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2 Wool: A Conventional Material for Fashion

Abstract: This chapter introduces the reader to wool, woven garments which have been worn by humans for about 5,000 years. Wool is among conventional materials used in fashion today.

Keywords: conventional materials, fashion, sustainability, wool

Wool is a fibre forming a protective coat on animals such as camels, goats,[1] llamas, rabbits, yaks (Degen et al., 2007) and sheep.[2] Its composition is largely keratin, a fibrous protein that is more resistant to damage than cotton and other plant fibres that are composed mainly of cellulose.

Sheep were domesticated over 9,000 years ago, and humans have worn woven woollen garments since approximately 3000 BC. A woollen textile from approximately 1500 BC was found preserved in a bog in Denmark,[3] and archaeological evidence revealed that Karakul sheep have been raised continuously in the Bukhara region, Uzbekistan, since 1400 BC. Romans brought sheep to the British Isles in 55 BC. Being poor, medieval peasants often wore rough wool, woven by women; individuals seldom had more than one set of clothing.

Over a billion sheep produce more than a billion kilograms of wool each year, but this is only about 1% of the fibre used in garments. Today, China, Australia,[4] New Zealand, Turkey, United Kingdom, Morocco, Iran, Russia, South Africa,[5] India,[6] Argentina, Kazakhstan, the United States and Uruguay are among the leading producers of wool.

The quality of wool is based on the diameter, the crimp, the colour and the length of the fibre. The diameter ranges between ultrafine of less than 15.5 microns and coarse of greater than 45 microns. Wool with a small fibre diameter is soft and deli-

1 While mohair comes from the Angora goat, cashmere wool comes from Kashmir and pashmina goats. For a discussion of cashmere quality see: Ansari-Renani et al. (2012).

2 Angora wool is made from the fur of the Angora rabbit.

3 See also Hald (1980).

4 Today Australia produces 80% of the Merino wool used in luxury fashion and suiting around the world.

5 For a thorough discussion of wool in South Africa, see Greeff (2014).

6 Indian wool is largely coarse used in the production of rugs.

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Figure 2.1: Nepalese woman in Lower Mustang weaving a rug from sheep wool (photo: Allan Degen).

cate and is used for such items as sweaters and shawls, whereas wool with a large fibre diameter is strong and durable and is used for such items as rugs (Figure 2.1), tapestries (Figure 2.2), overcoats and tents. The crimp is the natural wave in the fibre and can range from approximately one per cm in coarse wool to 12 per cm in fine wool – the greater the number of crimps, the softer the wool. The length of the fibre ranges between 4 cm in fine wool to 36 cm in coarse wool. Wool is usually white or off–white but can be darker, in particular the coarse wool.

Generally, animals need not be killed for the wool. Most wool is obtained from shearing live animals, but, in addition, fine soft wool is combed out from the undercoat in some animals. This is the case for Kashmir goats producing cashmere wool, with a fibre diameter of less than 19 microns, and for yaks, producing down wool with a fibre diameter of 18 microns. In addition to the fine undercoat, Kasimir goats have a longer thicker layer (70–90 microns) (Kerven and Toigonbaev, undated), whereas yaks have developed a thick, long outer layer of coarse wool of 70–90 microns and a middle layer of finer wool of 20–50 microns (Jing et al., 2022) (Figures 2.3 and 2.4). These outer layers are shorn and used for carpets, tents, outerwear and rope.

The wool of dromedary camels sheds or is simply pulled off by hand in the summer. Very little amount of wool is produced by these camels, and some is woven into tents (Degen et al., 2019). Bactrian camels produce a much heavier wool layer; the

Figure 2.2: Woman in Cape Town, South Africa, weaving a tapestry from sheep wool (photo: Allan Degen).

Figure 2.3: Tibetan woman drying coarse yak wool (photo: Allan Degen).

Figure 2.4: Nepalese man in Lower Mustang spinning yak wool (photo: Allan Degen).

calves produce fine wool, which becomes coarser with age, and female camels produce finer wool than male camels (Schmidt et al., undated). Karakul wool (also known as Persian wool) is obtained by killing unborn foetuses or lambs up to three days of age (Degen, 2013). The newborn lambs possess a tightly bound, curly, soft wool that is often black in colour. The colour fades and these desired traits are lessened after three days. The wool is used for hats and high fashion clothing. Older Karakul sheep produce coarse wool that is shorn for carpets and outer garments.

Over time, wool quality has been improved through selective breeding; Argentina, Uruguay and Uzbekistan are examples of countries with highly developed sheep genetic improvement programmes. There are hundreds of breeds of sheep. While Romney and Awassi produce a coarse wool ideal for carpets, other breeds, including Merino and Rambouillet,[7] produce fine wool ideal for apparel. Merino sheep were exclusive to Spain until 1789, when Charles IV presented six Merino sheep to the Republic of the Seven United Netherlands – the predecessor of today's Dutch monarchy. After the Dutch arrived at the Cape of Good Hope in the seventeenth century, this breed spread to the Dutch United East India Company colony, now a part of South

7 Rambouillet wool is similar to Merino, with a longer staple and less sheen.

Africa. Here, entrepreneur John Macarthur bought some, and transported them to Australia where they flourished. Sheep arrived in the Canadian prairies during the early nineteenth century. In Saskatchewan, some sheep farms eventually became large cattle ranches. During the US Civil War, Union uniforms were made of wool, despite their use in warm weather. In the early twentieth century, German colonists brought over karakul sheep to Namibia, where they were raised in large numbers.

