

THE USE OF GOAT HAIR

AN INTRODUCTORY HISTORICAL REVIEW

Michael RYDER*

Summary

Goats are not thought of as producing textile fibres, and compared with sheep, few coat types suitable for sophisticated textile use have evolved. Goats have a double coat in which long outer hair obscures short, fine underwool and there is a long history of the use of this "ordinary" goat hair. The textile fibre cashmere is the underwool from a coat of this type, but mohair is quite different since it lacks hair and is like the fleece of a sheep. Cashmere comes from goats of the highlands of central Asia and was discovered by Europeans in the seventeenth century. Mohair comes from a specific goat breed, the Angora, which emerged in Turkey and was first described by Europeans in the sixteenth century.

Key Words

Goats, Hair, Down, Cashmere, Mohair, Textiles

Introduction

Most domestic goats have a hairy outer coat, which obscures short, fine underwool or "down" (fig. 1). This structure has changed little from that of the wild ancestor. The thick "guard" hairs of the outer coat provide physical protection, while the underwool gives thermal insulation. Such "ordinary" goat hair has been spun and woven into cloth since antiquity. The hair and wool were originally used together, but more recently the wool has been combed out for separate use. Cashmere, one of the two major goat fibres used in textiles, is the very fine underwool from a double coat of this type. It is combed from the coat of central Asiatic goats during the spring moult.

The other major goat fibre is mohair grown by a specific breed, the Angora, which originated in Turkey. The Angora breed has a single coat of long, lustrous and

Résumé

L'utilisation du poil de chèvre. Examen historique préliminaire.

On considère généralement que les chèvres ne produisent pas de fibres textiles et, par comparaison avec le mouton, leur domestication n'a produit que peu de types de poils utilisables pour des textiles sophistiqués. Les chèvres ont une robe double constituée des longs poils extérieurs couvrant une laine courte et fine. Cette robe "ordinaire" des chèvres a été très longtemps utilisée. La fibre textile dite cachemire est constituée à partir de la laine de robes de ce type, mais la fibre mohair est assez différente puisqu'elle ne comporte pas de poils et ressemble à la toison des moutons. Le cachemire est produit par des chèvres des régions d'altitude d'Asie centrale et fut découvert par les Européens au XVII^e siècle. Le mohair est issu d'une race particulière de chèvre, l'Angora, qui est apparue en Turquie et fut décrite pour la première fois par les européens au XVI^e siècle.

Mots clés

Chèvre, Poil, Duvet, Cachemire, Mohair, Textiles

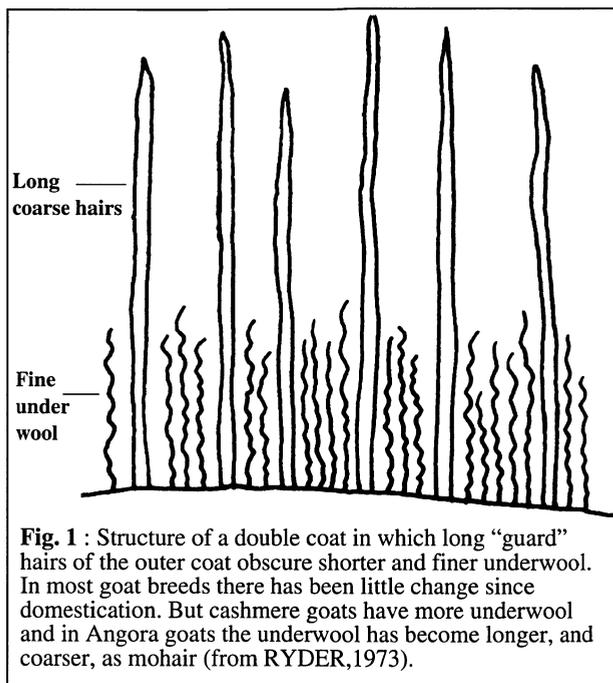
relatively coarse, but non-hairy fibres. Mohair is therefore quite distinct from cashmere, and since Angora goats, like sheep, have almost lost the primitive tendency to moult, the fibre is harvested by shearing (RYDER, 1990 a & b).

The domestication and prehistoric spread of goats

Goats belong to the same (Bovidae) family as cattle. Within this family they belong to the same tribe (*Caprini*) as sheep, along with some species that are neither sheep nor goats including the blue "sheep" or bharal (*Pseudois nayaur*) and the tahr (*Hemitragus*). I shall mention these later as possible sources of textile fibre from wild animals.

The goat genus *Capra* has six species. These include an ibex with a range extending from the Alps in Europe through the Middle East and Ethiopia to central Asia, where it is another possible source of fibre, the markhor

*4, Osprey close, Lord's Wood, Southampton 501 8EX, Angleterre.



(*Capra falconeri*) of Afghanistan, and the bezoar (*C. aegagrus*) of Iran and Turkey. The bezoar was the main ancestor of domestic goats. This wild goat has brown upper parts and a white belly. The face and neck are black, and there is a black stripe along the backbone as well as along each flank, with a vertical black strip on the shoulder, plus various white markings over the body (RYDER, 1986).

