

TEXTILES FROM AT-TAR CAVES: PART II-(2): CAVE 16, HILL C

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Foreword

This is to report on a rush mat which has been uncovered at Cave 16, Hill C, following the report on the eight pile textiles from Cave 16, Hill C which was printed in the preceding volume of this journal, *al-Rāfidān* Vol. XI, 1990: pp. 45–65, Pls. 1–3, and also the report on their representative colors and materials which were analyzed by Fibers & Textiles Laboratories, Toray Industries, Inc. [*al-Rāfidān* Vol. XI 1990: pp. 69–79, Pls. 1–13].

The location of Cave 16, Hill C, structure, deposits, excavated situation of the textiles and other archaeological goods uncovered there have already been treated by Mr. Ii in his report “Excavations at at-Tar Caves, The Fifth Working Season: Cave 16, Part 1” in Japanese [Ii 1986: pp. 1–21, Pls. 1–8]. Moreover, the excavated situation of the rush mat, which is the main subject of this article, has been detailed in the above report [p. 11; p. 9, Fig. 7; p. 10, Fig. 8].

As you see in the report and the figures, Textile 51, the rush mat, (Representative Specimen No. V-134-1 and the other twelve specimens which are observed to come from an identical origin) was unearthed in the double-folded state at the place close to the south opening in Room 2, where the rush mat was discovered on the rock body whose rugged surface had been horizontally leveled with small size of rock body gravel. Furthermore, a pile textile was found laid out on top of the rush mat, and still directly on top of the pile textile, some other textiles, archaeological relics stemming from the buried and some human remains were seen scattered at random (Pl. 1a).

In addition, there are some other examples, such as the ones from Room 2, Cave 17, Hill C and Room 2, Cave F6, Hill A, which can be identified as the ones containing the relation of the excavated location between the rush mat and the pile textile so clearly as this example. The specimen No. F6-C-37-4 (Pl. 1c, Fig. 3), which was uncovered at Room 2, Cave F6, Hill A, is almost similar to Textile 51 in material, weave structure and design of the rush mat. The top and bottom of its chequer design are symmetrically arranged with stripe patterns.

By the way, in making some remarks about the usage relation between the rush mat and the pile textile seen among the Iraqi private houses at the present day, it is customary for the people to put the rush mat first on the floor, and then spread the pile textile on top of the rush mat when they use both at the same time in their daily life. Such being the situation, is it impossible for us to presume that the usage relation of the pile textile top and the rush mat bottom at at-Tar Caves affords a proof to back up the buried's daily practice while alive?

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Textile 51 Rush mat with chequer design:

Representative Specimen No. V-134-1 (Pl. 1b, Fig. 2)

This is a mat which has been woven with the use of rush for the weft. In the meantime, a set of relatively thick warps is used for the warp, by making either a single grandrelle thread [Fujii and Sakamoto 1990: p. 59], which is plied with sheep yarn and cashmere yarn together, or a single cashmere thread, which is plied with cashmere yarns only and is nearly as thick as a single grandrelle thread, into triple warp threads placed in parallel. And the set of the rather thick warps is interworked with a single rush weft by turns.

The use of the technique that a set of triple warp threads is arranged in parallel for the warp is probably because the weaver must have sought for toughness to be secured on the rush mat of one's own making in order to use it as a rug or the like. Moreover, one may have paid attention to the following things: If a plain weave is done by putting the rush weft in high density into a single warp, it will make the mat face liable to damage with the rush refracting angle getting sharper. Hence, to avoid this, the method of triple warp threads placed in parallel will lead to the decrease in repetition of the warp-and-weft crossings, thereby resulting in the decrease in the rush refracting angle. And the mat face will get smoother (Fig. 1a).

As already stated in the examples of pile textiles—sheep fiber and camel fiber: Textile 17, Cave 12, Hill C [Fujii, Sakamoto and Ichihashi 1989: p. 137, p. 164]; sheep fiber and cashmere fiber: Textile 5, Cave 16, Hill C; sheep fiber and alpaca fiber: Textile 8, Cave 16, Hill C [Fujii and Sakamoto 1990: p. 63, p. 65; Fibers & Textiles Laboratories, Toray Industries, Inc. 1990: p.70.] —, they have used the grandrelle threads of different materials for the warp. In this connection, there are some differences in properties between sheep fiber and the other beast fibers, characterizing that sheep fiber is more elastic and larger in milling than the others, while the other beast fibers are less elastic and smaller in milling than sheep fiber [Fujii and Sakamoto 1990: p. 48]. It is, therefore, figured out that the grandrelle thread in which sheep yarn and cashmere yarn are plied together just as in Textile 51 will help to minimize the change in size. For the above

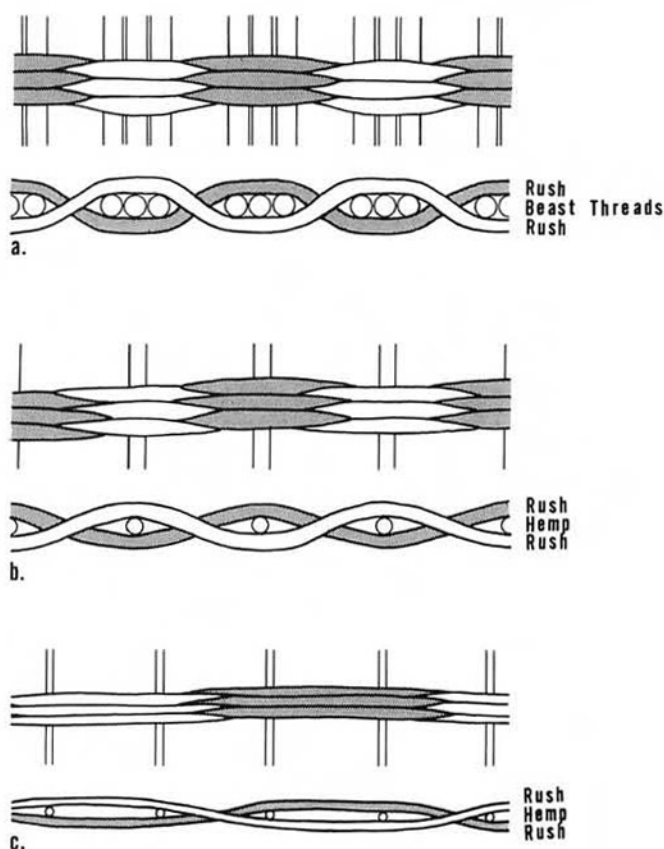


Fig. 1 a. Textile 51: Specimen No. V-134-1, Cave 16, Hill C
b. MESEKIORI: Rush Mat, Matting in Japan
c. MOROMEORI: Tatami-facing in Japan

reason, this kind of grandrelle thread is thought to have been used for most of the warp threads with a view to preventing the rush from going out of shape.

