with Naga-ed-Dêr, although the graves belong to less prosperous inhabitants and organic preservation is poorer. So far there is no evidence of the penis sheaths found at the latter site, and only the back of the heads, neck and hands of women were wrapped in multiple layers of bandages over 10cm thick, and the bodies then swathed in linen shrouds. The thick layers of bandages had been heavily saturated with resins, visible with the stereomicroscope at magnifications of 25x to 40x. The resin has not yet been identified.

The layers of resin-impregnated textiles are extremely fragile, dark brown, completely desiccated and powdery (Fig.3). The outer structure of the textiles appears intact, but when attempts were made to separate the fibres for slide preparation for identification by light microscopy, it was found that the internal structure of the fibre had completely disintegrated. The microstructure had disappeared, and only a brown sludge remained when glycerine was applied and the yarn teased to separate the ultimate fibres.

Similar difficulties in sample preparation are reported by T. Midgley (Midgley 1928, 67) and it would be interesting to ascertain whether the early Badarian textiles also contained resin. Seven bodies with heads wrapped in cloth and one male with a 'pad'

Fig.2 Cabled threads embedded with residue of malachite; note red mineral-based dye. Abydos, c.3250 B.C. Photomicrograph 20x (J. Jones)

Fig.3 Desiccated, resin-impregnated textile, with sand encrustation. HK 43, c.3500 B.C. Epi-darkfield photomicrograph 27x (R. Oldfield)

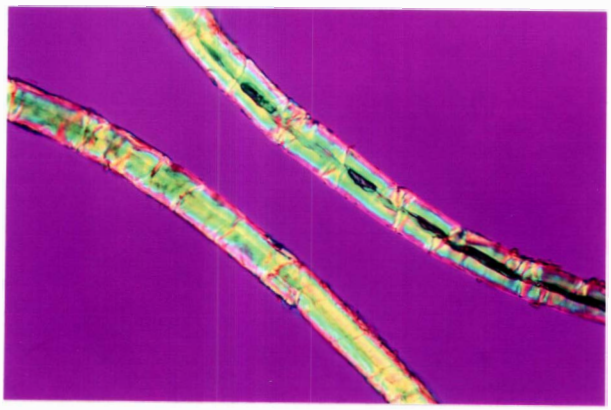

Fig.4 Flax ultimate fibre, with fine central lumen and dislocations characteristic of flax. Abydos, c.3600 B.C. Photomicrograph with crossed polars, and 1λ plate 360x (R. Oldfield)

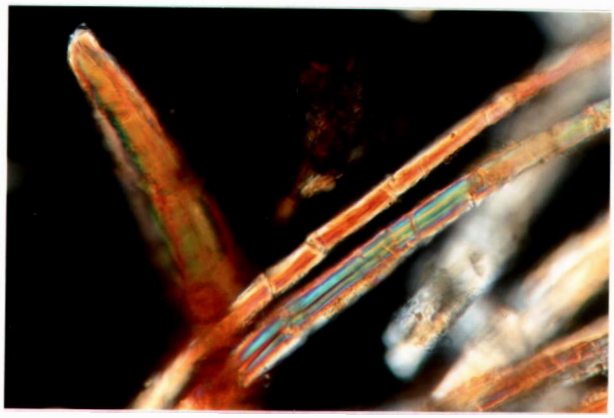

Fig.5 Flax ultimate fibre. Note dislodged pieces of resin. HK 43, c.3500 B.C. Photomicrograph with crossed polars 360x (R. Oldfield)

of cloth at his hands were reported in the early cemetery at Badari (Brunton, Caton Thompson 1928, 19) but no mention is made of the presence of resins by the excavators.

The fragments of outer shrouds from HK43 had only patches of resin, and examination of fibres from the cleaner areas in brightfield and crossed polars at high magnification established that the fibre used in the production of these textiles was flax (Fig.5).

The textiles are surprisingly fine, although some allowance must be made for shrinkage of the outer cellulose layer of the fibre and the difficulty in taking multiple thread counts in such highly degraded specimens. The finer textiles have generally been wrapped directly against the body and the coarser in the outer layers, in the same sequence observed by the writer in the Dynasty I (*c.*3000 BC) royal burials at Abydos. Remnants of weft fringe were found in one burial.

The thread counts range from approximately 18 x 25 per cm^2 to 21 x 25 per cm^2, and thread diameters from 0.15 to 0.3mm. There appear to be two main densities in a plain weave: a fine, loose, open 'gauze'-like weave and a tight, slightly coarser weave. The occasional double laid threads appear to be the only weaving faults. All of the yarns examined are single, s-spun, with a few s2S plied threads, with loose to tight angles of spin.

The condition of the textiles makes it difficult to assess whether they were new or reused household materials, nor was it possible to see the method of joining of the yarns. It is hoped that further finds will be made during the 2002 season which include more of the clean outer shroud.

Spindle whorls and fragments of textile and spun yarn were found amongst evidence of household activities in the outbuildings of a large farm (HK11), of slightly earlier date than the cemetery (Wattrell 2000). The level of organic preservation is extremely good, although some potentially interesting pieces of textile are firmly embedded in animal dung!

Of the two examples of yarn, one was plied s2S, and the other in the manner of the Fayum and Abydos textiles - z2S. When a fragment of loosely woven linen was found which was produced from a combination of z2S and single s-spun threads, and another of s2S and z2S plied threads, it seemed that this could be evidence of a transitional stage in the technological development of spinning. The early, more 'primitive' technique of yarn preparation appears to be in use at the same time as the 'new'- in the one textile!

The funerary textiles are finer than those from the settlement, and so far all have been woven exclusively of yarns spun in the 'new' 'S' direction. This accords with the elaborate, henna-dyed hairstyles, hair extensions, toupees and well-trimmed beards sported by those interred in the cemetery (Friedman 2001). Despite the paucity of their grave goods, these 'working class' Egyptians were adorned with only their best for the passage to the afterlife.

Conclusions

Thomas Midgley, when 'recanting' his original identification of the Badarian textiles in 1928, wrote: 'It is desirable that other fabrics of this period, in a better state of preservation, should be examined before making a more definite statement as regards the vegetable fibre used in these extremely early weaves'.

At this stage of research all of the Predynastic fibres from Abydos and Hierakonpolis have been positively identified as flax. The early technique of z2S twisted yarns appears at Abydos (albeit in one sample only) *c.*3600 BC, whilst a change in technology is evident at the settlement at Hierakonpolis at approximately the same time. Certainly by *c.*3500 BC there is no evidence of the old spinning techniques in the cemetery.

Additional information extracted from these small, brittle fragments of linen with the help of the microscope is providing new insights into the origins of the complex burial customs centred on rebirth, resurrection, and sustenance in the afterlife in the earliest stages of ancient Egyptian civilisation.

A comprehensive study still remains to be

done to resolve all of the questions outstanding. Provenanced and well-dated textiles from old excavations such as those in the Bolton Museum should be re-assessed using modern techniques of microscopy. When combined with analysis of new, comparative material from sites excavated by modern scientific methods, a clearer perspective will be gained on the technological development of spinning and weaving at this early and largely neglected period of textile history.

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I am grateful to Mr. Ron Oldfield, Dept. of Biological Sciences, Macquarie University, who has carried out all transmitted light microscopy for fibre identification.

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The Webbing from Berenike: a Classification

Webbing may be defined as a strong, narrow, woven band used for girths, belts and as reinforcement for more delicate fabrics. In the first century AD rubbish dump at the Roman port of Berenike, Egypt, which produced most of the textiles in the 1999-2001 seasons (*ATN* 31, 18-20; 33, 17-19), a large number of webbing fragments were found, mainly of flax, but also of cotton and, occasionally, wool. Within each fibre category, there were similarities in constructional detail, though the type of construction in each fibre was quite different. As it is to be expected that pieces of similar type will turn up elsewhere in Roman Egypt, an attempt is made below to classify the various types and to suggest, where there is evidence, their possible uses.

Flax

The majority of pieces recovered (35) were of S-spun flax. These may be broken down into three main categories: basket weave (F1), with pairs in both systems (Table 1, Fig. 6); half-basket weave (F2) with paired warp and single weft (Table 2, Fig. 7), and a single example of half-basket weave (F3) with single warp and paired weft (Table 2, Fig.8). In categories F1 and F2, the majority of pieces have a number of single warps at each selvedge, normally 8 or 4 (F1a, F2a). Occasionally, no singles were noted (F1b, F2b). Other variations have been classified as F1c and F2c.