Domestication took place about 11 000 years ago probably in the foothills of the Zagros mountains where modern Turkey borders on Iraq and Iran. Sheep were domesticated in the same area at about the same time (RYDER, 1983a). At that time, before the area had been extensively grazed, there was much greater tree cover than there is today. The village of Zawi Chemi Shanidar in the Kurdistan area of northern Iraq had goat remains as early as 9000 B.C. ; the relatively high proportion (25 %) of immature animals was taken as evidence of domestication. The relative proportion of sheep and goats varied at different levels averaging 50% sheep and 42 % goats, and from that day to this, throughout the Middle East, goats have been grazed with sheep in mixed flocks. Jarmo is another village site, which had domestic goats from 7000 B.C.

A similar site to Jarmo, but with goat bones dating from 9000 B.C., is Tepe Sarab on the Kermanshah plateau in Persian Kurdistan. This site may have been a seasonal settlement for goat herders. It had many little, unbaked figurines of livestock, including goats. A figurine of a sheep dated 5000 B.C. had the first indication of a fleece (RYDER,

1983a ; 1992). Further south, on the Upper Khuzistan plain in south-western Iran, changes have been followed during successive stages of occupation (HOLE *et al.*, 1969). At Tepe Sabz and Ali Kosh between 7500 and 6500 B.C. there were fewer sheep than goat remains ; the goat horn shape was indistinguishable from that of wild goats, but most of the goats were eaten young, and the horn size indicates a predominance of young males. This suggests that the females were kept alive for milking and/or breeding.

During the next 500 years the goat horns became flattened, which was taken as evidence of increasing domestication. From 6000 B.C. onwards sheep began to be more common. No more than 40 % of sheep and goats reached the age of three years. From 6500 B.C. in addition to settled villages, there is evidence of pastoral camps with dry-stone animal pens. These camps may have been occupied during seasonal movements of goats and sheep from the plains to the mountains for summer grazing. If so, this would suggest that transhumance pre-dates true nomadism, and so instead of being specialised is really more primitive. After 4500 B.C. sheep predominated and there was a decline in skin-working tools with an increase in the number of spindle whorls. This suggests a change from skinwear to clothing made of spun sheep's wool.

A more recent study of bone remains from Tal-e Malyan (ancient Anshan) in Iran indicated an economy based on sheep and goats (ZEDER, 1991). During the earliest period around 3000 B.C. goat remains were more common than sheep, but later around 2000 B.C. there were more sheep remains. At that time goat hair was woven in Babylonia ; it was one quarter of the value of sheep's wool.

They are interesting biological questions, first why among deer, goats and sheep only with the second two species was domestication pursued, and second, why much more breed variation, particularly of the coat, has occurred in sheep than in goats. The coat of wild sheep is little different from that of deer and goats, and one view is that the greater variation in sheep is solely due to the greater application of human selective breeding with sheep than with goats. But there could be a biological explanation based on a greater rate of mutation in sheep: without such spontaneous variation it is not possible to carry out selective breeding.

Goats would have been initially more useful than sheep to early farmers because they browse on trees and so help to clear forests. They have adapted better than sheep to hot, desert regions with shrubs, and are happy in rough mountainous country, but are unable to withstand cold and rain as well as sheep can. The goat may never have been as



Fig. 2 : One of the first illustrations of goats from Mesopotamia about 3000 B.C. Goats with spiral horns (top left) being milked alongside sheep (bottom right) (from Ryder, (1983a).

important as the sheep, at any rate in Europe, after the first forest clearance of the Neolithic period, which provided grazing for sheep, which are now the dominant species in temperate areas. Wool gave sheep an economic superiority over goats. Domestic goats spread over a large part of the Old World during the Neolithic period. It was probably the first farm animal to reach China at this time. Variations in horn shape are evident in the first illustrations of goats in Mesopotamia and Egypt, which are about 5500 years old (fig. 2). Some animals have normal curved horns, while in others they are spiral. Spiral horns have been thought to indicate derivation from the wild markhor, because this has spiral horns. But variations in horn shape are more likely to be a product of domestication, and the initial domestication is unlikely to have involved more than one species of wild goat, or more than one area.

The same variation in horn shape is seen in skeletal remains from prehistoric Europe, and hornless goats appeared during Roman times. The first colour illustrations of goats from ancient Egypt indicate a range of colour - black, white, dark and light tan, and piebald (coloured with white markings), but no grey, which is common today among the primitive breeds of northern Europe. Just as there are white breeds of sheep without a fleece so there are white goat breeds, such as the Swiss Saanen. But selective-breeding for white hair appears to have taken place in only the Angora and cashmere types. Even in coloured breeds the underwool is paler and commonly white. Although mammalian coat-colour genetics has much in common between species, the common brown colour in primitive sheep is absent from goats. The apparent brown colour in such goat breeds as the Toggenburg is "tan", which occurs in genetically white animals (RYDER, 1980).

