

Cashmere

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Woolen mills in the United States manufacture annually one-quarter million pounds and more of cashmere. Genuine cashmeres became famous all over the world especially after the war because of the woolens marketed by Rodier in Paris under the trade name of "Kasha."

Textile literature offers very little information for those who are interested in cashmere. Thus, Matthew's well known work, "The Textile Fibers," contains hardly a page devoted to this subject, all other works covering the same subject give only a few lines space (for instance: Hanausek, "Microscopy of Technical Products"). Illustrations are correspondingly meagre, and make it difficult for the inexperienced to recognize cashmere readily under the microscope. It is the purpose of this article to fill in this gap to some extent.

Origin

Cashmere hair is obtained from the cashmere goat (*capra hircus laniger*) which is native in Tibet and in northern India. It is kept as a domestic animal, and once a year during molting the hair is plucked from the back of the goat by hand. It then is sorted according to its natural color, white, gray or brown. All attempts to raise the cashmere goat in other localities have met with failure. It thrives and grows the fine down only in elevations of 10,000-15,000 feet.

Travelling merchants buy the accumulated wool from the natives. They, in turn, sell the individual bundles to wholesale merchants in China who market the wool in bales of about 220 lbs.

Physical Properties

The hair cover or fleece of the cashmere goat consists of the fine down which contains coarse waves, is very soft, and has a silky gloss, the real cashmere wool; and the stiff longer hair, the beard hair. The raw wool contains

50% and more of sand and dust. The color of the hair is, as already mentioned, white, gray and brown. The chief commercial color is a mixture of grayish white and brown hairs. The beard hair is white or dark brown to black.

Length of the Fibers:

Cashmere wool hair. .1¼-3½ inches

Cashmere beard hair. .1½-5 inches

The hairs are contaminated with white scales from the skin of the animal. Figure 1 illustrates part of such a scale with some wool fibers. The scales have a fine net-like texture. The black specks on the picture are air bubbles. When exposed to the light of a quartz lamp, the cashmere hair has a bluish white fluorescence, like sheep's wool. The scales from the skin show a strong white fluorescence.

Microscopical Test:

1. Cashmere wool hair:

The hair consists of the cortical or fiber layer, and the layer of scales, the epidermis.



Figure 1

All the fibers show clearly half-cylindrical or cylindrical scales which slightly projecting beyond the cortical layer cause a serrated effect. The number of scales per 100 μ (micron) averages 6 to 7. The difference in the amount

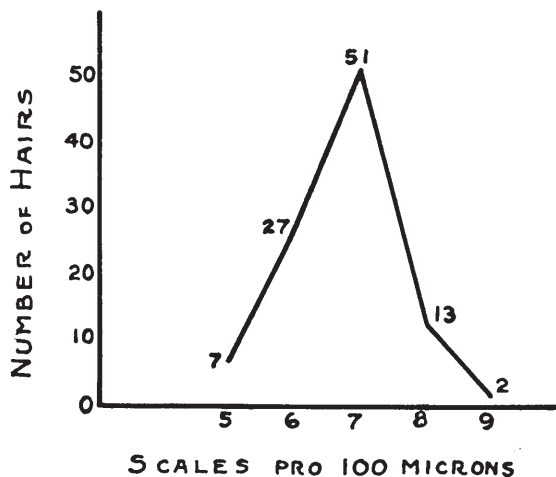


Figure 2

of scales on 100 different hairs is illustrated in the following diagram, Figure 2. The average calculated from these 100 hairs gives 6.74 scales per 100 μ .

The number of scales on sheep's wool is between 10 to 12 per 100 μ . The number of scales, therefore, is a good method for distinguishing cashmere from sheep's wool. The two microphotographs, Figures 3 and 4, clearly illustrate this difference.

The cortical layer of the white and gray hairs shows distinct longitudinal streaks with crevices between fibers, while the brown hairs are covered completely with minute dyestuff pigments (colored granules). Figure 5 illustrates three white and two brown hairs with their characteristic marks.

Fineness:

The diameter of the hair, the true indicator of fineness, is extremely regular with all cashmere wool hairs. The values, given in the following diagrams, Figure 6, prove this very well.

Measurements of the Fineness:

Number of Hairs	Average Diameter
100	15.03 μ
200	15.16 μ
300	15.08 μ

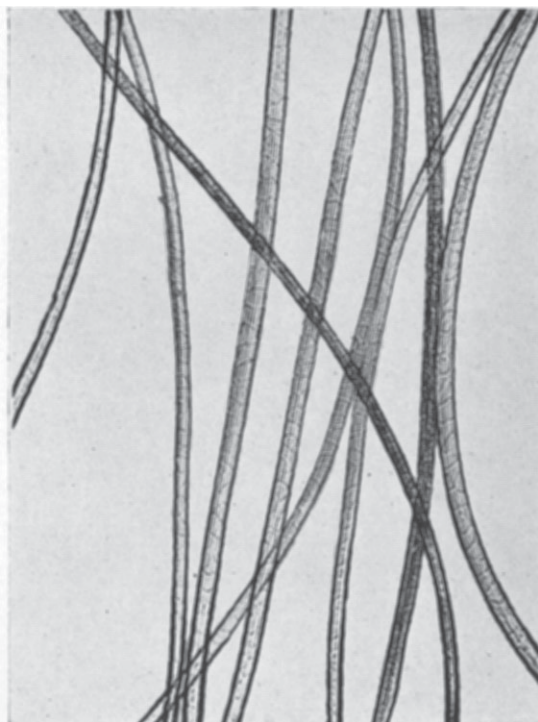


Figure 3
Cashmere. 120X.