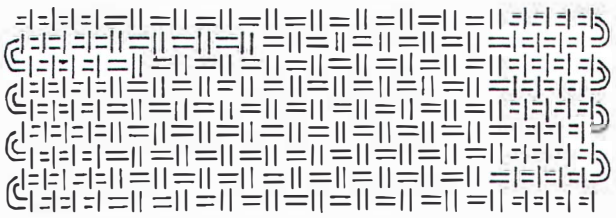

Fig.6 Type F1: basket weave (Berenike 1508)

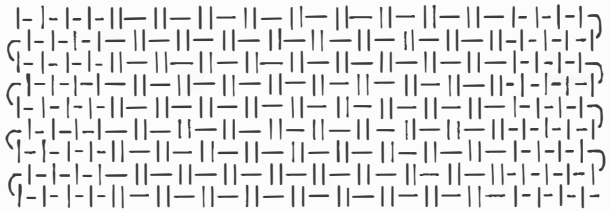

Fig.7 Type F2: half-basket weave (Berenike 0709)

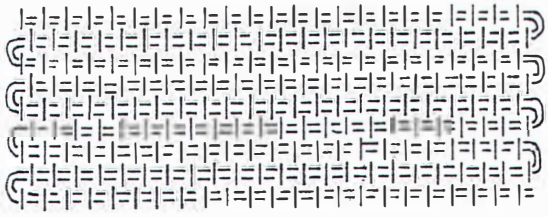

Fig.8 Type F3: half-basket weave (Berenike 97.115)

Discussion

Three of the examples of Type F1a (1952, 2887, 3081) and one of Type F2a (2849) have a narrow red stripe at each side, now badly faded and sometimes barely visible, among the single warps towards the selvedges (Fig. 11). Similar pieces have been noted by Fiona Handley at Quseir al-Qadim (*ATN* 31, 14). One of the Type F1a red-striped pieces (2887) and two examples of Type F2a (0839, 2990) were firmly attached to medium-weight S/S flax tabby (12 x 11, 12 x 10, 13 x 9 per cm respectively). It seems likely, therefore, that these types of webbing, all roughly 30-35mm in width, were used as reinforcement. We have suggested elsewhere (Wild and Wild 2001) that they may have been used as reinforcing strips for sails. It is interesting, in this connection, that the thread counts of the tabby matrices fall within the same general range as those of the sailcloth from the Vasa and other, more recent, Swedish examples analysed by Westheden Olausson (Westheden Olausson 1998).

The only previously known sail from Roman Egypt, reused as mummy packing in a grave at Thebes, and now in the Muséum d'Histoire Naturelle de Lyon (Rougé 1987,

F1: Basket weave

	No.	Width	Warp	Weft	Structure
F1a	1508	30mm	pairs	pairs	8 singles at each selvedge
	2357	30mm	pairs	pairs	8 singles at each selvedge
	1952	30mm	pairs	pairs	8 singles at each selvedge. 4 und./4red/27-28 pairs/4 red/4 und.
	2887	25+mm	pairs	pairs	4 und./4 red/12 pairs/4 red/ 4 und. Attached to S/S flax tabby (12 x 11 per cm)
	3081	damaged	pairs	pairs	8 singles at selvedge 4 und./4 red
	1511	30mm	pairs	pairs	4 singles at each selvedge
	1875	32mm	pairs	pairs	4 singles at each selvedge
	3174	40mm	pairs	pairs	4 singles at each selvedge
	1818	38mm	pairs	pairs	2 outer warps single, 3rd thicker single
F1b	1509	32mm	pairs	pairs	No singles noted in warp
	2851	32mm	pairs	pairs	No singles noted
F1c	1953	35mm	S/Z pairs	S/Z pairs	9 S spun singles at each side (Thicker than normal webbing)

Table 1 Flax Webbing, all S-spun except where noted (und.: undyed)

Schoeffer *et al.* 1987) is reinforced in a grid pattern by similar strips of S/S flax webbing. A detailed study of four of the fragments has revealed that all the webbing was in basket weave, either of Type F1a, with two singles to each side, or F1b (Table 5). All have a narrow decorative blue and/or red warp stripe to each side. The vertical strips on the sail (35mm–38mm) tend to be wider than the horizontal strips (*c.*25mm–29mm). Both the webbing and its linen matrix are finer than their equivalents at Berenike, but this is only to be expected if the Lyon sail were from a Nile boat rather than an ocean-going ship.

Clearly types F1a and F2a were not used solely as reinforcement. In one case (1372) two lengths of type F2a webbing were knotted together, suggesting use as some form of strap or tie. There is no indication as to the possible uses of the other types of flax webbing. The extra stout piece (1953), listed as F1c, with S/Z pairs in both systems (to enable it to lie flat?) is likely to have been used on its own as a girth or strap.

Cotton

There were ten pieces of cotton webbing, probably from eight examples. All were of Z-spun yarn with plied warp. They may be divided into those with single weft (C1) and those with paired weft (C2) (Table 3, Figs. 9 and 10). Of those with single weft, some had a decorative coloured warp stripe at each side (C1a) while others did not (C1b).

Discussion

In two cases (1512, 1539, probably from the same piece) the decorative stripe was blue (Fig. 12), in another (97.107) brown, though badly decayed, and in a third (0888) the stripe had disappeared altogether, leaving a gap. It is possible that the missing yarn had originally been red, as had that which now appeared brown. One example (0888) was sewn to a piece of Z/Z cotton tabby, 16 x 12 per cm.

F2 and F3: Half-basket weave

	No.	Width	Warp	Weft	Structure
F2a	0759	30mm	pairs	singles	8 singles at each selvedge
	0839	35mm	pairs	singles	8 singles at each selvedge. 3 lengths, sewn to S/S flax tabby (12 x 10 per cm)
	0890	30mm	pairs	singles	8 singles at one side, 6+ the other. (Damaged)
	1876	30mm	pairs	singles	8 singles at each selvedge
	2762	28mm	pairs	singles	8 singles at each selvedge
	2849	*c.*30mm	pairs	singles	8 singles at each selvedge 4 und./2 red/2 und./....
	2921	*c.*30mm	pairs	singles	8? singles one side, other missing
	2990	30mm	pairs	singles	8 singles at each selvedge. Attached to S/S flax tabby (13 x 9 per cm)
	1372	35mm	pairs	singles	4 singles at each selvedge. 2 lengths, knotted together
	0797	43mm	pairs	singles	5 singles at each selvedge
	0798	30mm	pairs	singles	*c.* 6 singles at edge
	0799				(scrap of similar band to 0798)
	2907	45mm	pairs	singles	4 singles one side, 6 the other
	2920	damaged	pairs	singles	6 singles one side, other missing
	0838	30mm	pairs	singles	10 singles at each selvedge
	0869	damaged	pairs	singles	traces of singles at edge
	3238	damaged	pairs	singles	singles at selvedge, uncountable
F2b	1480	35mm	pairs	singles	No singles noted in warp
F2c	1788	30+mm	pairs	singles	4 singles/2 pairs/4 singles/4 pairs/1 single/8+pairs
	2802	38mm	pairs	singles	4 singles/1 pair/4 singles/26 pairs/4 singles/1 pair/4 singles
	2923	"	pairs	singles	4 singles/1 pair/4 singles/main pairs
	1465	35mm	pairs and singles	singles Z-spun	Wa: Z spun pairs (?) in centre S spun singles at edges
F3	97.115	30mm	singles	pairs	*c.* 46 singles in warp

Table 2 Flax Webbing, all S-spun except where noted

C1: plied warp, single weft

No.	Width	Warp	Weft	Structure
C1a 97.107	35mm	plied	singles? (invisible)	brown line, ?3 threads wide, now largely missing, 6 warps from one selvedge, 8 from the other
0888	38mm	plied	singles	Wa: ?5/ dec. missing/24/dec. missing/?5. Sewn to Z/Z cotton tabby, 16 x 12 per cm.
1512	35mm	plied	singles	blue-green stripe. Wa: 4 undyed/2 blue/ 18 und./2 blue/4 und.
1539	damaged	plied	singles	blue stripe. (= 1512)
C1b 1686	30mm	plied	singles	no decoration noted
2848	33mm	plied	singles	" " "
2988	38mm	plied	singles	" " "

C2: plied warp with paired weft

1414	32mm	plied	pairs	
1510	43mm	plied	pairs	*c.* 38 in total warp sheet
1599	43mm	plied	pairs	36 in total warp sheet (probably = 1510)

Table 3 Cotton Webbing, all Z-spun

W1: Half-basket weave with single warp

No.	Width	Warp	Weft	Structure
2776	45mm	S-spun singles	Z-spun pairs	Wa: 32 per cm in centre, 36 per cm at selvedges
2831	48mm	S-spun singles	Z-spun pairs	warp denser at selvedge

W2: Half-basket weave with plied warp

1917	44mm	Z-plied 2 ply S-spun	S/Z pairs	

Table 4 Wool Webbing

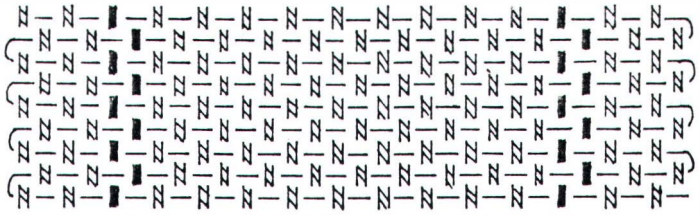

Fig. 9 Type C1: plied warp with single weft (Berenike 1512)

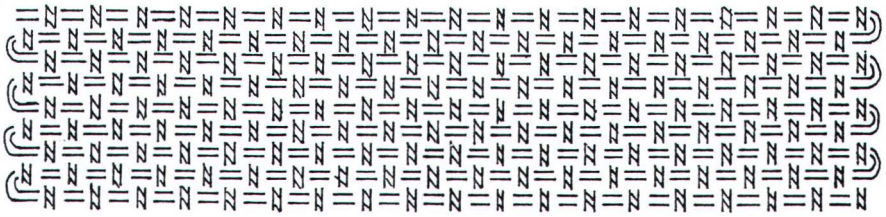

Fig. 10 Type C2: plied warp with paired weft (Berenike 1510)

We have argued elsewhere (Wild and Wild 2000, 271-273) that the Z/Z cotton at Berenike was of Indian origin. It seems likely that the cotton webbing was used to reinforce (Indian) cotton sails in the same way as the flax webbing was used to reinforce the linen sails of Roman Egypt. The sails appear to have been of similar design, and although the construction of the webbing was different, copying appears to have extended as far as the conventional coloured stripe. The width of the webbing is similar to, or just slightly wider than, that of the reinforcing flax webbing.