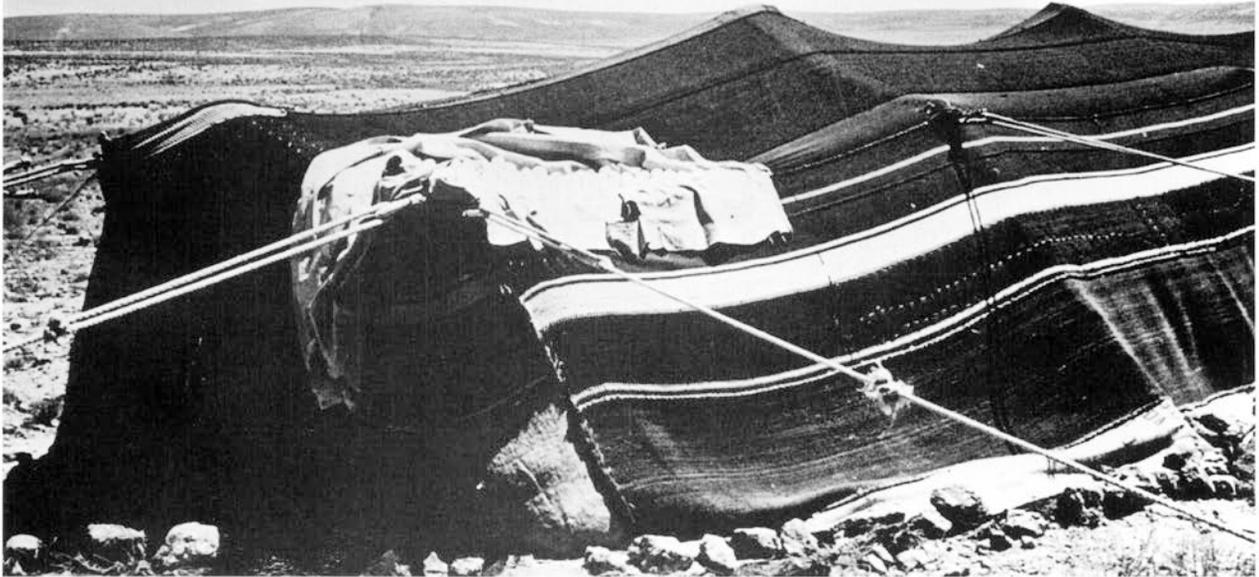
The use of ordinary goat hair

The development of a range of colours has been one of the few changes in the coat since domestication because the hairy outer coat with fine underwool has been retained (fig. 1). Coat length, however, increased so that primitive European breeds tend to have long hairs, with much individual variation. But modern dairy breeds have reverted to a short coat.

The hairy outer coat makes ordinary goat hair on the whole too coarse for textiles - hair shirts are traditionally associated with asceticism ! There is, however, a long history of its use in cloth and also in oriental carpets. It was used in ancient Egypt (FORBES, 1964). A "workmen's" village at Amarna dated fourteenth century B.C. had 4000 textile finds, most of which were linen. Amongst these were 38 made from sheep's wool and only two of goat hair. This cloth was made from long, coarse dark brown (probably faded black) hairs (EASTWOOD, 1985). There are Biblical references to goats' hair e.g. *Exodus 35 : 23 & 36 : 14*, but there is no indication that the curtains referred to in the second reference were of mohair, as some authors imagine, and not ordinary goat hair.

The ancient Greeks followed by the Romans plucked or sheared goats in the same way as sheep. The Greeks used a knife (*tragokourike machaira*) (WILD, 1988) to shear sheep, although before shears were invented in the Iron Age a comb was used to harvest wool. This is well attested in Mycenaean Greece (MELENA, 1987). The use of a comb implies the preferential removal of the fine underwool, but there is no evidence that this was done with goats in classical antiquity. The hair was used mixed, with no separation of the underwool from the hair.

Fig. 3 : Bedouin tent in South Jordan made from ordinary goat-hair cloth (from WEIR, 1976).



Pliny wrote that only the poorest people wore goat-hair cloth. Columella stated that it was used for ropes with a reputation for lasting longer in water than hemp ropes, as well as for sacking, sails, and tents. The use of black, goat hair in tent cloth has been a major use from antiquity to the present day, notably by nomads in the Middle East, although such tents range from North Africa to Tibet.

The black colour dates back to the earliest domestic goats, but a good reason for retaining black hair is that it provides greater shade and coolness during the heat of the day (fig. 3). The Biblical, Old Testament, *Song of Solomon* (1 : 5) has a reference to black tents. Much later, during the first century A.D. St Paul was a tent maker in Tarsus at the foot of the Taurus mountains in the region of Turkey known as Cilicium, which was famous for the weaving of goat hair into tent cloth. The name is perpetuated today in the French term *cilice* for hair cloth.

MORTON (1935) illustrates the weaving of tent cloth in Tarsus during the 1930s. His photograph shows a vertical loom, the weighted warps of which descend into a pit, which also accommodates the legs of the male weavers. But nomad women in Turkey weave tent cloth on a horizontal ground loom. Such tent cloth I have examined had faded to uniformly dark brown and been made from very thick, but only two-ply, yarns, which had been plaited at the edges to form a fringe. In November 1991 I saw black goats grazing stubble near Tarsus and discovered that

the nomads keep a black breed, the *Kil-keçi* (Hair goat) which as well as milk provides 1kg of hair for tents annually. Anatolia was also the area in which mohair emerged (see below).