Owing to the bad damage, we failed to identify the weave start and weave finish of this large mat. However, we were very happy to confirm a warp knot (of the grandrelle thread) by means of the fringe type [Fujii, Sakamoto, and Ichihashi 1989: p. 115], which is often seen in the warp finish, surviving sewn inside the cloth for selvage protection. This is the place of starting border or finishing border of warp threads, and there is a chequer design band of 2.65 cm in width running about 15 cm inside from there. The design band consists of the horizontal stripes of dark grayish brown and pale reddish yellow on top and bottom each, between which dark grayish brown and pale reddish yellow chequers are arranged in three rows (Pl. 1b, Fig. 2).

As for its selvage, the rush weft is seen making a U-turn with the use of the selvage-making method Type 1 [Fujii, Sakamoto and Ichihashi 1989: p. 116] around a core of a single cord which is composed of a bundle of forty cashmere z-twisted threads. Furthermore, we see the sheep thread plain weave cloth (V-134-1-a) of 6.0 cm in width and 1.4–1.6 mm in thickness folded over 3 cm each on both surfaces of the

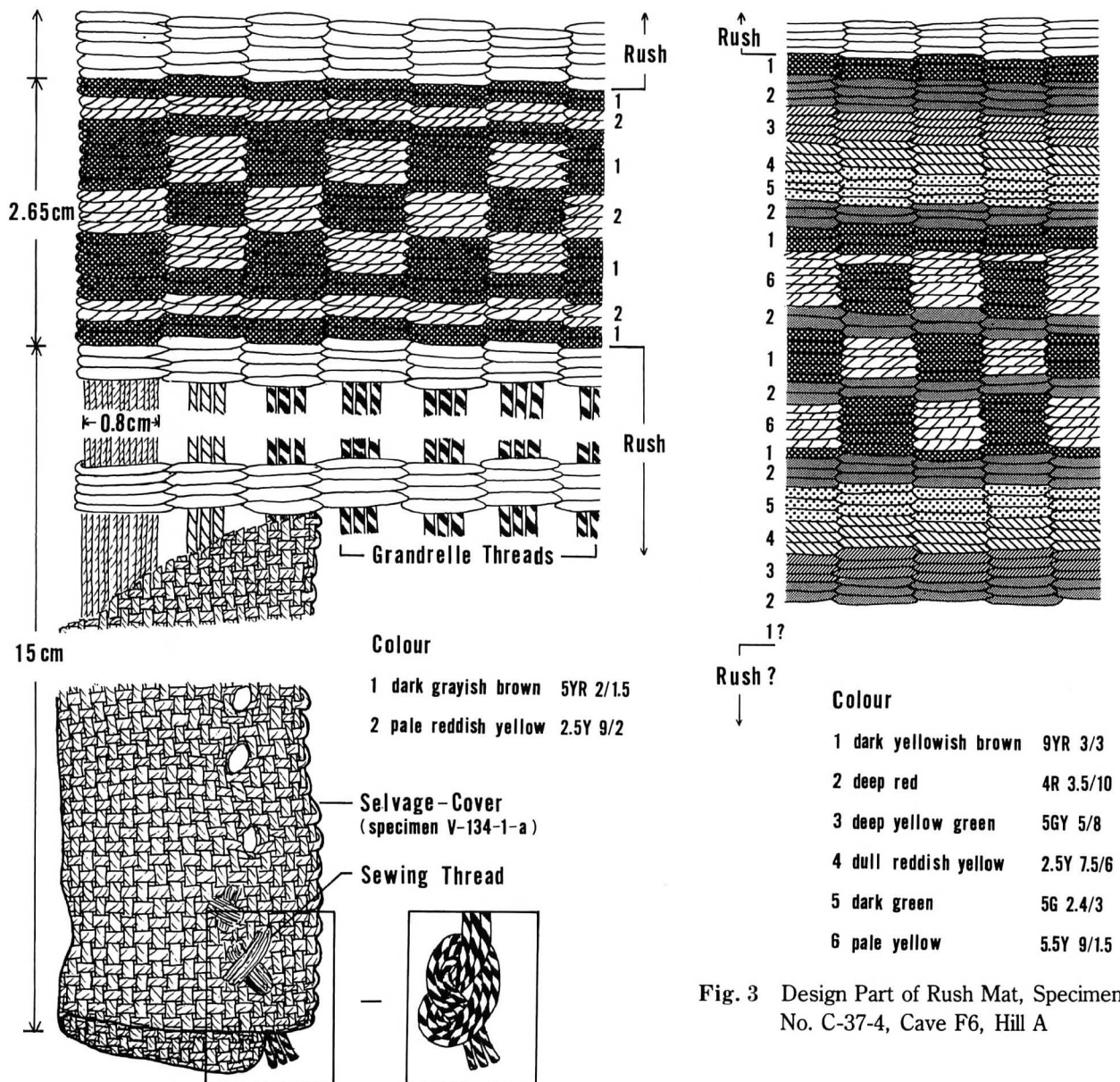


Fig. 2 Design Part, Specimen No. V-134-1 and Selvage-Cover, Specimen No. V-134-1-a, Cave 16, Hill C