Figure 4
Cape Wool A/B. 120X.

Since the hair is obtained by plucking it from the skin of the animal, most hair retains the root. The fibers have long fine ends which mostly, because of their fineness, are broken already on the back of the animal. The normal cashmere wool hair grows thinner towards the root as well as towards the end, see Figure 7.



Figure 5
A. White cashmere hair.
B. Brown cashmere hair.
240X.

Cross-Section :

The cross-section of the fiber practically is circular, and it is, therefore, possible to determine the fineness of the hair by its diameter without any error. The brown hair shows the brown dyestuff pigment also in the cross-section.

2. Beard Hairs :

The beard hair consists of three parts, the epidermis, the cortical layer, and the medulla. The medulla constitutes on the whole the larger part of the hair. The root and the extreme end do not contain any medulla. Partially medullated hair rarely is found. Figure 9 illustrates two beard hairs with roots and ends. The extreme end of the brown hair has broken off, and the remaining end shows clearly the structure of the medulla. The dyestuff pigments are present from the end of the root.

DIAMETER VARIATION CURVES OF CASHMERE WOOL HAIRS

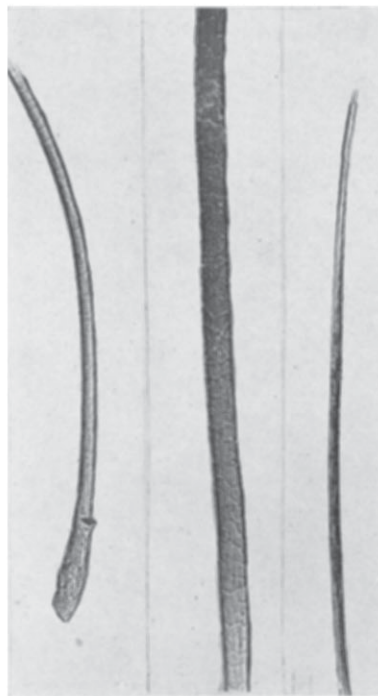
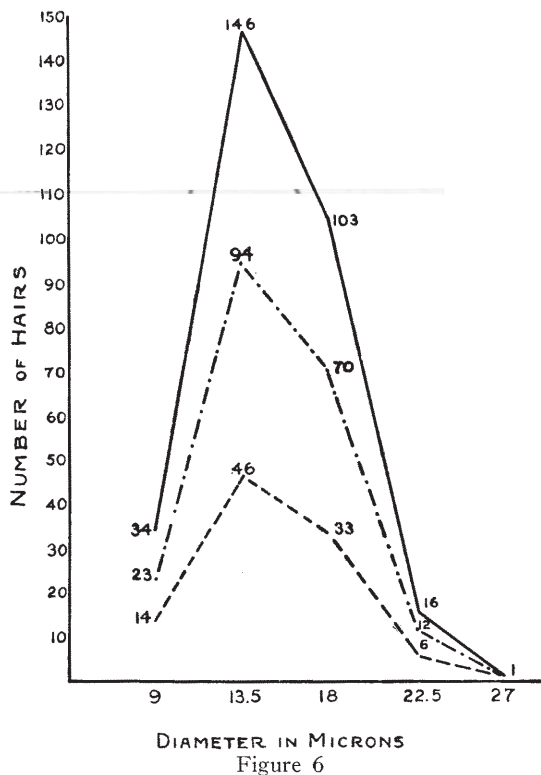


Figure 7
Hair root, body of the hair, and of cashmere wool hair.
160X.

Fineness:

The diameter of the beard hairs is extremely irregular. The following values were determined from 300 hairs and are given in a diagram, Figure 10.

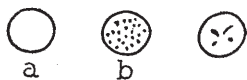


Figure 8
Cross-sections of Cashmere woolhairs.
a, white; b, brown; 375X.