Wool is very highly absorbent, and when it absorbs moisture, thus increasing its weight, it becomes warmer to the wearer. Since moisture absorption and release are gradual, wool does not cool the wearer by drying quickly. Other advantages of wool include the fact that it ignites at a higher temperature than cotton and some other fibers. Also, it has a lower rate of heat release than cotton and it forms a char that is self-extinguishing. Wool is, therefore, ideal for garments made for firefighters and soldiers.

Wool is natural, renewable and biodegradable, and therefore considered a sustainable material for making garments. The animals providing the wool are part of the carbon cycle, consuming plants and converting carbon to wool. By weight, wool is comprised of 50% carbon. Compared to other textile fibre products, woollen garments have long lifespans and can be worn longer than most other clothing. Also, wool products tend to be washed infrequently and at lower temperatures than other materials; this has less environmental impact. Although wool has a market share of approximately 1% of textile fibres, it represents 5% of recycled fibres. That said, attention should be made to animal welfare, as wool is sourced from sheep.

The International Wool Textile Organisation is committed to wool textile education. The organisation supports degree programmes that link with research and encourages collaboration between academia and industry by encouraging cross-disciplinary approaches. Various universities prepare people for careers in wool. These include the University of New England, the only university in Australia to offer a comprehensive range of sheep and wool units developed and funded by industry. Courses were developed by the Australian Wool Education Trust to encourage graduates into a career in the Australian sheep and wool industry. At Queensland University of Technology, the Creative Industries Faculty and the School of Design offer teaching and research in design and sustainability, while science degrees provide skills relevant to profitable and sustainable textile industries.

In France, HEC Paris offers a unique “Luxury Certificate” programme. While luxury wool products are popular in France, many are exported. In Germany, Hochschule Niederrhein University of Applied Sciences – based in Mönchengladbach – is among the leading faculties of clothing technology in Europe, with teaching and research covering topics from fibre to final textile products. In Kazakstan, Kazakh Institute of Karakul Sheep Breeding, Academy of Agricultural Sciences in Shymkent, specialises in the breeding of Karakul sheep and in grading the quality and colour of wool. In Wellington, New Zealand, Massey University offers undergraduate and PhD degrees in Textile Design. An objective here is to support sustainable economic growth.

In addition, a large number of women weaving co-operatives have been established, many of them specialising in wool. These co-operatives provide income for the

women and preserve the traditional weaving styles of the area. Here, we mention a few of these co-operatives. Ccaccaccollo Women's Weaving Co-op, located in Sacred Valley, near Cusco, Peru, is owned by 46 Quechua speaking women whose aim "is to help bring back the weaving traditions that had been lost over the previous generations as there wasn't a way to earn a significant income." The co-op specialises in alpaca and llama wool (Figures 2.5 and 2.6) (Planeterra, n.d.).

Figure 2.5: Peruvian women spinning alpaca wool (photo: Allan Degen).

Figure 2.6: Peruvian women weaving alpaca wool (photo: Allan Degen).

Lakiya Negev Bedouin Weaving Cooperative, located in Lakiya, Israel, was established by two Bedouin women "to preserve traditional weaving and provide employment for Bedouin women. Today, there are 30 to 60 Bedouin women employed at the cooperative" (Degen & El-Meccawi, 2022). All weaving is on a ground loom, and only coarse Awassi sheep wool is used to produce carpets and bags (Figures 2.7–2.11). Lectures are presented on all stages of the process, including shearing the sheep, preparing the wool, weaving and finishing the product (Degen & El-Meccawi, 2022).

Figure 2.7: Bedouin girl in the Negev Desert shearing an Awassi sheep (photo: Allan Degen).

Cross Roads, a Global Textile Marketplace, represents cooperatives, artisans, and companies. Adventure Yarns is an international development project based in Tajikistan and Kyrgyzstan that started in 2009, managed by ICARDA and funded by IFAD: "The objective is to assist Tajik farmers to produce quality Angora and Cashgora goats and work with spinners and knitters to produce luxury mohair and Cashgora yarns and knitted products for export. The export of yarns and handicrafts is expected to improve livelihoods of farmers and rural women while offering customers quality, fairly traded products made from natural fibers" (Clothroads, n.d.).

Figure 2.8: A Bedouin woman in the Negev Desert spinning Awassi sheep wool. The tent in the background is composed of Awassi sheep wool, some camel wool and goat hair (photo: Allan Degen).

Figure 2.9: Bedouin woman in the Negev Desert weaving a tent composed of Awassi sheep wool, some camel wool and goat hair (photo: Allan Degen).

Figure 2.10: Bedouin woman in the Negev Desert finishing a pillow cover woven from Awassi sheep (photo: Allan Degen).

Figure 2.11: Examples of Awassi wool at the Lakiya Negev Bedouin Weaving Cooperative – the wool is dyed in 27 colours (photo: Allan Degen).

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