Wool

Only three examples of wool webbing have yet been noted at Berenike. At 44mm-48mm, they were wider than most of the flax and cotton examples. All were in half-basket weave and utilised a combination of S- and Z-spun thread. They can be divided into those with single S-spun warp, denser towards the selvedges (W1) and one example where the warp is plied (W2) (Table 4, Fig. 13).

Discussion

The combination of S- and Z-spun yarns was no doubt designed for strength. There is no suggestion that it would have been used to reinforce other fabrics. Presumably it formed part of some form of strap, girth or belt. Wool appears to have played no part in the seafaring textiles of Roman Egypt. Straps and girths would have been required to fasten traded goods onto pack-animals for their voyage overland to the Nile, but all the examples found at Berenike to date have been of goat-hair. Two examples of bands from late Roman contexts were in ply-split braiding; from the early midden came a complete animal girth made from a piece of goat-hair fabric folded longitudinally and sewn, with loops attached to the ends, presumably to fit beneath the belly of the animal. Perhaps the best explanation for the lighter-weight wool webbing should be sought amongst items of dress and personal equipment.

Acknowledgments

While my name appears here as author, my debt will be obvious to John Peter, who provided the identifications, took the photographs and, indeed, introduced me to the Berenike Project in the first place. We both express our thanks to Dr Deirdre Emmons of the Muséum d'Histoire Naturelle de Lyon for permitting us to examine the sail fragments in her collection.

All S/S flax basket-weave.

F1a: Pairs in both systems, with 2 outer warps on each side single. Red or blue and red stripes

Position	Width	Warp	Weft	Structure
horiz.	28mm	pairs	pairs	2 und. singles/2 und. pairs/2 blue pairs/2 red pairs/12 und. pairs/2 red pairs/2 blue pairs/2 und. pairs/2 und. singles
horiz.	*c.*25mm	pairs	pairs	As above
horiz.	29mm	pairs	pairs	2 und. singles/2 und. pairs/2 red pairs/14 und. pairs/2 red pairs/2 und. pairs/2 und. singles

F1b: Pairs in both systems. No singles. Blue and red stripes

vert.	37-38mm	pairs	pairs	4 und./4 coloured /20 und./ ?4 coloured/4 und. (all pairs)
vert.	35-37mm	pairs	pairs	Same. Red pairs survive, interspersed with blue pairs, now missing?
vert.	35mm	pairs	pairs	4 und. pairs/1 blue pair/1 red pair/3 blue singles/1 red pair/18 und. pairs/1 red pair/1 blue single /1 red pair/1 blue pair/4 und. pairs
horiz.	28mm	pairs	pairs	4 und./2 blue/2 red/12 und./2 red/2 blue/4 und. (all pairs)
horiz.	27-28mm 25-26mm	pairs	pairs	6 und./1 blue/1 red/14 und./1 red/1 blue/6 und. (all pairs) (2 examples, different widths)
horiz.	29mm	pairs	pairs	6 und./2 blue/1 red/10 und./1 red/2 blue/6 und. (all pairs)

Table 5 Webbing from the Lyon Sail

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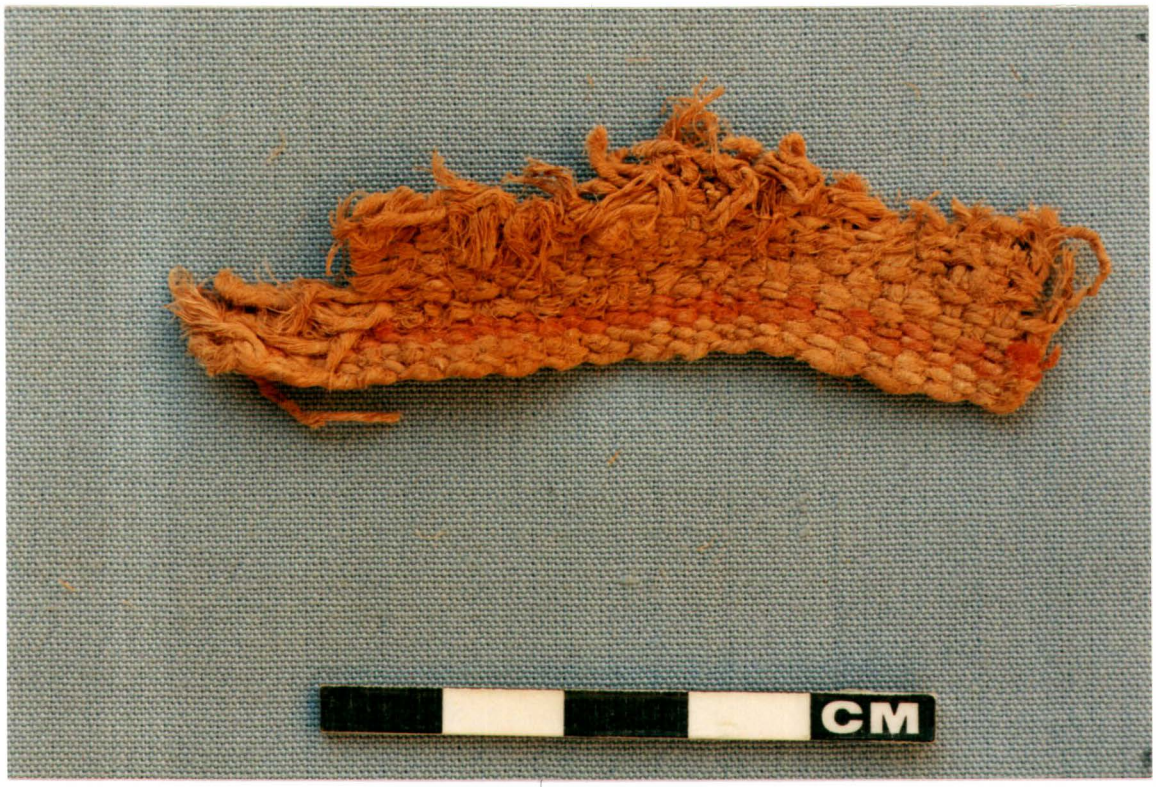

Fig. 11 Type F1a webbing with red warp stripes (Berenike 3081)

Fig. 12 Close-up of Type C1a webbing with blue warp stripes (Berenike 1512)

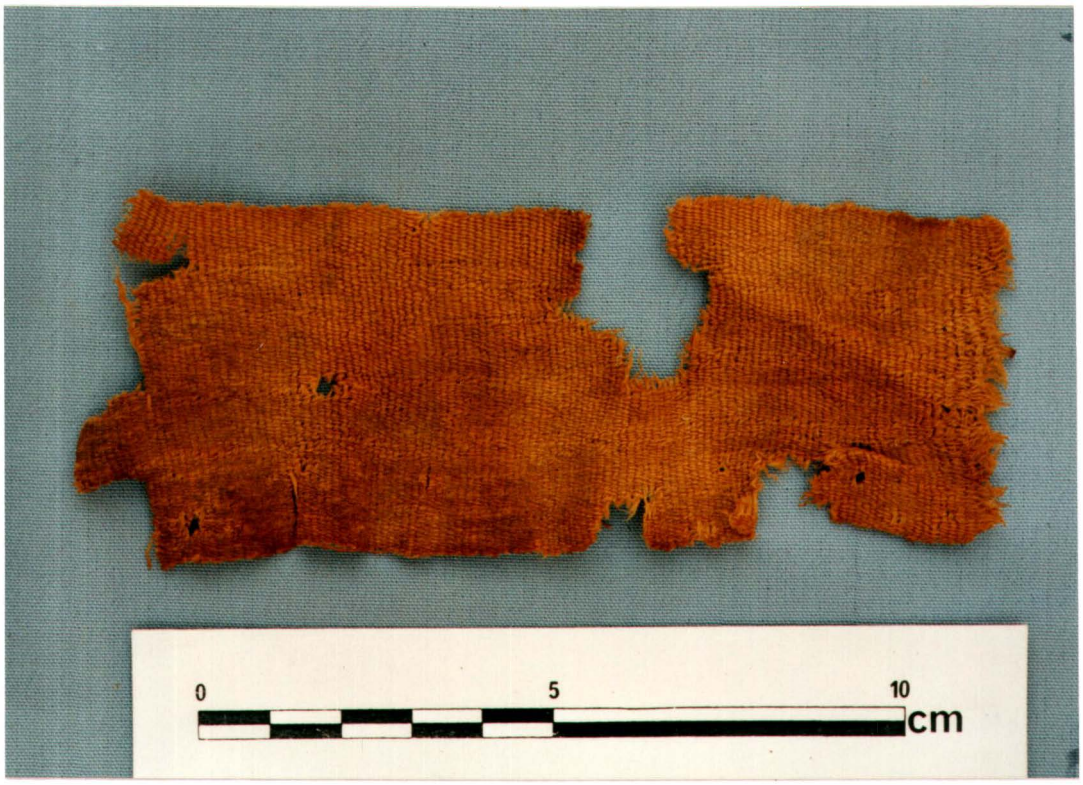

Fig.13 Type W1: half-basket weave wool (Berenike 2831)

Low Cost Digital 'Microscopy' for Archaeological Textiles Research

Introduction

There are a number of attractions in using digital images in the study of archaeological textiles. These include ease of storage, archiving, recovery and transport, e-mailing, ease of manipulation and the facility for generating quantitative data using image analysis. Digital images of fabrics and yarns may be easily captured using digital cameras but the limitations of the macro facilities on most affordable cameras limit their use, in most cases, to recording and archiving purposes.