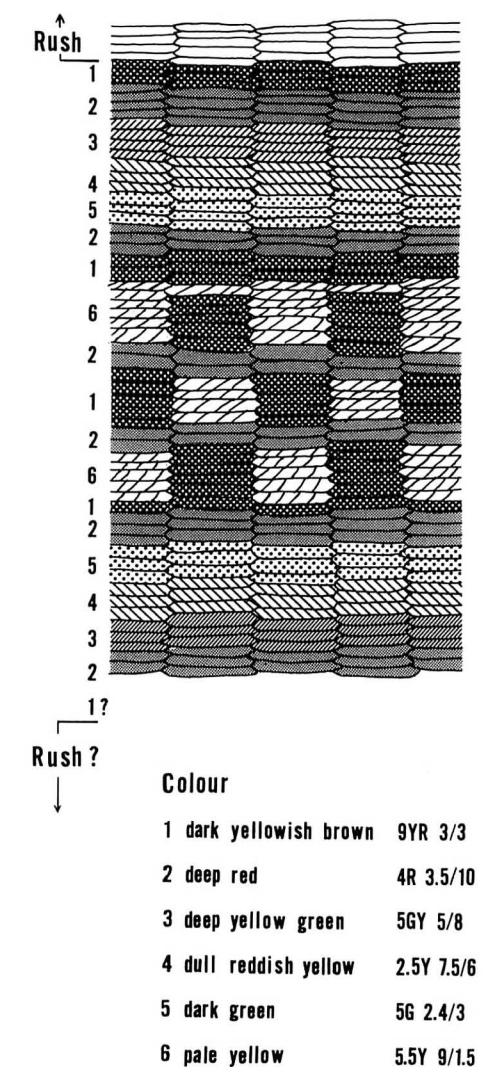


Fig. 3 Design Part of Rush Mat, Specimen No. C-37-4, Cave F6, Hill A

cloth, just like covering the vertical direction of the very selvage. And the cloth is noticed to have been stitched up along the inside of the selvage at an interval of 3–5 mm between seams by using the dark grayish brown goat fiber sewing thread of 2.0 mm in diameter.

Another specimen comparable with the above has been uncovered at Cave F6, Hill A (F-6, C-37-4). In comparing this with Textile 51, it is observed that grandrelle thread is used for the warp more frequently than in Textile 51. Moreover, in the case of C-37-4, triple warp threads placed in parallel have been interlaced with a single, slightly slender rush weft in high density here. To our regret, however, we were unable to identify the selvage, weave start or weave finish of the specimen C-37-4 due to the bad damage. But, roughly speaking, its weave structure was noticed to be similar to that of Textile 51. With regard to the design band of C-37-4, in spite of its having a chequer design, six-colored stripe patterns are arranged symmetrically on top and bottom of the chequer design unlike Textile 51 which has two-colored stripe patterns in it, as shown in the illustration (Pls. 1b, 1c, Figs. 2, 3).

List of the Data on Rush Mat from Cave 16, Hill C

Explanatory notes

The following textile data indicate the analyses based on the research method specified in Chapter I, Textiles from at-Tar Caves Part 1: Cave 12, Hill C [*al-Rāfidān* Vol. X, pp. 110–112]:

1. The Textile number (e.g.: textile 51) indicates an identified series of fragmentary specimens, of which the representative one is best-preserved and most characteristic. And each fragmentary specimen has its own registered number given at the time of its excavation.
2. 'Size' is determined by "the maximum length of warp direction×the maximum length of weft direction".
3. 'Thickness' is given by "Peacock dial thickness gauge, H 0.01–10 mm (OZAKI MFG. Co., Ltd.)".
4. The color of all the textiles is chiefly given to its representative specimen in accordance with 'Jacal color cards 220', following the signs shown in the revised Munsell Table. But, markedly discolored representative specimens are replaced by some other better preserved ones from among fragmentary specimens for naming, if available.
5. 'Thickness, diameter, twist count and thread density' are shown with their minimum-maximum values. 'Diameter' shows the the thread diameter measured with the 25-fold magnifier (Monocular 8×30, Asahi Pentax).
6. The weft density in the case of two or more wefts used at one shed is indicated as follows: It is shown by the number of shed and the weft number which is passed at a single opening operation. For example, the data description is: (12–14)×2/cm; the figures in the parentheses show the minimum-maximum values at the spots where the frequencies of shed are measured. '×2' means paired weft; '×3' means three wefts. And the multiplied value is equivalent to the actual number. In the case of double or more warp threads in parallel, the warp density is indicated as the ones mentioned above.
7. The thread number of selvage cord is so arranged as to start from the selvage edge in regular order.
8. When a selvage or an edge is observed in the fragmentary specimen, its detail and specimen No. are additionally written.
9. The figures and photos shown here all accord with the warp direction, and the textiles with edges and pile knots clearly identified are positioned with their weave finish up and weave start down in warp direction.
10. The description of 'raw material' of beast fibers entered in the report has conformed to the analytical results of Fibers & Textiles Laboratories, Toray Industries, Inc.

Textile 51: Rush mat with chequer design

Representative specimen: Registered No.: V-134-1

Size (cm): 43.0×28.0

Structure: Ground Variation of plain weave, warp 3, weft 1, weft-faced

Design Variation of plain weave, warp 3, weft 1, weft-faced

Design: Chequer

Thickness (mm): Ground 3.72
Design 5.00–5.30

Warp (1)

Triple warp threads
in parallel

Warp (2)

Triple grandrelle threads
in parallel

Warp (3)

Selvage cord

Raw material: Cashmere

Cashmere Sheep

Cashmere

Color: Pale yellow

Pale yellow Dark brown

Pale yellow

5.5Y 9/3

5.5Y 9/3 5YR 2.4/4

5.5Y 9/3

Diameter (mm): 0.90–1.50

0.80–1.40

0.70–0.90

Twist, Twist No. (/cm): $\begin{matrix} Z \\ \diagup \end{matrix} S(2.0)$ $\begin{matrix} Z \\ \diagup \end{matrix} S(2.0)$

—Z(5.0)

Density (/cm): 1.1×3

1.1×3

Selvage:

Type 1, Cord 1
(40 threads)

Weft

Weft (1) Chequer

Weft (2) Chequer

Raw material: Rush

Common goat

Sheep

Color: Dull reddish yellow

Dark grayish brown

Pale reddish yellow

2.5Y 7.5/6

5YR 2/1.5

2.5Y 9/2

Diameter (mm): 1.30–2.00

0.90–1.10

0.80–1.00

Twist, Twist No. (/cm): —

—S(2.0)

—S(2.0)

Density (/cm): 9.0–10.0

14.0

14.0

Remarks

The ground has a composition of a set of three warp threads with a single rush weft. Such a selvage making method as putting forty cashmere threads together into a core, seen here, results in facilitating the smooth U-turn of the rush weft around the selvage. The single cashmere thread is 0.70–0.90 mm in diameter, while a bundle of the forty cashmere threads totaling 7.0–8.0 mm in diameter.