Goat hair was occasionally used for clothing in medieval Europe. I know one example from Sweden, and I recorded one from Scotland (RYDER, 1983b) - the only goat hair cloth among several hundred British medieval wool textiles. Some un-spun goat hair from a medieval tannery in Aberdeen had coarse, black hairs 23 cm long and was identical to the hair of feral goats in Scotland today (RYDER, 1970) (fig. 4). Two more goat-hair finds from a medieval site in Berwickshire Scotland were the same (RYDER & GABRA-SANDERS, 1992). I have recently investigated the animal-hair caulking of medieval planked, wooden boats excavated in London and much of this was goat hair containing its underwool (RYDER, 1993a).

There is still a market for goat hair in Europe. About 1000 tonnes are imported into UK annually. It is used to make brushes, cloth for suit interlinings, and as a binder in building plaster. Any underwool is removed to make felt, while the hair is being prepared for spinning. This implies the production of coarse yarns lacking fine fibres (underwool). A major source is Asia (China, Mongolia and the Indian sub-continent) and some of the hair is from cashmere goats, which are clipped before and after combing for the fine fibre (see below).

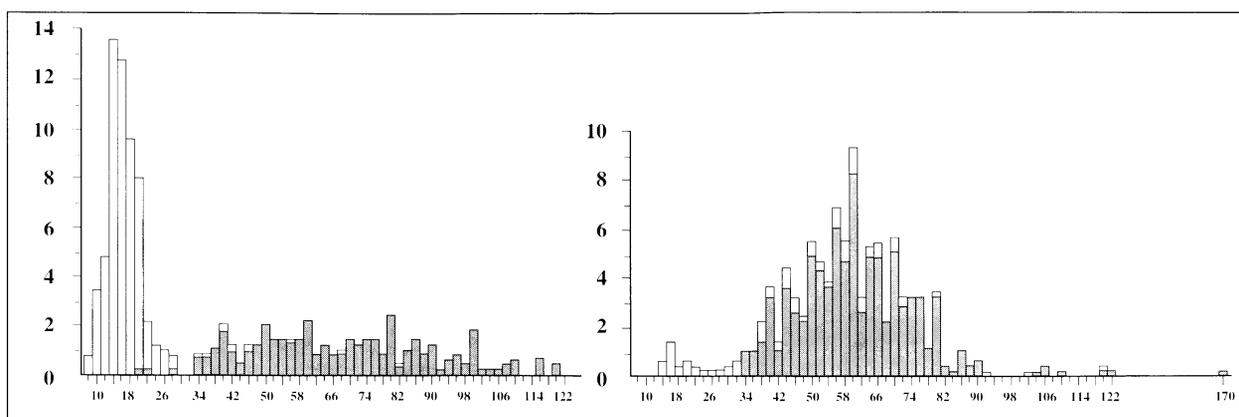


Fig. 4 : Fibre diameter distributions from Scottish feral goats in February (top) when there is a big difference in diameter between the outer hair (right) ranging around 80 microns in diameter, and the more numerous underwool (cashmere) fibres (left). Note that the most frequent diameter is 14 microns. In June (bottom) most of the underwool has shed, and the hairs, which are regrowing after the moult, range from 35 to 90 microns and are not yet as coarse as they become in the winter. The shaded parts indicate the presence of a central medulla (core) which is associated with hairiness (from RYDER 1970).

Cashmere

The animals

Cashmere fibre is the soft underwool or “down” of a double-coated type of domestic goat native to the mountainous region of central Asia. The name comes from the old spelling of Kashmir, which is where in the eighteenth century Europeans encountered the fibre in delicate woven shawls - the fibre comes from further north. Well into the nineteenth century Europeans were unclear as to the nature of the fibre until its source was accepted as the goats of Tibet.

Moorcroft, who travelled in Kashmir from 1819 to 1825, called the fibre *pashm shul* (“shawl wool”) and the animals “shawl goats”. *Pashm* is the Persian word for wool and *pashmina* is the name given to cashmere fibre in the Indian sub-continent. It is interesting that the exploitation of this fibre took place in a region in which goats predominate. There is no evidence on when cashmere was first used, but the use of shed fibre from wild animals (which continues today) suggests that its use began in prehistory. Cashmere goats today are generally white with spiral horns. They are of medium size, the head is small, the nose concave, and both sexes are bearded (fig. 5). They are distributed from northern China through Inner Mongolia and Xinjiang into Tibet and Mongolia, to Kirghizia in the former Soviet Union. There are other down-producing goats in the former Soviet Union, Afghanistan and Iran. I learnt from a visit to China in 1988 that the Chinese believe that it is not possible to produce cashmere at altitudes lower than 1000 m. or south of latitude 36°, whereas in fact genetic factors are more important.



Fig. 5 : Female Chinese cashmere goat after combing and clipping with the 475 g of fibre that has just been combed from the coat (photograph PROF LI JIAN-PING, 1986).

Table I : Membres of *Caprini* tribe in and around Kashmir.