Optical microscopes may be fitted with digital cameras and these are capable of generating high resolution images, up to 3000 x 2000 pixels, at magnifications of up to 500x. Video microscopes again facilitate the capture of digital images in VGA/XGA resolution and magnifications up to 60-100x and finally modern SEM's and ESEM's typically capture high resolution images up to 3000 x 2500 pixels at useful magnifications up to >5000x. Unfortunately for the majority of textile archaeologists, digital optical microscopes, digital macro-photography and video cameras are not readily available in their working environment and access to SEM's and ESEM's is restricted by the availability and cost of using such facilities.

Work has progressed at UMIST in the development of a low cost solution to digital image capture to the point where it may offer opportunities to other researchers interested in using digital images for quantitative research.

Fabric Scanning

The very rapid development of personal computers and the equally rapid provision of relatively low cost accessories has provided an alternative means of digital image capture that has considerable potential for textile archaeologists. The A4 flatbed scanner was originally developed from photocopying technology to provide a means of copying A4 text as a bit-mapped image and using OCR software to convert the bit mapped file to text characters. Generally scanning was carried out at 300 dpi in black and white.

More recently with the advent of laser colour printers printing at 600 dpi and then with the latest development of ink jet photo-quality printers capable of generating dot densities up to 2400 dpi, the manufacturers of flatbed scanners have responded with low cost (£60-£120) A4 scanners typically capable of scanning at 1200 x 2400 dpi with 36 or 42 bit colour recognition using highly accurate micro stepper motors. Furthermore the optics of the latest scanners are capable of capturing data from surfaces lying at a significant distance (15-20 mm) above the top surface of the glass platen. It should be stressed that this capability to pick-up focused image data from above the platen varies from one make of scanner to another and is crucial to the success of the methodology described in this article.

Let us suppose we are interested in capturing data from a reasonably flat fragment of textile fabric approximately 5 cm x 2.5 cm. If this fragment is placed on a suitable A4 scanner, together with an appropriate scale or graticule (if necessary within the area of the platen reserved for small photographs or slides) and is scanned at maximum resolution, 1200 x 2400 dpi, then the data collected for the sample will be approximately 5000 x 1200 pixels (if the long axis of the sample is placed on the long axis of the scanner). Naturally the scanner can be used in such a way that the maximum resolution is reserved for the finest thread system. It is therefore possible to capture a high resolution 1:1 coloured image of the fragment with approximately 1000 data points/cm. The inclusion of a suitable scale adjacent to the sample ensures that the spacing of these data points can be accurately calibrated using the method described below. Assuming the scanner captured a perfectly focused image, then it would be possible to identify and measure features on a scale of 1/1000 cm or 1/100 mm, or 10 microns! In practice the image is not perfectly focused and the quality of the image is dependent on the quality of the optics such that the more expensive scanners provide better data. However with a device currently costing approximately £100 it has proved possible to make reliable measurements in the best case with a resolution of $\pm$ 1/2 pixel, i.e. $\pm$ 1/200 mm or $\pm$ 5 microns. In the worst case the error would be $\pm$ 1 pixel, or $\pm$ 10 microns.

Possible Applications

Once the available resolution on a particular scanner is established (see below for methods of calibrating the scanner) then the range of useful applications can be determined. If we assume in the worst case a scanning/focusing error of $\pm$ 1 pixel together with a measurement error of $\pm$ 1 pixel, then the total error would be of the order of $\pm$ 20 microns on each measurement taken. We can then specify the level of accuracy we require and it is a simple matter to determine what kind of features can be measured. It is immediately apparent that trying to use this method to measure fibre diameter is pointless. The majority of textile fibre dimensions lie in the range 5-50 microns and a worst case error of 20 microns would make the exercise pointless.

Clearly the feature to be measured must have a dimension that is a sufficiently large multiple of one pixel to cause the error to be either negligible, or acceptable in the context of the nature of the sample and the problem being addressed. For example the image of a yarn with a diameter of 500 microns, (1/2 mm), would contain approximately 100 pixels across the fibre and the error in measuring this would be at best $\pm$ 1.5% and at worst $\pm$ 2.0%. This error range, given the advantages of rapid image acquisition, low cost and the ease of automating the data capture with image analysis, would make it a very attractive methodology with a perfectly acceptable precision. Given the general dearth of quantitative 'microscopic' data in the textile archaeology 'field' it is probable that features as small as 25 pixels or 100 microns (1/10 mm), could yield useful data, with an accuracy between $\pm$ 3% and $\pm$ 8%. Indeed depending on the nature of the investigation and with careful calibration of the scanner to eliminate any scanning/focusing error it may be possible to measures features as small as 12/13 pixels or 50 microns with an acceptable precision for the task in hand and this implies that the full range of spun yarn diameters could be measured (Cooke, 1990).