Fragmentary specimens

V-134-1	V-134-1-a	V-29-2	V-47-22	V-51-9	V-58-10	V-73-16
V-90-11	V-95-12	V-101-7	V-103-8	V-106-5	V-107-10	

Selvage-cover

Representative specimen: Registered No.: V-134-1-a

Size (cm): 30×6

Structure: Plain weave, balanced

Thickness (mm): 1.40–1.60

Warp

Weft

Sewing thread

Raw material: Sheep

Sheep

Common goat

Color: Dull reddish yellow

Dull reddish yellow

Dark grayish brown

2.5Y 7.5/6

2.5Y 7.5/6

5YR 2/1.5

Diameter (mm): 0.90–1.20

1.00–1.20

2.00

Twist, Twist No. (/cm): $\begin{matrix} Z \\ \diagup \end{matrix} S(2.0-3.0)$ $\begin{matrix} Z \\ \diagup \end{matrix} S(2.0-3.0)$ $\begin{matrix} Z \\ \diagup \end{matrix} S(1.0-2.0)$

Density (/cm): 6.5–7.0

6.0–6.5

Selvage:

Type 1

Acknowledgements

We highly appreciate Mr. Tomitake Higuchi, Director of the Fibers & Textiles Laboratories, Toray Industries, Inc., and his colleagues for their cooperation in completing this report with fundamental material analyses of textile fibers presented in a following part of this report, as well as the Toray Science Foundation.

Our thanks are also herewith extended to Mr. Masayoshi Sadahira, Ex-Director of the Mat Rush Branch of Hiroshima Prefectural Agricultural Experiment Station, for his analysis of rush and helpful pieces of advice.

In addition, we are grateful for the helpful cooperation we obtained from Mrs. Kazumi Oguchi, Research Associate of the ICSAI, who worked with us for the drawings, and Mr. Kohji Watanabe, photographer of the Photo Service Co. Ltd., who kindly took the photographs of Pl. 1b and 1c.

We also thank Mrs. Maya Ikuma who kindly participated in the discussion for the completion of the English manuscript.

(Hideo Fujii, Kazuko Sakamoto & Mikizo Ichihashi)

Study on the Mats Discovered at at-TAR Caves in IRAQ

This rush mat (Specimen No. V-134-1, Fig. 1a) is woven with the variation of plain weave (warp 3, weft 1). Since three warps are in the state of parallel arrangement, they can be taken as a single thick warp in its weave composition. This weave method is called 'MESEKIORI' (plain weave) in Japan (Figs. 1b, 4), as the texture layer alternates with each other, with each square made by interlacing a single weft with the single warp set at regular intervals, while using the warp and the weft of different materials. This is the weave commonly seen in 'NEGOZA' (sleeping-rush mat) or some miscellaneous goods (notion) in Japan. Moreover, the at-Tar mat is also common to the 'MOROMEORI' weave (rib weave, tatami-facing) in Japan, where rush wefts are densely interworked with the two warps arranged at an equal interval, in that the warps are invisible to the naked eye on the mat surface hampered by the wefts of high density (Fig. 1c).

The plant for weft thread was identified as belonging to the genus *Juncus* due to the following characteristics observed at the Mat Rush Branch of Hiroshima Prefectural Agricultural Experiment Station:

1. The vallecule on the epidermis of the stem coming from the sclerenchyma shows the characteristics peculiar to the genus *Juncus*, viewed from the sclerenchyma among the parenchyma in the cross section of the stem, the arrangement of the vascular bundle and the asterisciform cells in the medulla.
2. The species cannot be identified.
3. As for the rush in the sample, it was supposed that

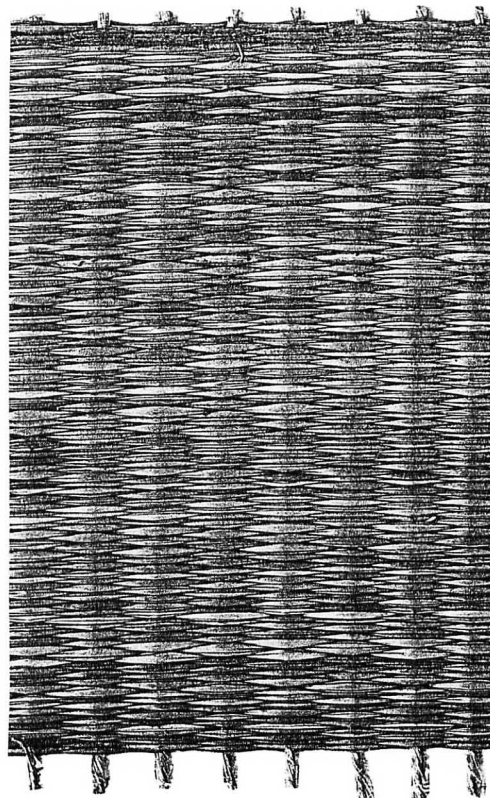


Fig. 4 MESEKIORI

the thick stems were divided into two and dried, because it was comparatively thin and the vertical tear was observed. The further observation, however, suggests that the tear was made when it was pressed.

