Musk-Ox Wool and Its Possibilities As a New Textile Fiber

By WERNER VON BERGEN*

(*Concluded from Sept. issue, p.* 474, *Oct. p.* 556, *Nov. p.* 648, *Dec. p.* 745)

Upon my request Mr. Stefansson demanded that the document be returned to him, and the thesis was returned to him in October. This gave me the opportunity to study in the last minute the most important source for my research work on the musk-ox fibers, and to compare Atkinson's results with my own data.

Canadian Musk-Ox Hair

In the first place I had to establish that the hairs tested in Leeds were from a Canadian species. There are known to be four related species of musk-oxen.

Related Species

Common Musk-Ox.—Ovibos Moschatus Moschatus (Zimmermann), the typical form. Arctic America from the west side of Hudson Bay to Bank's Land. *Melville Island Musk-Ox—Ovibos Moschatus Melvillensis.* Kovarsik, Melville Island.

Hudson Bay Musk-Ox—Ovibos Moschatus Niphoecus (Elliot) Blacker in color, horns are lighter, little white on head. Region to the northwest of Hudson Bay.

Ward's Musk-Ox or White-faced Musk-Ox—Ovibos Moschatus Wardi (Hydekker) White space between horns and on face, also generally whitish on sides of head; more white on feet. General color lighter. Eastern Greenland.

The fibers dealt with in this study come from the last species.

The main difference which exists in the fibers of the Canadian species and those of the Greenland species is the color of the fine down or wool hair. The underhair of the first is brown and of the latter gray. The other physical properties are similar to each other which can be seen from Table III.

TABLE III

Wool hair	Musk-Ox White Faced New York 1930	Musk-Ox Canada Leeds
Color	Gray White-Gray	Brown
Length Bulk	2″ - 5″	3″ - 3.5″
Scales per 100 microns	6 visible	6 poorly visible**

* Chief Chemist, Forstmann & Huffman Co., Passaic, N. J.
** Covered by dyestuff pigments.

Fineness	Alaska middle	New York	
Under 15 microns	51%	38%	48%
15-25 microns	47%	59%	48%
Over 25 microns	2%	3%	4%
Average	15.3 microns	16.53 microns	16.15 microns
Beardhair Color	Brown and Black		Black
Length	1-16		8-12

In Leeds about 15 pounds of 100% musk-ox yarn were produced after the English worsted method. From this yarn 1/20's and 1/10's weaving and hosiery yarns were made through twisting in 2/20's, 3/20's, 2/10's and 3/10's with different turns. The yarn possesses an average amount of strength. The weaving yarn was made into different kinds of goods. One part of the yarn was combined with a yarn containing Yorkshire's most typical wool—the Wensleydale—and two pieces were woven. From this cloth three suits were made and one was presented to the King of England, one to Stefansson and one is the property of Prof. Barker.

In my opinion this combination of the fine musk-ox wool with the coarse English wool was an unfortunate one, because the character and soft handle of the musk-ox wool were entirely covered by the coarse wool. The two curves of the fineness show this fact very clearly. (Figure 21.)

After spinning, weaving, and finishing different kinds of goods of musk-ox or *ovibos* hair, Atkinson came to the following conclusions:

1. The handle of the fine *ovibos* is of such softness that it can be favorably compared with cashmere and vicuna.

2. If sufficient quantities of *ovibos* under-hair without any admixture of the long coarse outer-hair, could be procured the use of the fiber would become a commercial proposition.

3. The natural color of the under-hair is an advantage. During the war natural colors were highly prized in that they helped eke out the wool supplies, and also afforded a welcome amelioration of the dyestuff situation.

4. The most useful results could be procured by the use of *ovibos* under-hair for hosiery purposes, socks, gloves, scarves, etc., provided there were no long hairs present.

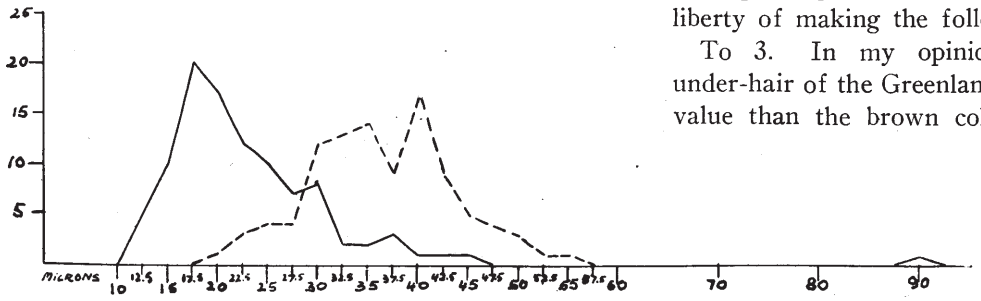

Fig. 21. Width Variation Curves
————Musk-Ox Yarn Leads
— — — — Wensleydale Wool-Yarn Leads

5. If cloths were made they would be more adaptable as warm linings to winter waistcoats, etc., than for suitings.

6. Warm, soft and full handling rugs could be made with advantage from the under-hair. The bursting of the yarn by attempts at milling would bring about the desired results.

7. The non-milling property of the under-hair is an advantage because the air-retaining qualities of a fabric are practically consistent with its heat-retaining properties.