Calibrating the Scanner

The simplest method of calibrating the scanner is to place a gridded microscopic

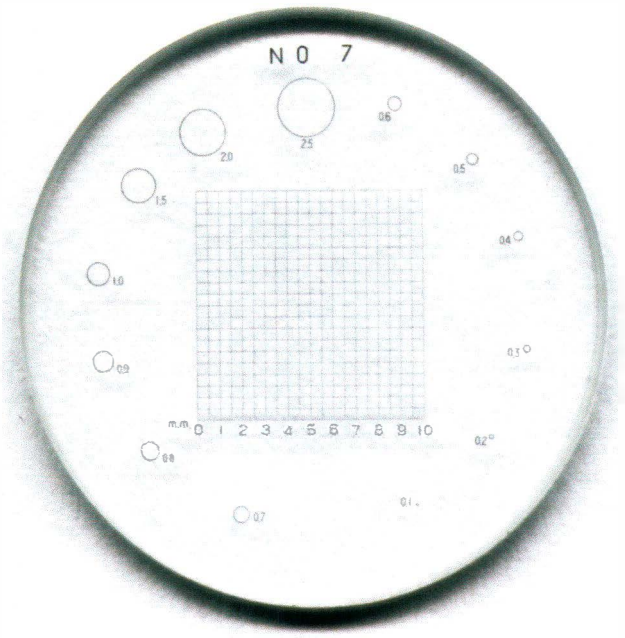

Fig. 14 Graticule, scanned image

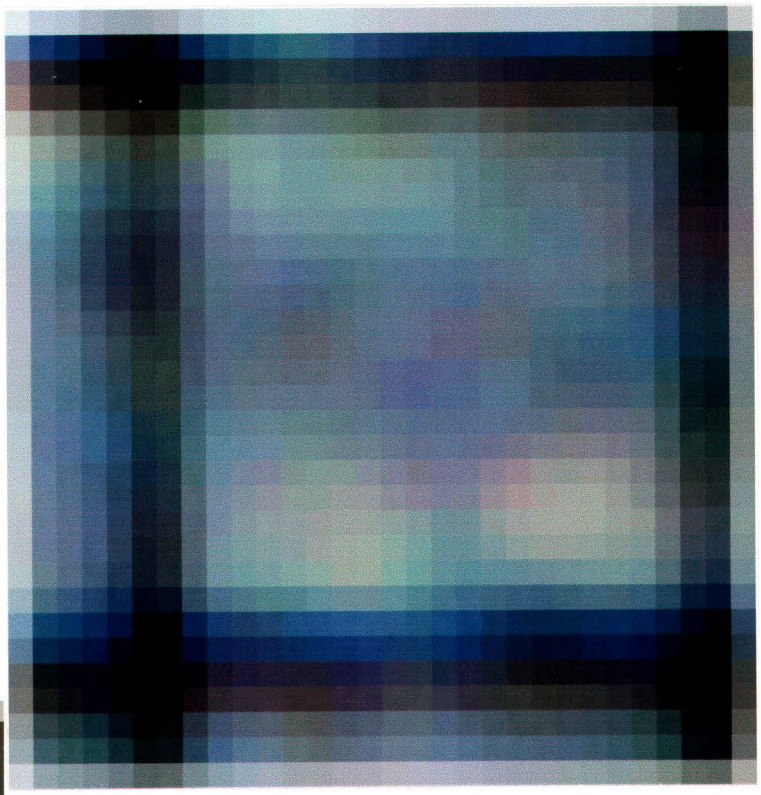

Fig. 15 Grid of graticule (Fig. 14), enlarged

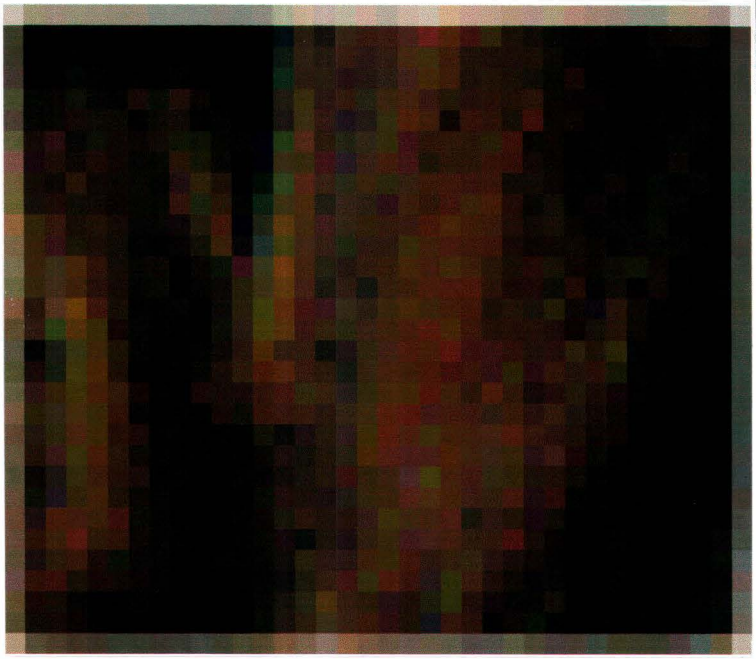

Fig. 16 Two adjacent warp yarns in 2/1 twill sail

graticule similar to Figs. 14 and 15, engraved with 1mm or 1/2 mm spaced lines, in the section of the scanner reserved for slides or photographs. The graticule is covered with plain copy paper and selected for local scan at the maximum resolution of the scanner. The scanned image is then imported into a software package such as Adobe Photoshop. Using the zoom facility in Photoshop the image magnification is increased until the image pixelates and the individual pixels are sufficiently large to count with ease (Fig.16). The number of pixels/mm can then be counted directly from the image in both the x and y axes. For certain makes of scanner the measured scan resolution may be different from the manufacturers' claimed resolution. Once this calibration is complete and the pixel size is determined, then the available precision of the methodology can be calculated as above.

Recent Applications

Since the methodology was developed 12 months ago it has been used in three different projects. In the first project UMIST was offered short-term access to an archive of knitted samples produced in the 1930's. The interest in these samples related to work carried out by Cooke and Tavman-Yilmaz (Cooke, Tavman-Yilmaz 1999) into the use of image analysis to determine the way in which particular knitted museum objects had been manufactured, i.e. hand knitted, hand-frame knitted, v-bed knitted, Cotton's Patent machine knitted, etc. The archive of knitted samples was fixed by adhesive into a pattern book and could not be removed from the page without damaging the archive. Scanning was carried-out on a Ultima scanner at a resolution of 600 x 1200 and proved to be a particularly simple and rapid process. The methodology of discrimination between the knitting methods involves using image analysis to measure the size of adjacent knitted loops across the knitted fabric and subsequently analysing the nature of the size variation. In this project the fabric images were sent by e-mail to Turkey where they were satisfactorily analysed. In this case the scanner replaced a macro-photography unit and provided images that could be measured with an accuracy of $\pm$ 2% that was adequate for the purposes of the project.

The second application was in the determination of the cover-factor of a number of coarse woven sail fabrics. The fabrics were simply scanned at a resolution of 600 x 1200 and the warp and weft thread spacing and the warp and weft yarn diameters measured by counting pixels. The method was rapid and due to the coarse nature of the fabrics and yarns, the yarn diameter could be determined with a accuracy of better than $\pm$ 2%.

The third project involves the correlation of airflow through a fabric with the measure of cover-factor determined by the method described above. This project is on-going and the results will be reported in due course.

Word of Warning

When use is made of a scanner capable of 2400 dpi scanning, with 42 or 48 bit colour depth, then even a relatively small fabric sample will produce a very large image file. For example a sail sample measuring 5 x 8 cm produced an uncompressed .bmp file of 128 megabytes. To handle a file of this size efficiently it is essential to have 256 megabytes of RAM and a relatively fast processor, >1 G Hz. It is not a good idea to use compression, i.e. saving the image in .jpg format, to reduce image size as the compression removes some of the fine detail essential for the measurement process. Equally scanning at lower colour resolution, 16 or 24 bit colour depth will reduce image size at the expense of image quality. If it is essential to use an older slower PC, then the sample should be scanned in overlapping sections using the area select facility in the scanner software to keep the image size down to an acceptable level.

Conclusion

The use of an A4 flat-bed scanner as an alternative to microscopy, video microscopy or macro-photography for capturing digital images of archaeological/ancient textiles has a number of advantages including ease of use, speed of use, cost of equipment and the facility with which the digital images may be stored and processed with image analysis software. Depending on the desired accuracy effective 'magnifications' of from 5x to 75x may be achieved with the latest scanners with scan resolutions of 2600 x 3320 dpi.

Naturally this technique cannot replace microscopy as a means of studying the detailed features of a textile, but in a number of projects at UMIST the methodology has produced useful results. The authors would be pleased to discuss the process with potential users and look forward in due course to learning of the experiences of other researchers.

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Verkohlungsversuche zu neolithischen Geweben und Netzen aus Pfahlbausiedlungen am Bodensee

Bei der textiltechnischen Bestimmung von verkohlten Bodenfunden taucht naturgemäß irgendwann die Frage nach ihrem einstmaligen unverkohlten Aussehen auf.

Unter den zahlreichen Textilfunden aus den Ufersiedlungen des Bodensees (meist Geflechte aus Gehölzbast) sind auch einige kleine Gewebefragmente. Sie sind alle aus dem leicht vergänglichen Flachs (Körber-Grohne, Feldtkeller 1998) hergestellt und deshalb dort nur verkohlt erhalten. Für ihr Alter (3900 - 3500 v. Chr.) sind sie mit Fadenzahlen von 8cm bis zu 12cm (je nach Siedlung) erstaunlich fein (Abb.17). Sie sind in Leinwandbindung meist ausgeglichen gewebt, und manchmal sind Anfangskanten, Webkanten oder auch komplexe Abschlußkanten daran erhalten.

Um herauszufinden, ob sie wirklich mit diesen feinen Ketteinstellungen gewebt worden sind, habe ich versucht, Musterstücke anzufertigen, die nach dem Verkohlen den verkohlten Originalen

Abb.17 Leinwandbindiges Gewebe aus Ludwigshafen am Bodensee mit einer durchschnittlichen Fadenzahl von 10/cm. 1/1 nat. Gr.

möglichst gleich sein sollten, um dann umgekehrt auf deren ursprüngliches Erscheinungsbild rückschließen zu können (Abb.18).

Weil diese neolithischen Gewebe aus dicht gezwirntem Garn gemacht sind, wurde für die Rekonstruktion maschinell gesponnener Einfachfaden (Langflachsgarn Nm 6 und Nm 9,6) auf dem Spinnrad nocheinmal etwas überdreht und dann gezwirnt. Die Rückseite einer kleinen Aluminiumleiter diente, mit Hilfe von Rundstäben und Tongewichten, als Gewichtswebstuhl. Es wurden jeweils zwei oder vier gleiche Teilstücke gewebt, die dann zum Vergleich verschieden weiterbehandelt wurden: verkohlt (in Aluminiumfolie über Holzfeuer) oder gewaschen und verkohlt.

Die Leinwandstücke laufen ja schon durch vorsichtiges Waschen in kaltem Wasser etwas ein, und diesen Vorsprung behalten sie auch beim Verkohlen bei. Letzten Endes schrumpfen sie bis zu 20 - 25 % (Abb.18). Von der Fadenzahl der verkohlten Gewebemuster ausgehend kann man nun die ursprüngliche Ketteinstellung der Gewebefunde abschätzen.

Bei Fäden, Zwirnen und Zöpfen sieht das Ergebnis etwas anders aus. Schwach gedrehte Fäden wurden gar nicht kürzer, Zwirne nur wenig, und dicht geflochtene Zöpfe schrumpften am meisten (Abb.20). Man hätte zwar gern exakte Zahlen, kann das aber bei diesen Versuchen nicht erwarten. Zu viele natürliche Prozesse spielen hier mit. Eine Tendenz ist jedoch klar: gerade Fasern schrumpfen in

