



FIG. 1

- A. THE LIGHT WARP THREADS SEEN ON THE FACE OF THE FABRIC; THEY PASS REGULARLY UNDER AND OVER ONE THREAD OF THE MAIN WEFT, C, AND AT THE SAME TIME OVER TWO THREADS OF THE SECONDARY WEFT, D.
- B. THE DARK WARP THREADS, NOT IN USE ON THE FACE, BUT ALSO INTERWOVEN WITH THE MAIN WEFT, C.
- C. THE MAIN WEFT THREADS WHICH ARE INTERWOVEN WITH THE WARPS, A AND B.
- D. THE SECONDARY WEFT WHICH NEVER APPEARS ON THE FACE OF THE FABRIC NOR ON THE BACK, BUT LIES BETWEEN. A SINGLE THREAD OF THE SECONDARY WEFT MAY BE SEEN NEXT EACH THREAD OF THE MAIN WEFT, C.
- E. SECTION OF THE FABRIC INTACT, SHOWING CLOTH WEAVE MADE BY LIGHT WARPS, A, AND MAIN WEFT, C. IN THIS AREA THE DARK WARPS, B, ARE CARRIED ON THE BACK, AND THE SECONDARY WEFT, D, IS HIDDEN BY THE LIGHT WARPS ON THE FACE.
- F. SECTION WITH LIGHT SURFACE WARPS, A, REMOVED, SHOWING SECONDARY WEFT THREADS, D, AND THE PLACE WHERE THE DARK WARPS, B, INTERSECT THE MAIN WEFT, C.

NOTES ON THE WEAVES OF A GROUP OF SILK FABRICS
FROM THE BURIAL MOUNDS OF NOIN-ULA NOW
IN THE PENNSYLVANIA MUSEUM OF ART,
PHILADELPHIA

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THE earliest patterned silks which have as yet come to light are those discovered by Sir Aurel Stein in Lou-lan, Turkestan, which date from the first or second century A. D.² The designs of these fabrics usually show fantastic animals set in elaborate scrolls, and the weave is not only complex but it is unique (Frontispiece). A study and comparison of the weaving of the Lou-lan silks with the figured silk textiles found at Noin-Ula brings out the interesting fact that both are of the same extraordinary technique. Certain pieces from the Noin-Ula excavations are now in America . . . in the Pennsylvania Museum of Art, Philadelphia, and in the Textile Museum of the District of Columbia, Washington; this fortunate circumstance has made it possible to include here a description of the weaves of these fabrics, and analyses of several of the examples. The pieces illustrated are duplicates of some of the silks reproduced from the Russian study of the textiles from the burial mounds of Noin-Ula (Pls. 2, 3, 4, 6, 7, 8, 9.).

The Mongolian textiles in the Pennsylvania Museum represent two different types of weaving. In the group that is of the same technique as the Lou-lan silks, the designs are made by the warp threads, and only the warp threads are visible on the face of the fabric, for the wefts

¹ This article has been compiled from notes on the Lou-lan and Noin-Ula silks made by Nancy Andrews Reath before her untimely death. The description and analyses of the weaves follow her method of classification defined in *The Weaves of Hand-loom Fabrics*, The Pennsylvania Museum, 1927.

² Sir Aurel Stein, *Innermost Asia* (Oxford, 1928), Vol. I, Chapter VII, Section III-VI, Vol. III, Pls. XXXIV-XXXVI. See also, F. H. Andrews, "Ancient Chinese Figured Silks," *The Burlington Magazine*, Vol. XXXVII, pp. 3-10, 71-77, 147-152. Andrews includes a brief description of the weaves of these silks from Lou-lan, most of which he calls "warp rib." His diagram of the weave is incomplete.

are concealed by the warps³ (Pls. 3, 6, 7). We might therefore expect the weave to be some form of satin or warp twill, but examination shows that the fabrics are a complex type of cloth weave in which there are several warps of different colours and two wefts. The weaving is very fine, and it is necessary to use a magnifying glass in order to see that the warp threads pass regularly under and over the main weft. The second weft is not interwoven with the warps, and it does not appear on either the back or the face of the fabric, but lies between. It is arranged in such a way that each thread of the main weft is separated from the next by one thread of the secondary weft, and the warps therefore pass *under* one main weft thread and *over* one main and two secondary weft threads (Fig. 1). The function of this secondary weft is to reinforce the fabric and to lengthen the float of the warps on the surface of the fabric. Since the warps are interwoven only with the main weft, it is the intersections of these threads that determine the basic form of the weave. Fabrics of cloth weave in which more warp shows on the surface than weft are sometimes called "warp cloths," and those in which more weft shows are known as "weft cloths." In the history of weaving warp cloths are rare, but weft cloths are fairly common, and examples have even been found among early silks.⁴ The ribbed appearance of the face of the Noin-Ula fabrics may be due to a difference in the size and number of the threads or to the use of the secondary weft. The weave of these silks has not been noted among later textiles, and its elaborate and unusual form is evidence of the highly developed technique practiced in the East in this very early period.