8. The difficulty of obtaining the fine under-hair only would be great.

9. The only method would be that of combing it out in the month of June after it has loosened at the roots.*

10. The coarse outer-hair of the *ovibos* could be utilized in the same manner as horse hair for upholstery etc.

Only through the use of this extract from Mr. Atkinson's thesis my article may be considered as complete. I am glad that in the main points I came to the same conclusions and confirmed the research of Prof. Barker and Atkinson without being influenced by their findings. Upon the various points I wish to take the liberty of making the following remarks:

To 3. In my opinion the gray-white colored under-hair of the Greenland musk-ox today, is of more value than the brown colored hair of the Canadian animals, because a much greater variation of shade is possible through dyeing with different colors. P. G. Redington was fortunate in selecting the white-faced musk-ox for domestication in Alaska.

To 5. The fine hair, as vicuna, cashmere and camelhair, never were really suitable for suitings, they are more adaptable for the manufacturing of dress goods, made from woolen yarns, and as the musk-ox hair is a similar fiber this applies to it also. When I analyzed the yarn spun in Leeds (sample obtained from the suit of Mr. Stefansson) I realized the difficulties they had even to spin 1/20 worsted. In the following Table IV we have the result of the fineness analysis and for comparison an analysis of a regular camelhair wool yarn and a carded sample of musk-ox wool from the New York Zoological Garden, and a carded sample of musk-ox wool from Alaska yield Summer 1931.

The presence of over 10% of fibers coarser than 30 microns and 1% even coarser than 80 microns reduces the spinning quality of a fiber enormously.

To 9. To procure a valuable wool hair from the musk-ox the combing out of the animal has to be done

Fig. 22. Musk-Oxen in Feed Yard at Handling Sta. No. 2, College, Alaska

Courtesy Bureau of Biological Survey, Exp. Sta., College, Alaska

Fig. 23. Musk-Oxen at Biological Survey Exp. Sta., College, Alaska

* Dr. W. T. Hornaday, Director of the New York Zoological Park, thinks that this would be a serious undertaking as it would involve capturing the animal, throwing it and holding it down. Any **ovibos** thus treated would, he says, be a fit subject for pneumonia, as they can easily contract that disease during any period of cold spring rain.

TABLE IV

Microns	7.5	10	12.5	15	17.5	20	22.5	25	27.5	30	32.5	35	37.5	40	42.5	45	47.5	50	85
Musk-Ox Yarn Leeds	..	..	5	10	20	17	12	10	7	8	2	2	3	1	1	1			1
Musk-Ox Carded N. Y.	..	3	10	24	27	15	6	3	3	1	1	1	1	1	1	1			
Camelhair Yarn	..	1	11	30	17	14	9	3	3	2	1	1							
Musk-Ox Carded Alaska	2	21	26	18	11	9	4	3	2	2	1	1	1						

very carefully, and the hair classified on account of the beardhair present.

That this is possible is proven by the figures for the carded Alaska musk-ox wool in Table IV, which shows that only 3% of the hairs are over 30 microns and none over 40 microns. So the spinning properties of this wool are at least as good as that of fine camel hair.

For this Alaska sample I am indebted to W. B. Bell. The yield of this 1 lb. sample obtained from him was 84% which proves the correctness of my estimate on page 646 of the November issue. The fat content was 4.3% which is about the same as for raw cashmere.

This new-coming musk-ox industry will be the source of a better life for the white man, Eskimo and Indian of the Arctic. Let us verify the words of Irving McK. Reed, of Fairbanks, Alaska, a member of the Alaska Game Commission:

"Domestication of musk-oxen is one of the greatest constructive efforts in behalf of the Territory of Alaska (also of the whole Arctic) insuring a firmer foundation for a white population and our American civilization which must have some kind of agriculture as its foundation and cannot be permanently based on such ephemeral industries as mining and trapping. It will not only benefit this generation but untold future generations."

Mr. Reed passed through the wonderful building-up of the reindeer industry in Alaska. The reindeers have increased from 1280 heads imported into Alaska from 1892 to 1902, to nearly a million heads at the present time. Why cannot the musk-ox industry have the same future?

The United States Government and Canada are not the only ones who believe in the future of the musk-ox. About two years ago the government of Norway started a similar experiment with the animal in Spitzbergen, and in 1930 a private organization made a breeding trial in Iceland which did not succeed, as five of the six animals caught a disease from the sheep.

In closing I wish to express special thanks to the officials of the Department of the Interior, Canada, who served under the Administrations of 1930 and 1931, for all the literature received, to Dr. W. Reid Blair, Director of the New York Zoological Garden, and to L. I. Palmer, Senior Biologist for the different samples of musk-ox hair, and especially to the man whose name will always be mentioned in connection with the musk-ox, Vilhjalmur Stefansson, the father of the domestication idea. I shall never forget the great confidence he placed in me when he allowed me to study his confidential records in the library of his New York residence.

Only through his tenaciousness and perseverance in sticking to his idea are we indebted to the fact that domestication of the musk-ox is well under way in Alaska. This is proven by the evidence presented by the last two pictures Figures 22 and 23. I am indebted to Mr. W. B. Bell, in charge of the Division of Biological Investigations, of the United States Department of Agriculture for the two photographs and I wish to thank him for the interest shown in this study.

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