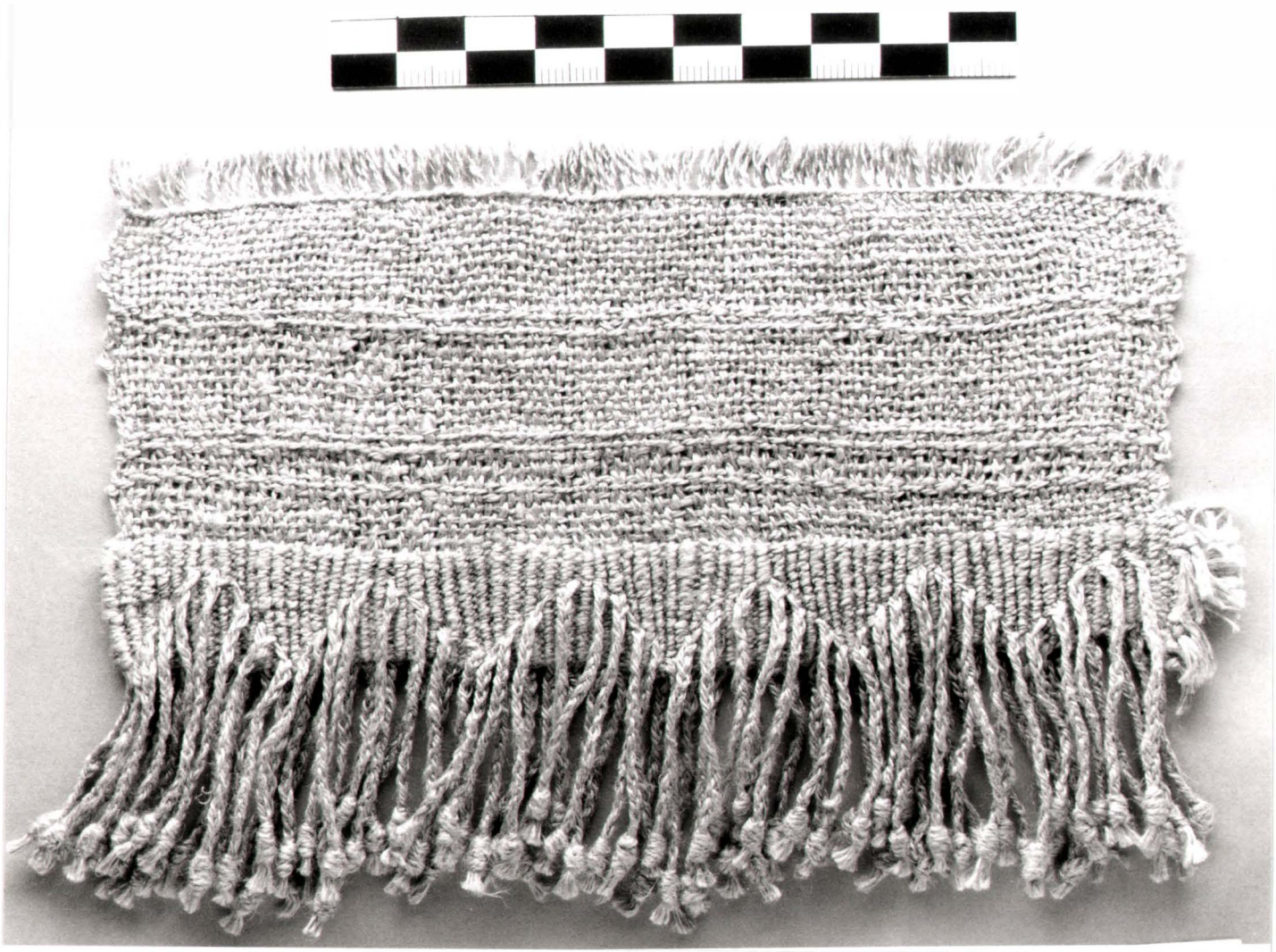

Abb. 18 Nachbildung der verzierten Abschlußkante aus Lüscherz (Vogt 1937, 64-65), gewaschen.

Abb. 19 Nachgewebte Leinwandproben, zum Vergleich verschieden weiterbehandelt. Fadenzahl: gewebt 8/cm, gewaschen 9/cm, nur verkohlt 9–10/cm, gewaschen verkohlt 10–12/cm.

Längsrichtung durch Verkohlen nicht, sie schrumpfen umso mehr, je mehr engen Biegungen sie ausgesetzt sind.

Auch für die Beurteilung der Netze, einer zahlenmäßig etwas größeren Fundgruppe, ist dieser Sachverhalt bedeutsam. Sie sind wie die Gewebe alle aus Flachs hergestellt und nur verkohlt erhalten. Will man nun Reste von Zug- oder Stellnetzen einer bestimmten Fischart zuordnen, so muß man ihre originale Maschenweite (die Länge des Netzgarnes von einem Knoten bis zum nächsten) kennen. Erste Versuche haben auch hier dieselbe Tendenz gezeigt: umso mehr enge Biegungen (in diesem Fall Knoten) im Garn sind, desto mehr schrumpft es. Engmaschige Netze sind also wahrscheinlich mehr geschrumpft als weitmaschige.

Nocheinmal kurz zusammengefaßt: die Verkohlungsversuche ergaben Hinweise auf die ursprüngliche Maschenweite der Netze und die ursprüngliche Ketteinstellung der Gewebe. Damit kann gleichzeitig anschaulich gemacht werden, wie die Leinwandgewebe einmal ausgesehen haben und wie ihre jeweilige Qualität im Gebrauch damals war.

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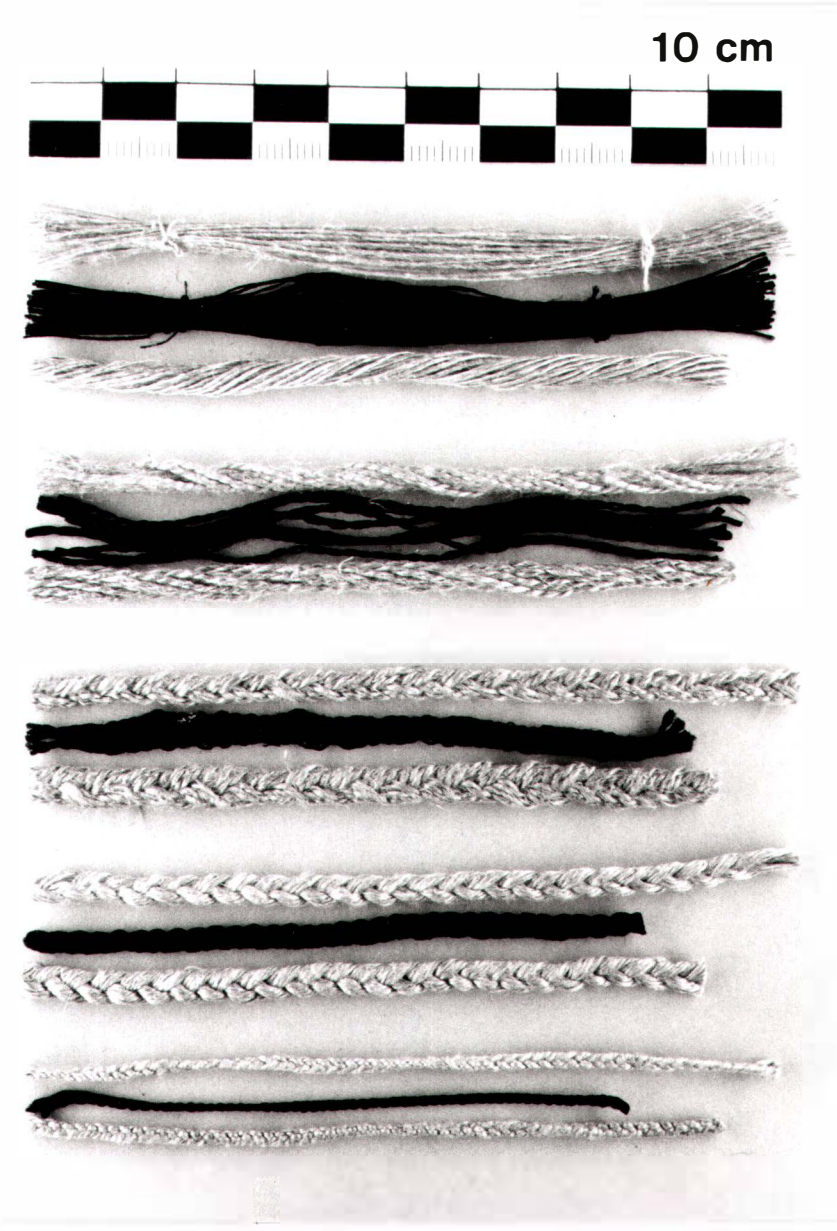

Abb.20 Fäden, Schnüre und Zöpfe im Vergleich, jeweils unbehandelt, verkohlt, gewaschen

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Reviews

Colours in Antiquity, Edinburgh, 10-13.9.2001

From the 10-13th September 2001, the Department of Classics at the University of Edinburgh organized an interdisciplinary conference in Edinburgh on colours in the ancient Mediterranean world. The aim of the conference was to bring together scholars with different backgrounds in order to highlight different aspects of colour. This resulted in a profitable and vivid discussion.

The geographical and temporal areas that were covered were Minoan Greece, Egypt, Israel, Greece, Rome and Byzantium. Much

Fig.21 Ari Greenspan, Zvi Koren and Irving Ziderman (left to right) at the 'Colours in Antiquity' conference. (Photo: Rolf Haubrichts)

emphasis lay on what - and how - symbolism, as well as social affiliation and status, was expressed through colours, for example in bridal garments and Minoan frescoes.

A subject much debated was the different aspects of purple from the Minoan period and onwards: purple as a costly dyestuff, purple as a cheap commodity (the opposite view), the importance of purple for the economy, the organisation of dyeing activity and its symbolic and religious meaning.

Some papers also discussed more technical aspects of colours like techniques for preserving ancient dyes and pigments and in some cases their rediscovery. Another topic was how it is possible to detect traces of (often) long faded colours on stone objects, such as gravestones.

Three of the papers dealt with colours on textiles. To dye textiles dyestuffs from both plants and animals were used. Some common dye-plants used during classical antiquity were madder, weld, woad, orchil and alkanet. Dyestuffs of animal origin included purple, kermes and cochineal.

The textiles reviewed come from both Israel and Egypt. The textiles from Egypt date from the end of the first century AD to the beginning of the third century AD and were found in rubbish heaps at the Roman quarry site of Mons Claudianus. The textiles from Israel have been found at several sites along the Spice Route from Petra to the Mediterranean coast and date from the third century BC to the early Islamic period. On some of the textiles madder, indigo and kermes have been used as dyestuffs.

A common point in the papers was how difficult the concept of colour is to grasp. In the ancient literature there are many words describing colours and nuances not using colour terms but words connected with plants, the sea or the sky, and also words referring to brightness. Some papers discussed the difficulties of actually knowing what colour or nuance was intended and

how to know and understand many of the colour expressions.

To sum up: A very interesting, richly varied and colourful conference!

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The Clothed Body in the Ancient World: Milton Keynes, 17-19.1.02.