Common Name	Local Name	Latin Name	Location
Blue "sheep"	bharal (Hindi) ná (Tibetan)	<i>Pseudois nayaur</i>	Tibet
Tahr	(Himalayan tahr)	<i>Hemitragus jemlahicus</i>	Himalayas
Goat	markhor	<i>Capra falconeri</i>	Western Kashmir and Afghanistan
Ibex	(Siberian ibex)	<i>Capra ibex siberica</i>	Kashmir and Pamirs
Sheep	Ladakh Urial Tibetan Argali	<i>Ovis ammon vignei</i> <i>Ovis ammon hodgsoni</i>	Ladakh Tibet

The origin of the cashmere type of goat

The first domestic goats are likely to have been of bezoar ancestry and to have reached the Central Highlands of Asia with the earliest pastoralists. Cashmere goats are unlikely to have been domesticated locally, as postulated by MILLAR (1986). The three areas of domestication suggested by him are : the Himalayas in the south east, Mongolia in the north east and Kirghizia in the north west. These have distinct types of cashmere goat, which the present author considers are more likely to be due to divergence. The Kashmir goat of the Himalayas has five breeds, the Mongolian goat seven breeds, and the Kirghiz goat eleven.

The spiral horns of cashmere goats do not indicate markhor ancestry, but rather an early mutation in domestic goats that persists in the cashmere type as a primitive feature. It is possible, however, that early domestic goats originating from the bezoar were crossed with another wild goat species. Experimental matings have shown that this is possible ; MILLAR (1986) implies influence from the ibex, and support for this has been gained from the observation made by SMITH (1987) during a visit to the area that not only does the domestic cashmere type have a similar geographical distribution to the ibex, but that domestic goats are still mated with wild ibex males.

The fibre

There is a strong tradition that the finest fibre comes from wild animals (IRWIN, 1973). Table I lists the wild species in the area that are possible sources of the fibre. This is based on species distributions given by Schaller (1977) and shows that in addition to two species each of sheep and goats, the bharal and tahr live in the area. More recently, RYDER (1993b) has given fibre measurements of some of these species. MOORCROFT (1841) in discussing which wild animals yielded fibre, used the term *asli-tus* not only for the fibre, but for the animal, and his account points

to the ibex as being the source. The term *asli-tus* was recorded first by Tavernier who visited Kashmir in the 1650s. *Shah-tush* is the modern textile trade name for the wild fibre, which is usually pigmented and actually less fine than domestic cashmere. SMITH (1987) confirmed that this is fibre from the ibex, which is picked up after being shed.

Coming to the fibre from domestic cashmere goats, we find that it has a similar fibre diameter to the underwool of "ordinary" (common) goats. The average fibre diameter of commercial Chinese cashmere, which forms the bulk of world supplies, is 15 microns, yet that of British dairy goats is frequently less than 14 microns. Even the characteristic softness of Chinese cashmere is probably not unique since the finer the fibre the softer it feels and the underwool of most mammals feels soft.

Commercially, however, Chinese cashmere is noted for fineness ; bulk qualities less than 16.5 microns enable it to be used in luxury knitwear. Cashmere with a mean fibre diameter of over 16.5 microns is woven into cloth often mixed with wool. Fibre with diameters of 18.5 microns is produced in Iran, Afghanistan and Siberia, whereas little wool from sheep is less than 20 microns in diameter. Turkey used to have a cashmere goat (see below).

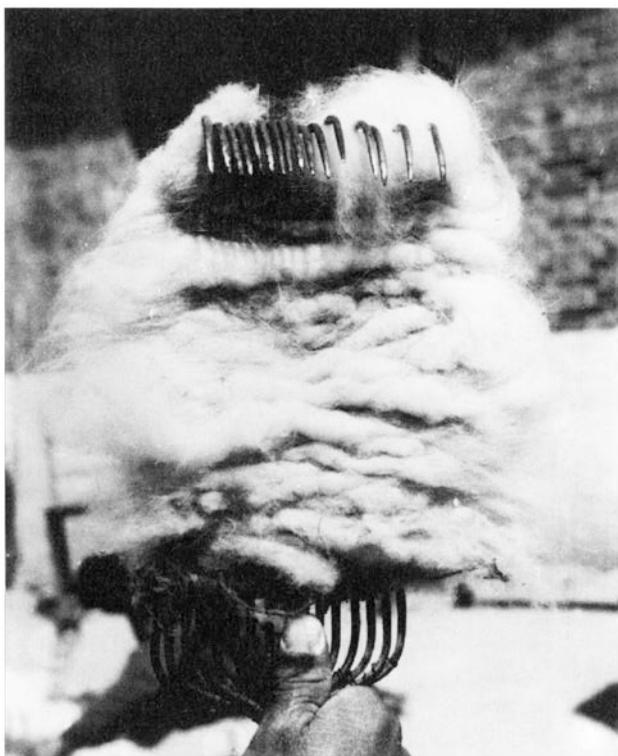
Chinese cashmere goats, however, do have the distinction of growing more underwool than other double-coated goats and also of having a greater proportion of white animals. White cashmere fetches the highest price and it could be that goats with a white coat have been selectively bred. Moorcroft mentioned the universal whiteness of goats in Ladakh in contrast to sheep, which were often coloured and therefore "less-highly" bred.