4. Many wild rush species usually have thick stems. But this sample mat may have been woven with selected thin stems.
5. Many volunteer plants in the genus *Juncus* can be found even now in Iraq. The single inflorescence sample that was obtained from among them is regarded as either *Juncus maritimus* L. or *Juncus acutus* L., judging from the shape of the inflorescence, the vallecula on the epidermis of the stem and the arrangement of the tissue in the cross section of the stem. Neither of these species can be found in Japan.

I express my heartfelt thanks to Mr. Shinji Tagami, Researcher of the Fiber Chemistry Section of the Eastern Hiroshima Prefecture Industrial Research Institute, who kindly furnished me the microscope photographs of Pl. 2.

(Masayoshi Sadahira)

Report on the Analyses of Fibers of Rush Mats at at-Tar Caves

Given below are the results of morphological analysis attempted by us on the textiles found at at-Tar Caves. The English was kindly improved by Mrs. Maya Ikuma.

Summary

Textiles coming from at-Tar Caves:

In view of the fiber surface structure and the cross sectional structure, it has been proved that all the samples are composed of beast fibers which belong to animal fibers. Of all the beast fibers, sheep fiber, cashmere goat fiber, common goat fiber, alpaca fiber and camel fiber are in common use. The sample numbers follow those in the report that appeared in *al-Rāfidān* Vol. XI [Fibers & Textiles Laboratories, Toray Industries, Inc., 1990, p. 70, Table 1].

Analytical details

Methods:

- A. Pretreatment: The textiles were treated with ultrasonic wave washing while immersed in water, since their fiber surfaces were found soiled by lots of mud or the like.
- B. Observation of the fiber surface structure: The textiles were observed by using the scanning electron microscope after Au-Pd shadowing had been applied to their fiber surfaces.
- C. Observation of the cross sectional structure: The light microscope observation was carried out on a section of 6 μm in thickness each into which the samples were cut by Minot's microtome after they had been embedded in paraffin.
- D. Elementary analysis: Each sample was left to the analysis by means of scanning electron microscope and X-ray microanalyzer after its carbon shadowing.

Observations and consideration

Material analyses:

Pls. 3–4. show the results of photo-observation of the samples' fiber surface structures and cross sectional structures.

- a. Sample Nos. 25 (pale reddish yellow), 26'' (triple grandrelle warp threads in parallel, dark brown) and 27 (triple grandrelle warp threads in parallel, pale reddish yellow) are judged to be of sheep fiber from surface scale, cross sectional structure and thickness, irrespective of colour.
- b. Sample No. 25' (dark grayish brown) seems to be of common goat because of 1) its fiber diameter distinctly larger than those of the other beasts; 2) the dense existence of its scales in the fiber; 3) the existence of medullas in the fiber in cross sectional view.
- c. Sample Nos. 26 (triple warp threads in parallel, pale yellow), 26' (triple grandrelle threads in parallel, pale yellow) and 26''' (selvage cord, pale yellow) are composed of very fine fibers, in which there are no medullas. And they seem to be of cashmere fibers because of their more flattened scale shapes in longitudinal view compared with sheep fibers which have more crenated scale shapes.
- d. Sample No. 27' (triple grandrelle warp threads in parallel, dark brown) is regarded as the one of alpaca fiber from the irregular thickness of cross sectional view and the existence of medullas.

Table 1 Analytical Results of Beast Fibers of Rush Mats

Sample No.	Description				Material	Fiber width (μm)
	Textile No.	Specimen No.	Kind	Color of outward appearance	Beast fiber	
25	T-51	V-101-7	Weft (2), chequer	Pale reddish yellow	Sheep	18–45
25'	T-51	V-101-7	Weft (3), chequer	Dark grayish brown	Common goat	65–85
26	T-51	V-101-7	Warp (1), triple warp threads in parallel	Pale yellow	Cashmere	15–30
26'	T-51	V-101-7	Warp (2), triple grandrelle warp threads in parallel	Pale yellow	Cashmere	20–25
26''	T-51	V-101-7	Warp (2), triple grandrelle warp threads in parallel	Dark brown	Sheep	15–41
26'''	T-51	V-134-1	Warp (3), selvage cord	Pale yellow	Cashmere	20–35
27		C-37-4 F6 Cave	Warp, triple grandrelle warp threads in parallel	Pale reddish yellow	Sheep	15–30
27'		C-37-4 F6 Cave	Warp, triple grandrelle warp threads in parallel	Dark brown	Alpaca	13–30

(Fibers & Textiles Laboratories, Toray Industries, Inc.)