The study of dress in antiquity has had a renaissance in recent scholarship. This caused Lloyd Llewellyn-Jones (Open University) and Mary Harlow (Birmingham University) to organise a conference at the Open University in Milton Keynes, addressing themes such as methodology of dress history, dress as display, dress and eroticism, modesty, identity, ritual and social control, dress and the economy, dress and art, reception of ancient dress, and specific dress items and accessories. The conference attracted about 70 participants from 11 countries. More than 40 papers were presented, covering most of the themes outlined in the call for papers.

Llewellyn-Jones and Harlow opened by discussing how ancient dress has been perceived in art and scholarship in the Western World since 1500 to the present, and how Hollywood and the advertisement industry has contributed to how ancient dress is visualised. Hero Granger-Taylor demonstrated how the Romans displayed status through dress, and Sue Blundell and Nancy Rabinowitz discussed gender perspectives in Attic vase paintings.

Cosmetics and scent were discussed in papers by Alexandra Croom, Joanne Fletcher and Jeri DeBrohun, followed by a presentation where a model was tranformed into a Roman *matrona* by Sally Pointer. First her clothes were changed into tunic, *stola* and *palla*, then make-up was applied and explained, the model turning more and more ladylike for every stage. The coiffure was finalised with a wig, and the transformatiom was complete. In between, Judith Sebesta had discussed the *toga praetexta*, and Diana Wardle had presented her work on the reconstruction of Minoan and Mycenean garments. The latter was concluded with another dress show, where the conference organisers posed as models.

On Day 2, papers were mainly presented in two parallel sessions. Aegean and Mycenean dress was the main theme of one session, the second focused on late Roman and Byzantine dress. Speakers comprised archaeologists, linguists and art historians, resulting in a wide range of different approaches. This proved very fruitful and inspiring. Papers covered aspects such as boots, tiaras, eunuch dress, presentations of archaeological finds from Jordan and Israel, as well as wider perspectives on Greek, Roman and Byzantine fashion. Towards the end of the day, the two sessions were reunited to one. Here, Emma Stafford discussed evidence of the ancient bra, Shelley Hales addressed how nakedness and other divine features were used by Roman emperors, and Glenys Davis explained what made the Roman *toga virilis*.

Day 3 again had parallel sessions in the morning, this time the choice limited to Greek dress. Vase paintings were examined for evidence on dress; several speakers approached dress in Greek theatre, and one attempted to classify garments listed in a Greek inscription. In the afternoon, Mercedes Aguirre discussed dress and seduction, Margarita Gleba presented evidence for linen mail corselets, while Paul Christesen considered athletic nudity as a form of ritual. The final papers were on the Greek peplos and the construction of gender, by Mireille Lee, and Hans Van Wees on dress and status in early Greece.

The combination of scholarly papers and the presentations of dress, make-up and coiffure was a happy one. The demonstrations added three- and four-dimensional perspectives, and contributed substantially to creating a pleasant atmosphere of wonder, queries and discussion.

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Fig.22 A Roman matron being dressed at the 'Clothed Body' conference. (Photo: Lise Bender Jørgensen)

Notes and Queries

The Spinning Woman from Acre

In response to Avigail Sheffer and Miriam Webber's query about the depiction of a spinner on a bowl (*ATN* 31, 26-7), I have several points to raise.

First, the source of the image. I should like to draw their attention to a thirteenth century Bible Moralisée (Bibliothèque National MS lat. 11560, fol.59) illustrating the text of *Proverbs* 31, 19. While I have not seen the original of this, there is a very clear reproduction of it in Hartley and Elliot 1931, Vol. 1, 75, plate 22 (Fig.23). It seems to me that the stance as well as the costume might derive from this.

Secondly, the length of the distaff. If the drawing is corrected so that the distaff is through the girdle on the left side of the body, it does not appear too long to me. I am 1.5 metres tall and habitually use a distaff over 90cm long, which is adequate for wool but barely long enough for line flax. There is no doubt that European-style

Fig.23 Woman spinning, 13th century (after Hartley and Elliot 1931, Vol.1, plate 22)

spinning is intended.

Thirdly, left-handedness. The spinner is actually shown with her hands in the correct position for right-handed spinning and it is only the lower end of the distaff that is wrongly drawn across the body. If I am correct about the source, the lower end of the distaff is not shown as it is behind what appears to be a loom; the painter of the bowl, working quickly on wet slip, possibly from a sketch, can be forgiven for the error.

There are a number of apparently left-handed spinners in various illustrations, but I think the majority of these arise from reversal in printing (either modern or original), artistic licence or simple error. I know of only one which may be a genuine case of left-handedness: a reproduction of a sixteenth century Swiss picture of a number of men spinning flax (Baines 1989, fig. 13). While the majority of them have the distaffs on their left, one holds his between his knees, and one has the distaff on the right and the spindle suspended from his left hand. They would appear to have been drawn from life.

I hope that this is of interest.

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The Anglo-Saxon Laboratory

Those of us who work on textiles from Anglo-Saxon cemeteries - or indeed any of the Germanic cemeteries of northern Europe - all know the challenge of trying to reconstruct the clothing of the dead from the clues left in the grave. The arrangement of the body, the position of brooches on the body, the direction of the brooch-pin, and any fragments of textile adhering to the backs of buckles and clasps, all need to be considered (Fig.24a-b). Since there is little pictorial evidence from this period, the clothing styles of different regions have to be reconstructed by this painstaking analysis of individual graves, followed by comparisons between graves, then between cemeteries, until the defining features of a particular cultural group can be determined.

The Anglo-Saxon Laboratory (ASLab) is a new venture, which will aim to provide an integrated approach to this work. It comes from the Textile Research unit in York (UK), where Anglo-Saxon textiles have been studied for over twenty years. During this time it has been possible to work with some of the country's leading specialists in Anglo-Saxon artefacts and to learn from them the dating and interpretation of brooches, pins, buckles and clasps. Such collaborative work will continue and the aim of ASLab will be not to compete with established researchers, but to provide a service where no appropriate artefact researcher is available, such as small excavations and watching briefs. The new service will, in the first instance, provide research reports on

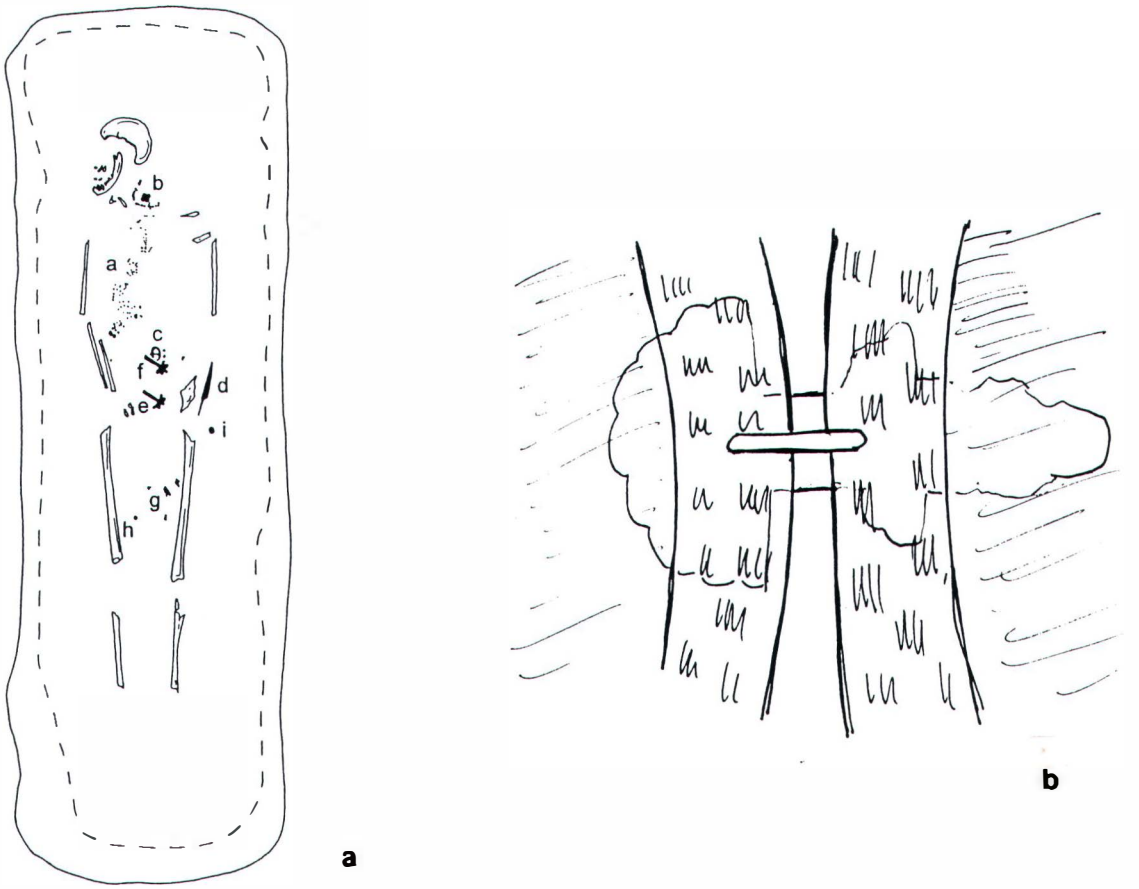

Fig.24 Reconstructing clothing from the remains on brooches:
a. a woman's grave at Buckland II, near Dover, with Frankish brooches, one above the other, their pins pointing across the body
b. on the backs of these brooches are tablet-woven bands attached to fine twills, indicating a gown with a vertical front opening of a style worn on the Continent

brooches, pins and other dress fittings and encompass dating, typology and a description of how the objects were worn. In time, it will expand to include other kinds of artefact, such as weapons and artisan tools.