The denser underwool of Chinese cashmere goats could have several causes, the first being influence from the ibex. Vigne (quoted by Moorcroft) wrote that the ibex has three times as much down as a goat and claimed that cloth made from it was finer and softer. But my examination of skins from the ibex failed to obtain

evidence that this species has more underwool than the other wild goats, although there was some indication that *aegagrus* might have more underwool than *falconeri*. Possibly the most important factor has been natural selection in the cold environment of Highland Asia, followed by human selective breeding in relatively recent times. Research I have in progress suggests that the concentration of cashmere goats moved from the western end of the Himalayas to north west China during the last 150 years.

Although cashmere goats in China produce 250 g to 500 g of fibre compared with only 50 g in ordinary goats, this is small compared with the fleeces of sheep, which range from one to five kg in weight. But the price of cashmere is 10 to 20 times that of wool. The outer hairs average 15 cm in length and can be coloured. Manufacturers prefer the underwool to be at least 4cm in length. Any underwool pigmentation is paler than that of the hair. Grey fibre fetches only 80 % of the price of the desired white product and tan fibre only 66 %. The amount of hair remaining in the down after harvesting comes third after fineness and colour in the grading of the raw material.

Fig. 6 : The Chinese hooked comb with pointed teeth full of combed cashmere fibre (photograph Prof LI JIAN-PING, 1986).



Cashmere is obtained from the goat by combing during the spring moult. Moorcroft described the use in Ladakh of a comb made from wooden pegs after the hair had been cut short with a knife. In Nepal today a small wooden rake is used. In China the hair is cut short with shears before combing first with a coarse, and then with a fine, iron comb, after which the remaining hair is clipped off (LI, 1988) (fig. 5 and 6). In Afghanistan and Iran cashmere goats are shorn. This makes the de-hairing during textile processing more difficult.

A great deal of mystique is attached to the modern mechanised de-hairing process. A modified woollen carding machine is used and a four-fold difference in diameter between the hair and down is needed for separation to take place. These modern difficulties make amazing the almost complete absence of hair from old Kashmir shawls that I have examined. Again the answer comes from Moorcroft who described how the hair was removed by women entirely with the fingers, the time taken to de-hair less than 60g of fibre being two hours. The material I measured comprised 55 yarns from all the shawls in the Paisley Museum, Scotland plus others from the Victoria and Albert Museum, London. They dated from 1650 to 1850 and the mean fibre diameters ranged from 12.0 to 19.2 microns. The overall mean diameter was 14.8 microns.

Mohair

Mohair is completely different from cashmere. It comes from a single breed of goat, the Angora, which is named after the Turkish province Ankara. Like cashmere goats, Angora animals are mainly white and have spiral horns, but they have lop ears and coat that is unique among goats in lacking hair and in comprising long, lustrous, and curly fibres (fig. 7). The original European use of mohair was in coat linings and upholstery, for which its lustre and resilience provided dirt resistance and hard wear. More recently, fashion and luxury outlets have developed in light-weight men's suits and women's dresses and stoles, for which mohair can be dyed brilliant shades.

The single coat of Angora goats is comparable with the fleeces of sheep. Mohair is relatively coarse ; the mean fibre diameter is about 30 microns in diameter and so the fibres are twice as thick as cashmere. Not only have the underwool fibres become longer and coarser than in a double coat, but more numerous. There appears to have been a mutation of the coat which produces a fleece like that of lustre-longwoolled sheep. The mutation in sheep appears to have taken place only in breeds that already had a single coat of medium-diameter fibres (see RYDER, 1992) ; how it occurred in sheep is no better understood

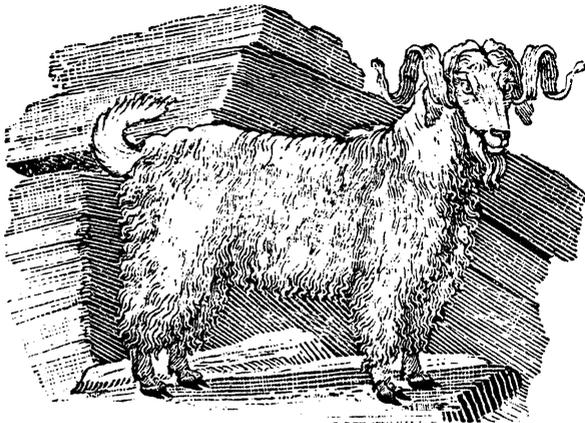


Fig. 7 : Drawing of “The goat of Angora” (from BEWICK, 1790).

than it is in goats. This unique Angora “underwool” is dominant in crossbreeds : when ordinary goats are mated with Angoras, the underwool of the offspring assumes the character of mohair and grows much longer than the outer coat hair, which is obscured (RYDER, 1966).