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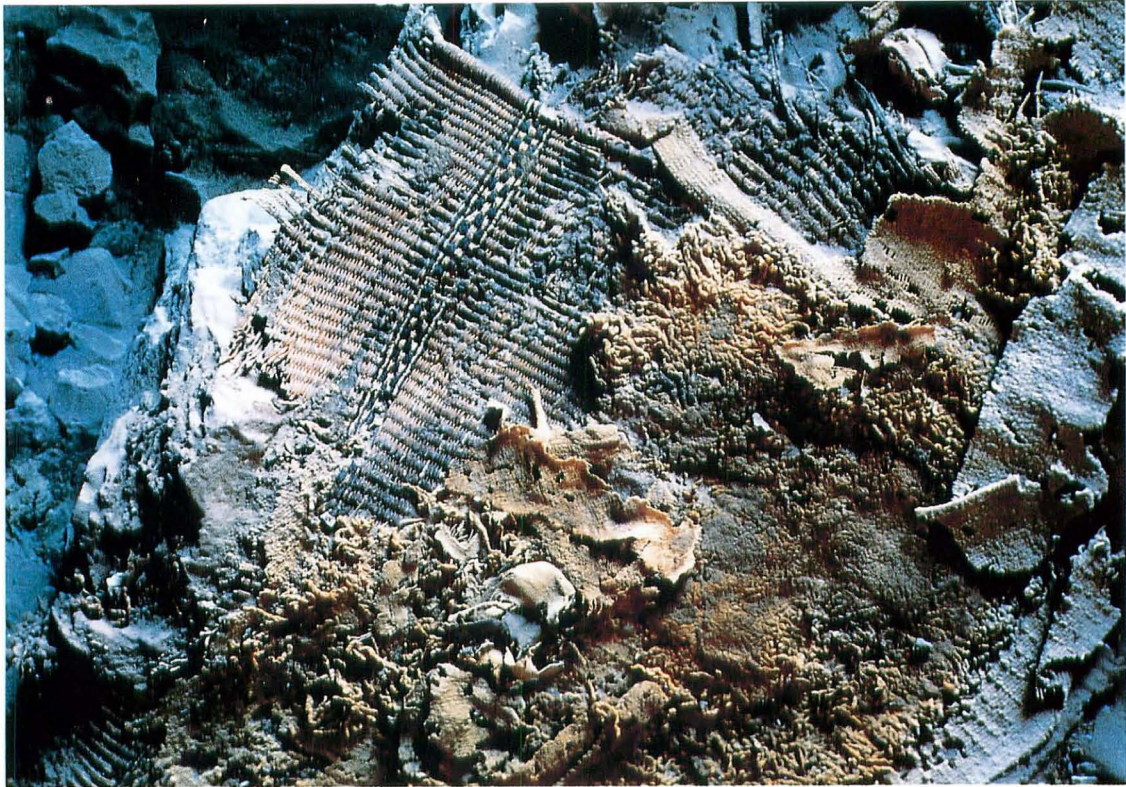
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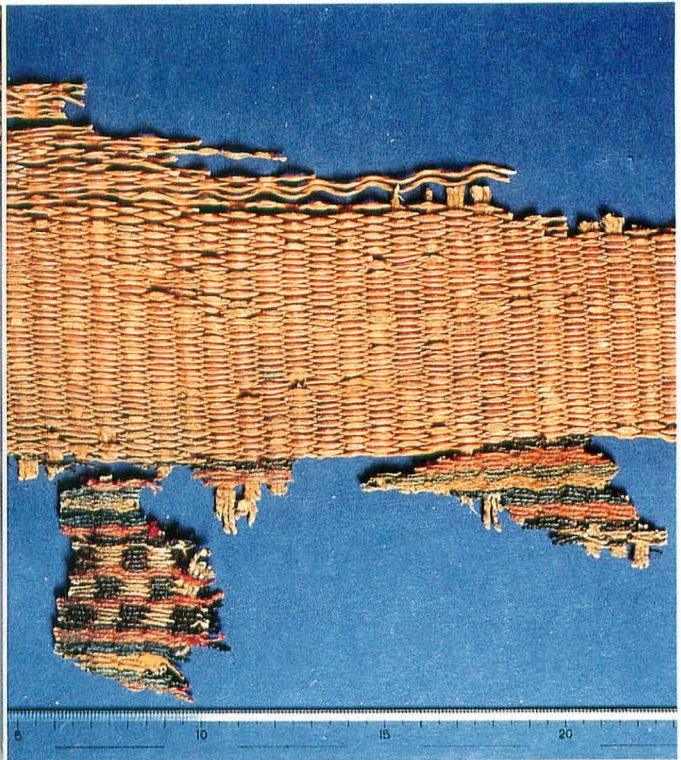
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a. Unearthed Example of the Rush Mat (Specimen No. V-134-1) Placed Under the Pile Textile.
The photo taken by Mr. Hiroyuki Ii.

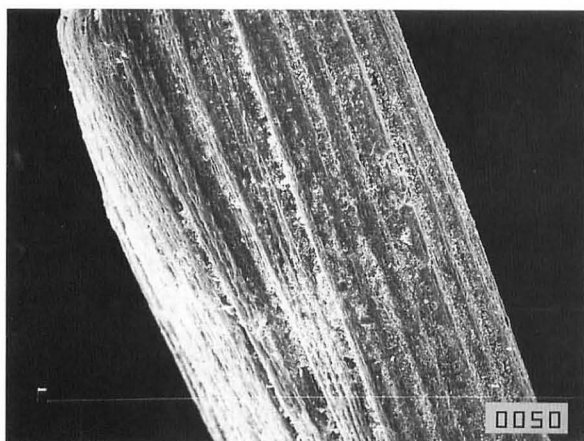


b. Specimen No. V-134-1, Cave 16, Hill C.