Work on the new venture has already begun, although, paradoxically, the first project is not the burial of an Anglo-Saxon, but a Viking. Northern Archaeological Associates were carrying out a watching brief at Adwick-le-Street near Doncaster, South Yorkshire, when they unexpectedly came across a single grave, in which there were two oval brooches of the type colloquially known as 'tortoise' brooches (Fig.25), along with remains of a copper-alloy bowl and miscellaneous iron objects. The arrival of the objects in York allowed us to provide some preliminary comments. The brooches are typically Scandinavian and may be dated by their design and technology to the later 9th century, which is the turbulent period in which the Danish army was making inroads into this part of Anglo-Saxon England. What is interesting is that the brooches are a non-matching pair, one of which appears to have been damaged before burial. To this may be added the evidence of the textiles on the backs of the brooches. In Scandinavia, matching pairs of tortoise brooches were used by women to fasten a garment which wraps around under the arms. The top edge of the garment had loops of fabric front and back, rather like dungaree straps, which were fastened by the brooches on the upper breast. In the case of the Doncaster brooches, three fabric loops are present on the brooch pins, but the fourth has been replaced by cords. This looks like a running repair and one can imagine some poor woman, far from her homeland, having to amalgamate old

Fig.25 A 9th-century copper-alloy oval ('tortoise') brooch, one of a non-matching pair from a woman's grave at Red House Park, Adwick-le-Street, Doncaster, S. Yorks. Note the area damaged before burial. (Photo: R.J.Klessig)

brooches which did not match and 'make-do-and-mend' with her clothing.

This project is still in progress, but we are looking forward to others which will deal with the clothing and dress accessories of Anglo-Saxons.

Acknowledgements

Thanks are due to Northern Archaeological Associates, and to the Brodsworth Estate, owners of the finds, for permission to refer to the Adwick-le-Street material. The author would also like to thank Ian Riddler (project manager: Buckland II) and Canterbury Archaeological Trust, for permission to cite the Buckland II evidence.

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Source Materials

Recent Publications

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Wild, F.C., J.P. Wild, 'Sails from the Roman port at Berenike, Egypt', *The International Journal of Nautical Archaeology* 30 (2), 2001, 211-220.

Wilson, A., 'Timgad and textile production' in: D.J. Mattingley, J. Salmon, *Economies beyond Agriculture in the Classical World,* London, 2001, 271-296.

Doctoral theses on archaeological textiles completed Spring 2002:

Jane Batcheller, *Late Roman Textiles from Karanis, Egypt: an investigation into the characterization of archaeological textiles,* University of Manchester, UK.

Lena Larsson Lovén, *The Imagery of Textile Making. Gender and status in the funerary iconography of textile making in Roman Italy and Gaul,* Göteborg University, Sweden.

Fabienne Médard, *Les Activités de filage sur les sites néolithiques du plateau Suisse. Système technique de production du fil dans son contexte économique et social,* Université de Paris X- Nanterre, France.

Shishlina, N. (ed.), *Textiles of the Bronze Age Eurasian Steppe,* Papers of the State Historical Museum, Vol. 109, Moscow, 1999. ISBN 5-87317-068-1.

Russian, with English summaries.
Distributed outside Russia by the University of Pennsylvania Museum.

The collective monograph explores various aspects of textile production and use by the nomadic inhabitants of the Eurasian steppe region during the Bronze Age. The material comes from recently excavated kurgan burials of Kalmykia, but also includes the earlier finds, now conserved in the National Historical Museum in Moscow and the Kalmyk Institute of Humanitarian and Applied Research. The region, which encompasses the European part of the steppes of Northern Caucasus, the lower Urals, and Caspian and Black Sea littorals, was at the intersection of various nomadic groups during the Bronze Age, among them pit-grave, catacomb and North Caucasian cultures. The material presented in the volume includes actual textiles and mats, imprints of cords, bands and woven textiles on ceramics, and tools related to textile production (spindle whorls, knitting needles, combs). The technical analyses have shown that the major raw material for the early textiles seems to have been plant fiber of various species, with wool coming into use only during the Middle Bronze Age. There does not seem to be much evidence for the presence of large looms, which may be explained by the nomadic way of life of the steppe people. The importance of textiles for the steppe cultures of the Bronze Age cannot be underestimated and future research will explore the differences in practice of various cultural groups and the spread of technologies associated with the use of wool.

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News in Brief

Textilmuseum Neumünster geschlossen

Nach fast 40 Jahren hat das Textilmuseum Neumünster seit dem 01.01.2002 seinen Betrieb im Museumsgebäude Parkstraße 17 eingestellt.

Im September 2001 beschloss die Ratsversammlung der Stadt Neumünster, ein neues Museumsgebäude im Zentrum der Stadt neben der Stadthalle zu bauen. Dort soll aus den Beständen des bisherigen Textilmuseums und den Sammlungen des Fördervereins Textilmuseum und Industriemuseum Neumünster e.V. ein neues Museum eingerichtet werden, in dem die Geschichte der Weberei von den Anfängen bis in das Industriezeitalter dargestellt wird.

Im Mittelpunkt stehen die bisherigen Abteilungen 'Frühgeschichte des Webens' und 'Die Entwicklung der Webtechnik' sowie die Tuchherstellung in Neumünster im 19. und 20. Jahrhundert.

Klaus Tidow

ETSG 2002: 6-8.9.02. 11th Biennial Conference, Ashburne Hall, University of Manchester

Tapestry Weaving Techniques before 1500 AD

The theme of this year's weekend conference of the Early Textiles Study Group offers an opportunity to consider the many forms and use of the technique over a broad spectrum of time and in many parts of the world. The ancient textiles of South America will feature for the first time in an ETSG conference, in three papers including that of the guest speaker Ann P. Rowe (The Textile Museum, Washington). Other papers will look at Ancient Egypt, Classical Antiquity and Medieval Europe. There will be an afternoon visit on Saturday 7th September to the Whitworth Art Gallery to see relevant textiles in the reserve collections. Booking forms and details can be obtained from Frances Pritchard, Dept. of Textiles, Whitworth Art Gallery, Oxford Road, Manchester M15 6ER.
<Frances.Pritchard@man.ac.uk>

Medieval Dyestuffs and Dyeing: 13-14.7.02, London and Reading.

The Medieval Dress and Textile Society are holding a two-day conference and dyeing workshop on 13th-14th July, 2002, at the Courtauld Institute of Art, London and the

University of Reading. Its purpose is to explore the practical and theoretical aspects of the study of dyestuffs and dyeing in the Middle Ages, and to encourage cross-disciplinary debate. Speakers and demonstrators include practising dyers, plant scientists, chemists, conservators, art historians and archaeologists. Booking forms from Anna Buruma, 67 Landseer Road, London N19 4JR.
Web-Site: www.medats.cwc.net

Dyes in History and Archaeology: 10-12.10.02, Avignon and Lauris, France.

The 21st annual meeting on Dyes in History and Archaeology will take place on 10th-12th October, 2002, at Avignon and Lauris, France, organised by Pr Claude Andary (Laboratoire de Botanique et Phytochimie, CNRS), Dr Dominique Cardon (CNRS) and M Michel Garcia (Association Couleur Garance).

Information and registration forms are available at:
http://ghhat.univ-lyon2.fr/ciham/

I Simposium Internacional sobre Textiles y Tintes des Mediterráneo en Época Romana: Ibiza, 8-9.11.02

An international symposium on textiles and dyes in the Mediterranean Roman World will take place on Ibiza, 8-9 November 2002, under the direction of Dra Carmen Alfaro Giner (Universitat de València) and Dr Benjamín Costa (Museo Arqueològic d'Eivissa i Formentera). Papers, covering a broad range of topics concerning textile and dye production and recent finds and research, in the Mediterranean area and beyond, will be given in Spanish, French and English. For further information, contact: Estíbaliz Tébar, Facultad de Geografía e Historia, Departamento de Historia Antigua (Universitat de València), Blasco Ibáñez, 28, 46010 - VALENCIA (España).
<Carmen.Alfaro@uv.es>

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The *Archaeological Textiles Newsletter* aims to provide a source of information relating to all aspects of archaeological textiles. Archaeological textiles from both prehistoric and historic periods and from all parts of the world are covered in the *ATN*'s range of interests.

1. Contributions can be in English, German or French.

2. Contributions may include announcements and reviews of exhibitions, seminars, conferences, special courses and lectures, information relating to current projects and any queries concerning the study of archaeological textiles. Bibliographical information on new books and articles is particularly welcome.

3. Accounts of work in progress. This general category includes research/activities related to archaeological textiles from recent excavations or in museums/galleries. Projects may encompass technology and analysis, experimental archaeology, documentation, exhibition, conservation and storage. These contributions can be in the form of notes or longer feature articles.

4. Please send submissions in hard-copy, typed, form (lines not justified). (An accompanying disk in Word would be welcomed.) References should be in the Harvard system (eg Smith 1990), with bibliography at the end.

5. Line drawings and photographs are accepted, but must be originals of high reproduction quality. Artwork should not be mounted or incorporated into text. Captions, please !

6. The Editorial Board reserves the right to suggest alterations in the wording of manuscripts sent for publication.

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