Another form of weaving characterizes certain other silk textiles found at Noin-Ula (Pl. 9). This type is of gauze weave in which certain of the warp threads, before the insertion of a line of weft, cross over adjoining warps, and are then held in place by the weft. Spaces usually appear between the groups of crossed warps and between the lines of weft, making the fabric an openwork material. Gauzes have always been much used in the Far East for costume material, but these early examples are remarkable for the exceeding fineness of their weaving.⁵

³ The problem of deciding which is warp and which weft is resolved by the existence of selvages on some examples; see Frontispiece and Pl. 6.

⁴ R. Pfister, *Etudes d'orientalisme*, Musée Guimet, (Leroux, 1932), Pl. LI, with design of lions; Pl. LI, vases and rams' heads; Pl. LII, beads and squares; Fig. 63, crescents within a beaded circle. These weft cloths have been attributed by Pfister to Sasanian Persia, third century, A.D.

⁵ It is interesting to note that many modern dish cloths are coarse examples of a simple form of gauze weave.

TECHNICAL ANALYSES OF EXAMPLES

No. 1, Pl. 3.

Plain compound cloth (III).⁶

Chinese, Han Dynasty (206 B. C.—220 A. D.)

Pennsylvania Museum of Art ('34-2-2), Philadelphia

Description: Dark red ground. A heron in tan outlined in brown standing on a large scroll in brown outlined in tan; at lower end of scroll, a Chinese character, meaning, "prosperity ten thousand years . . ." (probably one character is missing at the beginning)⁷.

Material: silk.

WEAVE: *Warps:* (1) dark red; (2) tan (originally white?); (3) brown (originally green?).

Wefts: (1) main weft . . . brown; (2) secondary weft . . . brown.

The whole of the fabric, both background and design, is in the same cloth weave. More warp shows on the surface than weft, and this type is sometimes called "warp cloth." The red warp crosses regularly under and over the main weft to make the ground; the tan and brown warps are brought to the surface, one at a time, and are similarly interwoven with the main weft to make the design.

There is a secondary weft of brown that does not bind the warp threads, but which reinforces the fabric. It lies just below the surface, and does not appear on either the back or the face of the fabric. This secondary weft serves to hide the warps when they are not in use on the face, and to lengthen the surface float of the warps, for each main weft thread is separated from the next by a secondary weft thread, so that the warps pass regularly *under* one main weft and *over* one main and two secondary weft threads (Fig. 1). In some places where the delineation of a motive requires a particular warp thread for only a short distance, it may be seen to pass under one main weft and over one main and one secondary weft; it then disappears from view and is replaced by a warp of a different colour.

NOTE: There is always one warp in use on the face of the textile and

⁶ Two other silk fabrics from Noin-Ula, now in the Pennsylvania Museum of Art (nos. '34-2-1, and '34-2-4) (Pls. 6, 7) are exactly the same in weave. The Lou-lan silk, now in New Delhi, India (Frontispiece), is also of the same technique. Excellent reproductions of larger pieces of some of these Noin-Ula silks and others from the same excavation are published in Otto Kummel, *Chinesische Kunst*, (Berlin, 1930) Pls. XLIV-LIV.

⁷ Pl. 2 reproduces an illustration of a larger piece of the same textile from the Russian study of the textiles from the burial mounds of Noin-Ula, and it seems to show the missing Chinese character. See also Pl. 49 in *Chinesische Kunst*, cited above.

two on the back: where the dark red warp appears on the face, the tan and brown warps are carried together on the back; where the tan is on the face, the dark red and brown are carried together on the back; where the brown is on the face, the tan and dark red are carried together on the back. The colours are therefore somewhat different on the back, and the design is blurred, although its main outlines can be seen.

The weave of the back is similar to the face, for the warps carried on the back cross under one main weft and over one main and two secondary weft threads. The intersections of these warps with the main weft cannot be seen on the face of the fabric, because they are covered by the float of the warp that is in use on the face. In Fig. 1 a section of the fabric is shown with the surface layer of the material removed so that these intersections may be seen.

All the threads of warp and weft appear to be untwisted; the weave is extraordinarily fine . . . for example, there are 22 weft threads (10 main and 12 secondary) in $\frac{1}{4}$ of an inch.

Size in metres: (of the piece) Length 0.091, Width 0.058; (of the Chinese character) Height 0.016.

No. 2, Pl. 9.

Fancy Gauze (313)⁸

Chinese, Han Dynasty (206 B. C.-220 A. D.)

Pennsylvania Museum of Art ('34-2-6), Philadelphia⁹

DESCRIPTION: Repeats of a small triple lozenge motive in cream colour, on a cream coloured ground.

Material: Silk.

WEAVE: *Warp:* cream colour.

Weft: cream colour.

In the background of this fabric two adjoining warps cross each other before the insertion of a line of weft. The pattern of triple lozenges is made by variations in the crossings of the warps, and by grouping them close together.

NOTE: Weaving extremely fine.

Size in metres: (of the piece) Length 0.08, Width 0.05.

⁸ A fancy gauze is a fabric of gauze weave in which a pattern is produced either by variations in the crossing of the warp threads, or by grouping of the weft threads, or by a contrast between areas of gauze and areas of cloth, twill, or satin. The pattern produced may be elaborate, or it may be merely of ribbing.

⁹ Another example in the Pennsylvania Museum of Art ('34-2-7b) is the same in weave and in design, but the colour is different, for it was smoothed out and dyed (after it was found), apparently with the original cinnabar dye.