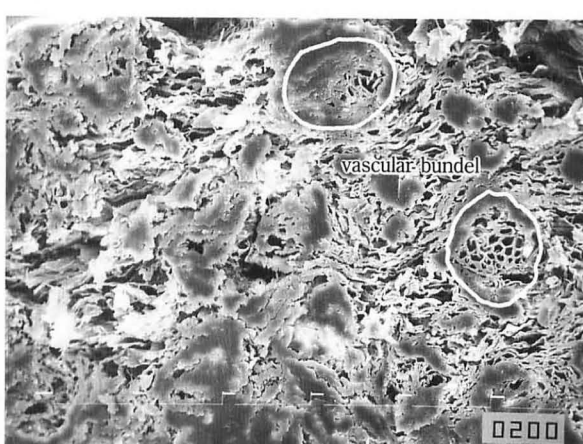
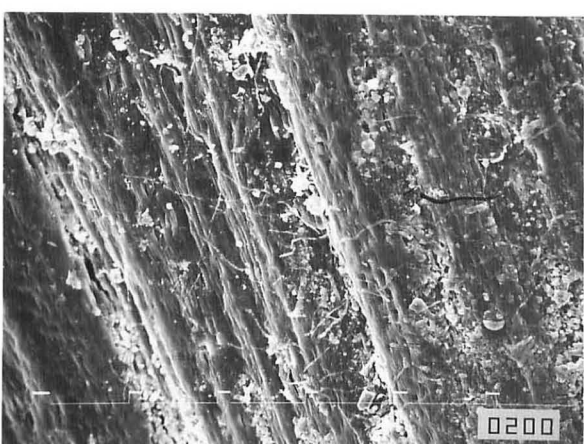
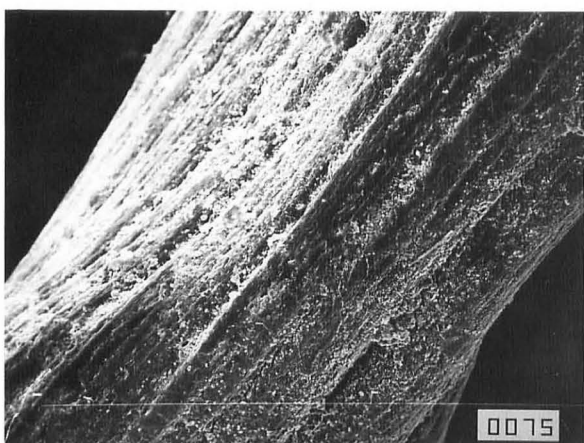
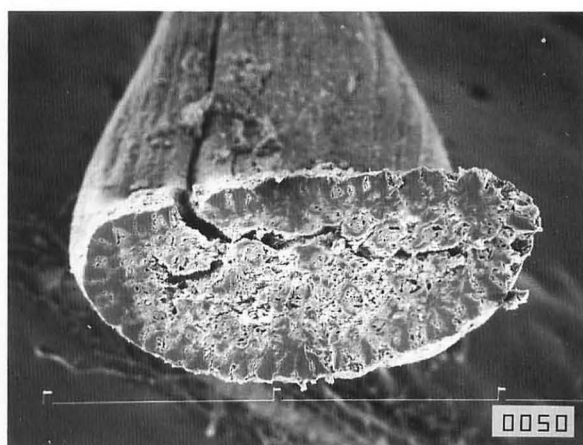
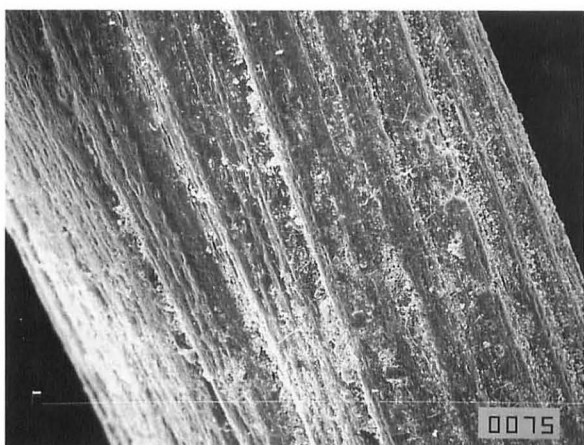
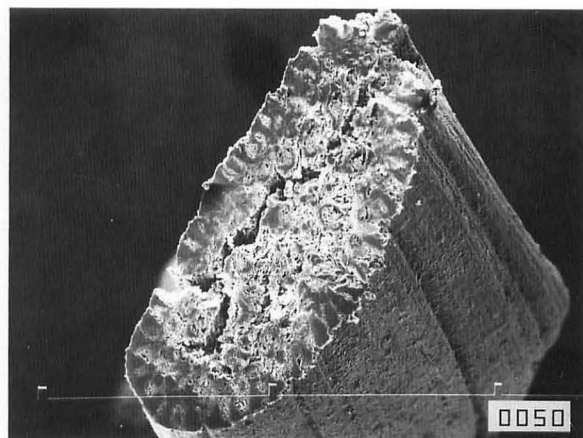


c. Specimen No. C-37-4, Cave F6, Hill A.

Surface view



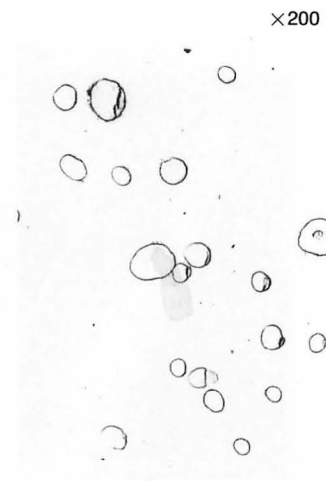
Cross section



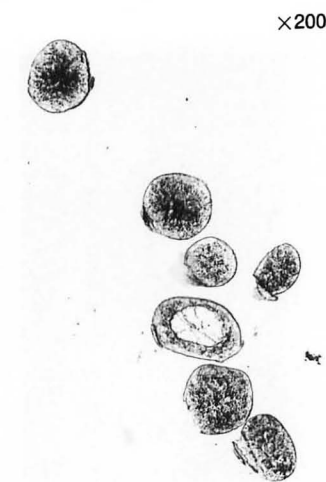
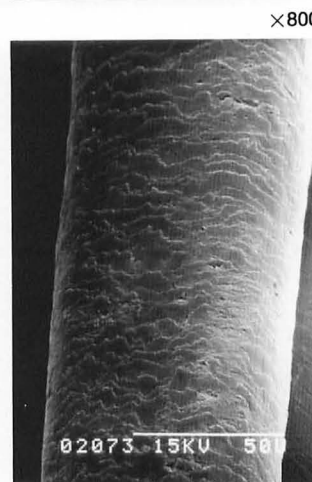
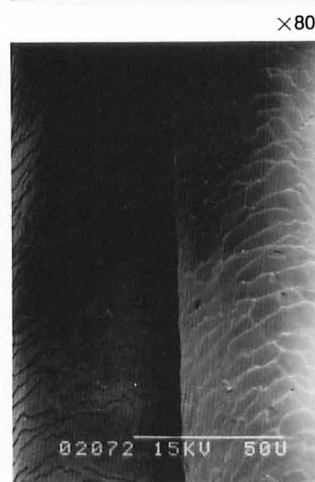
Longitudinal view

Cross section

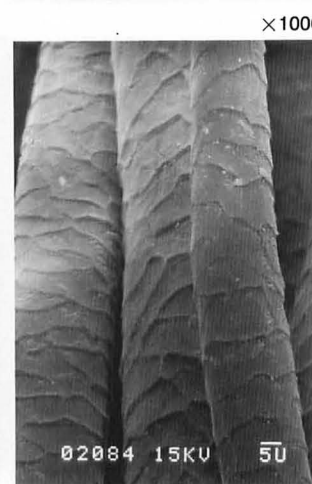
Sample 25
(Pale reddish
yellow)
Sheep fiber,
chequer.