Determination of the Fineness of Beard Hairs:

Number of Hairs	Average Diameter
100	63.6 μ
200	62.9 μ
300	62.2 μ

All measurements were made with glycerine as a medium of support. The fiber swells in water approximately 10%. Thus, when measured in water, an average diameter for cash-

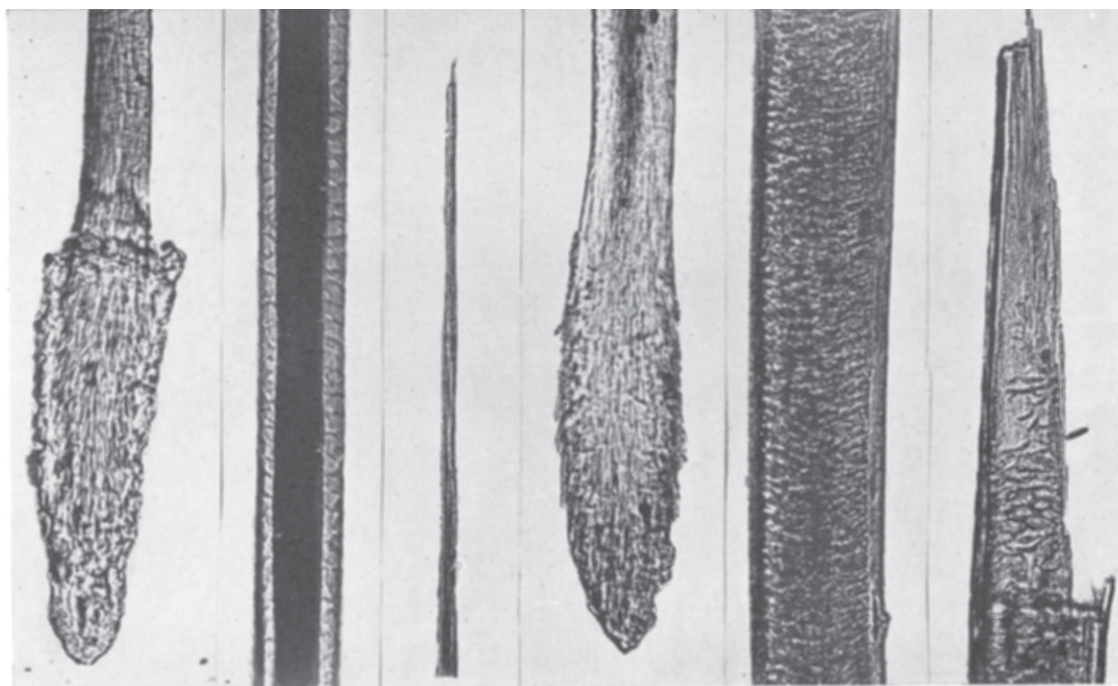


Figure 9
A. Root. B. Hair body. C. End. 160X

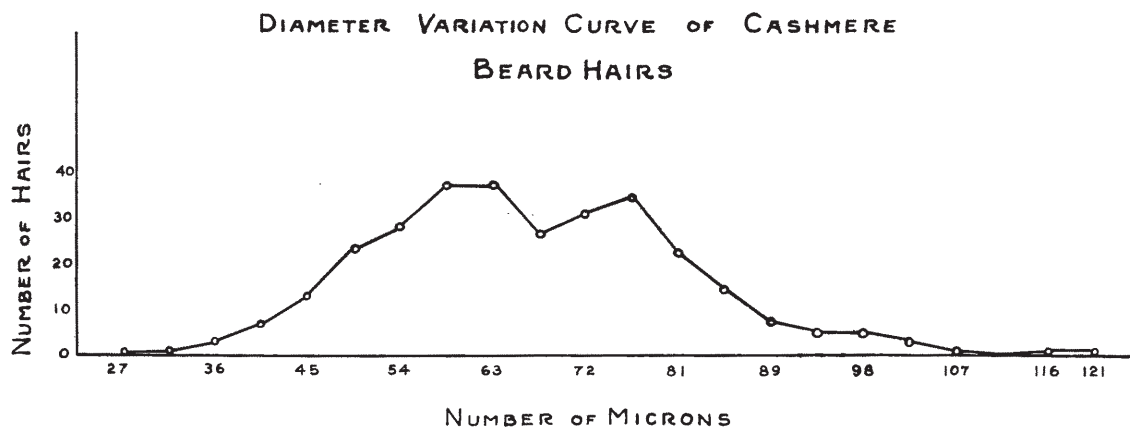


Figure 10

mere wool hair of 17μ is obtained instead of 15μ in glycerine.

The cross-sections of beard hair mostly show an elliptical form. According to whether the medulla is filled with air or free from it,

three cross-sections of cashmere beard hairs.

The true fineness of the beard hair should be determined from its cross-section on account of its elliptical form. For practical purposes, however, the ordinary microscopical

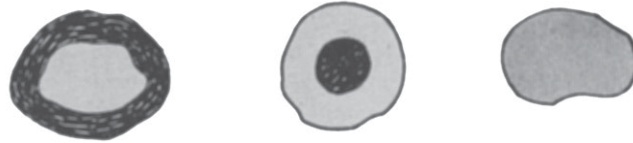


Figure 11

Cross-sections of Cashmere beardhairs. 160X.

it appears lighter in color compared with the cortical layer. No layers can be detected in the dark hair. Figure 11 illustrates

method of measuring the diameter is sufficiently accurate since the average values vary comparatively little.