As with most breeds of sheep, the tendency to moult has been lost by the Angora goat and so mohair is harvested by shearing (fig. 8). The goats are commonly shorn twice a year when the fleece is 12 cm long and weighs about 2.7 kg. Although more valuable than wool, mohair is much less valuable than cashmere, but the greater weight grown means a greater annual income from each goat.

But if the biological origin of mohair is a mystery, so is the historical origin of the breed. Nineteenth-century authors were impressed by the classical references to goat hair in Turkey where the Angora emerged into recent history (fig. 9). However, only two of these, in the first century A.D., have the vaguest hint that the hair is other than ordinary goat hair. Strabo wrote of fine, white and bright goat hair, and Columella divided goats into those with shaggy coats whose horns were allowed to grow, and those with fine hair whose horns were sawn off to prevent damage of the coat by scratching.

References to goat hair in Anatolia continue until A.D. 300 and so one hypothesis holds that there was continuity from the goat hair of antiquity to the mohair that emerged in Turkey after the Middle Ages (SCHREINER, 1898). The second hypothesis states that the Angora was introduced by Turkish tribes that invaded Anatolia from Central Asia during the eleventh to thirteenth centuries. Invasions provide a favourite explanation for breed origins, but this suggestion follows a Turkish tradition that was

quoted as early as the eighteenth century. Research in progress by the present author using Turkish documentary sources is gaining support for the second hypothesis.

Some biologists, noting the possible origin of Angora goats in central Asia, consider that cashmere and mohair goats might have had a common origin. The suggestion is that the mohair type developed by selective breeding of a cashmere type in which the number of underwool fibres had already increased. SMITH (1987) saw a possible link between the two types in the Chinese Zhongwei breed since its kids have a curly, lustrous coat for which they are killed. This breed is found in north west China i.e. not far from the area in which the Turks originated. Although fine mohair is superficially similar to cashmere, the two fibres have important histological differences and the difference in coat structure seems too great to have been brought about solely by selective breeding. More archaeological

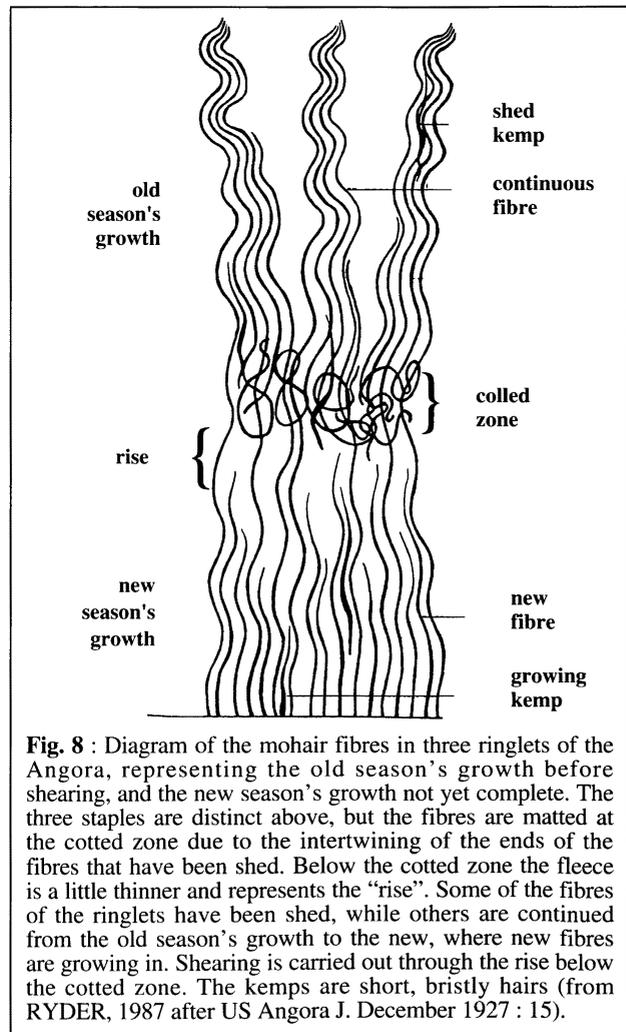


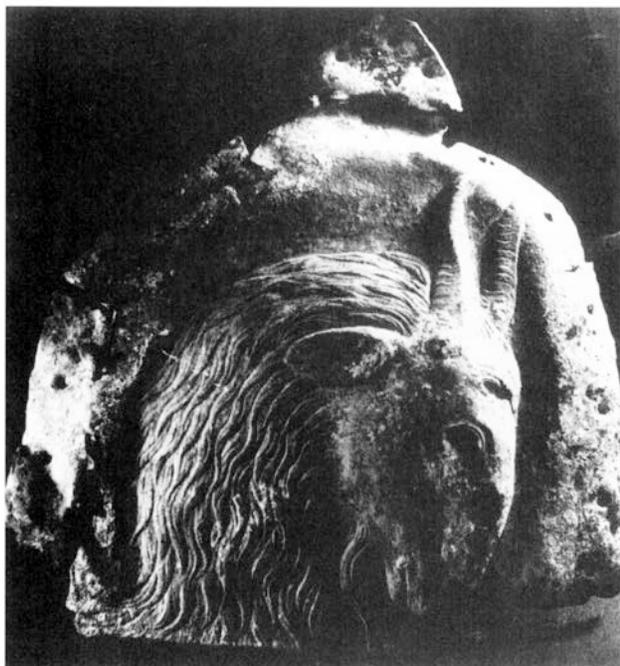
Fig. 8 : Diagram of the mohair fibres in three ringlets of the Angora, representing the old season's growth before shearing, and the new season's growth not yet complete. The three staples are distinct above, but the fibres are matted at the cotted zone due to the intertwining of the ends of the fibres that have been shed. Below the cotted zone the fleece is a little thinner and represents the “rise”. Some of the fibres of the ringlets have been shed, while others are continued from the old season's growth to the new, where new fibres are growing in. Shearing is carried out through the rise below the cotted zone. The kemps are short, bristly hairs (from RYDER, 1987 after US Angora J. December 1927 : 15).