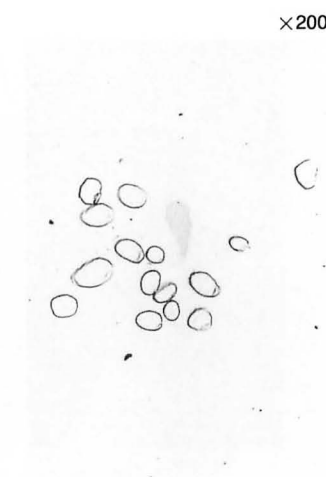
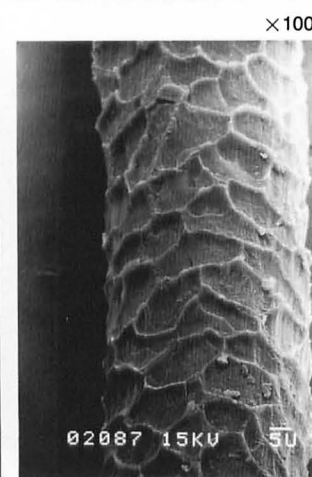
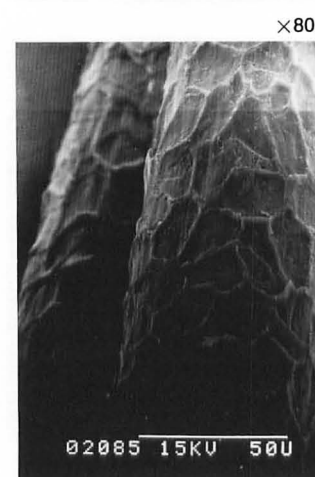
Sample 25'
(Dark grayish
brown)
Common goat
fiber, chequer.



Sample 26
(Pale yellow)
Cashmere fiber, triple
warp threads in
parallel.



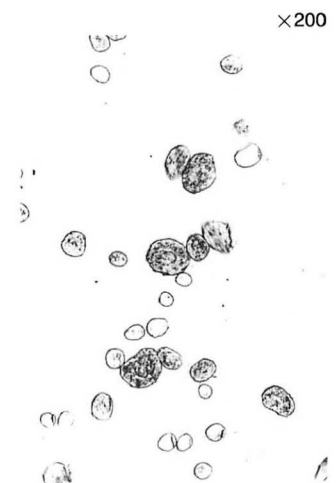
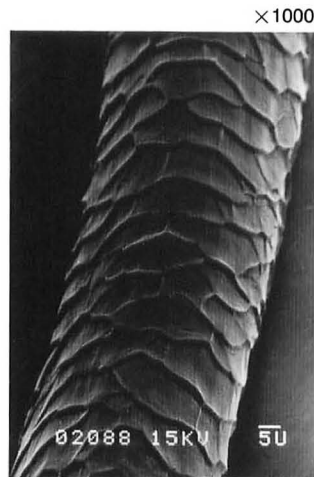
Sample 26'
(Pale yellow)
Cashmere fiber,
triple grandrelle
warp threads in
parallel.



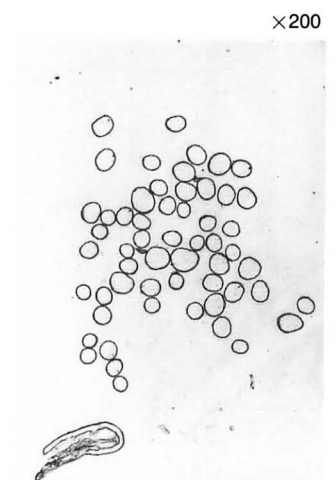
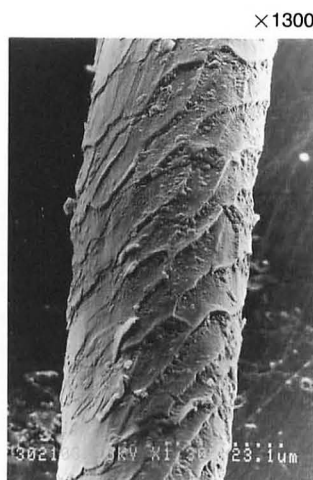
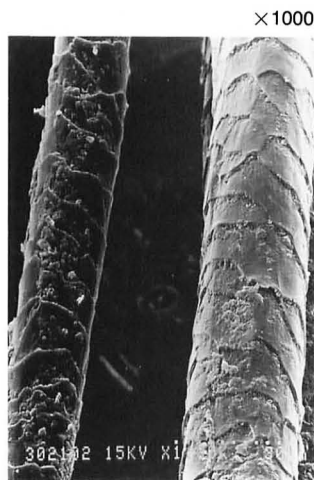
Longitudinal view

Cross section

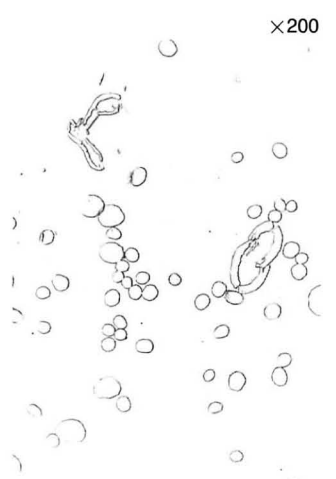
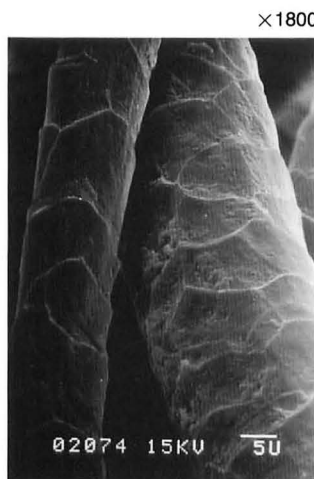
Sample 26"
(Dark brown)
Sheep fiber,
triple grandrelle
warp threads in
parallel.



Sample 26'''
(Pale yellow)
Cashmere fiber,
selvage cord.



Sample 27
(Pale reddish
yellow)
Sheep fiber,
triple grandrelle
warp threads in
parallel.



Sample 27'
(Dark brown)
Alpaca fiber,
triple grandrelle
warp threads in
parallel.