and biological evidence is needed before we can be sure of the origin of either type.

The name "mohair" derives from the Arabic word *makhayer*, but its meaning "selected" does not necessarily mean selectively-bred since the word can also be translated as "choice". The origin of the name accords with historical evidence that the Turks were under Arabic influence before entering Anatolia, and in turn supports the view that they introduced the goat. It is of interest to note at this point that during the nineteenth century there was in Turkey (between Ankara and Konya) a cashmere type of goat in addition to black "Kurdish" goats and Angoras, which was combed for the underwool (CONOLLY, 1841 ; SCHREINER, 1898 : 73).

In Turkey, the Angora goat was originally a house animal, being kept by the women to provide fibre for their own clothing. The first European record of the Angora was made by Belon in 1554 and mohair had reached Europe a century later when it was used to make wigs. The first scientific description of Angora goats was made by TOURNEFORT (1654) - "*The finest goats in the world are bred in Angora. They are dazzlingly white, with hair as fine as silk, which falls in curly tresses 22 cm long*".

Fig. 9 : Bronze relief of a goat from Anatolia dated 4th century B.C. The hair is shown long and wavy, but whether it is ordinary hair or mohair cannot be determined from this illustration. Also, this animal has a convex nose, whereas modern Angora goats have a concave nose.



European interest in mohair was countered by a Turkish prohibition of its export except as spun yarn. Mohair cloth was unknown in Britain until about 1700, and in about 1750 a European trading company was set up in Turkey to organise the export of mohair yarn and cloth.

The first raw mohair reached Europe in 1820 and once machinery had been developed to spin the long fibres, demand for mohair increased so that by 1839 more raw fibre than yarn was leaving Turkey. The person who established mohair manufacture in Britain was Titus Salt of Yorkshire who was a very enlightened, Victorian factory owner, providing many facilities including housing for his workers. He was also the first to import and manufacture alpaca fibre from South America. Such fibres, along with cashmere and mohair came to be known in the textile trade as "speciality fibres". The Coat of Arms of Bradford bears an Angora goat as well as a sheep to indicate the city's industry.

The superior yarn and cloth produced in Britain caused the decline of Turkish hand manufacture, but created an immense demand for mohair fibre, so that between 1839 and 1895 the amount exported increased from 0.6 to 5 million kg. This rapid increase in demand was met through upgrading native goats by cross-breeding with the Angora. This took place mostly between 1836 and 1870 and resulted in complaints of inferior fibre due to hair in the first crosses.

Writers of the late nineteenth century deplored the deterioration of the "true" Angora type and quoted Capt Arthur CONOLLY'S (1841) description - "The long-framed goat peculiar to Angora is invariably white, and its coat is of one sort ; it is silky and hangs in long curly locks. It is clipped annually in spring, progressively yielding from 1lb to 4lb [0.45 to 1.8 kg] of mohair." [i.e. with increasing age]. The demand for mohair also caused the goats to be farmed in larger, village herds of about 300 head. These communal herds, in which a villager might own 20 goats, persist today, sheep being kept in the same way.

The first Angora goats to leave Turkey went to South Africa in 1838, and others reached that country in 1860 so that by 1893 South Africa had 2.8 million goats (twice as many as in Turkey) and the production of mohair was 4.3 million kg. At that time, the world production of 9 million kg mohair came mostly from Turkey and South Africa, with a smaller amount from USA. Angoras reached USA in 1848 and 1879, where they are kept in Texas. These three countries have in common a high altitude plateau with low rainfall, which remain the main modern areas of production.

Recent production statistics and the spread of Angora as well as cashmere goats to other countries are out of the scope of the present review, but it is of interest to mention that there were three small imports of Angora goats into Australia in the

middle of the last century as well as two small imports of cashmere animals. Although these did not expand in numbers as in South Africa and USA, a nucleus of Angora goats was kept pure and almost certainly some of these escaped to join and influence the feral population of ordinary goats.

The cashmere goats were not maintained and it is possible that they all became feral. A re-examination of

the contemporary literature however, (RILEY, 1832) shows that the cashmere animals introduced were in fact "cachmere-Angora" crossbreds from France, i.e. what are now termed "cashgora" goats. This has considerable significance for the recent use of feral goats in Australia as the basis for the development of new cashmere and mohair growing industrie.

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