



# WOOL



# WHAT IS WOOL?

- **The wool**, animal based fibre forming the protective covering, or fleece, of sheep.
- Selective sheep breeding eliminated most of the long, coarse hairs forming a protective outer coat, leaving the insulating fleecy undercoat of soft, fine fibre.
- However, other hairy mammals, such as goats and camels hair were also used.

# WHY WOOL SELECTED AS FIBRE?

- When man selected the sheep for domestication, he was guided in his choice by his clothing needs. He wanted an animal that would provide a skin of size suitable for use as a human garment: and he wanted, at the same time, a creature that grew a soft and comfortable fleece.
- Sheep was an obvious choice.



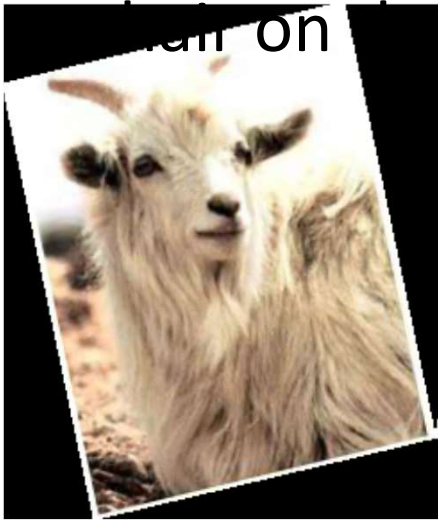


# SOURCES OF WOOL FIBRE



# Other Sources Hair fibre

- Other sources of wool are Llama, Hair have resemblance to wool fibres, therefore treated as wool. Hairs comes from goat, yak, camel and some other animals. These wool-yielding animals bear





# Classification of based on Sheep Breeding

- Modern sheep breeding have provided as a large proposition of wool as much as possible.
- Sheep that are preliminary used as a source of wool may carry only trace of outer covering in their fleece.
- Certain mountain breeds retain a relatively high proposition of the coarse hair fibers.
- The fibers are some time unusually white in color, and are opaque.

# Classification of based on Sheep Breeding

- **Marino wool:** The most important of all the sheep used as a source of wool.
- **Lamb's wool:** The finest wool is obtained from young sheep. Lamb's wool clipped at the eight month is very fine and of excellent quality.
- **Hog wool:** Six month later, when the sheep is fourteen month old, the wool is stronger and thicker. As the animal grows older, the quality of wool decreases slightly.
- **Altogether, a sheep, on the average, will provide between 0.9 and 4.5 kg (2-10 lbs) of wool per year, according to breed.**



# Sheep/Wool Shearing

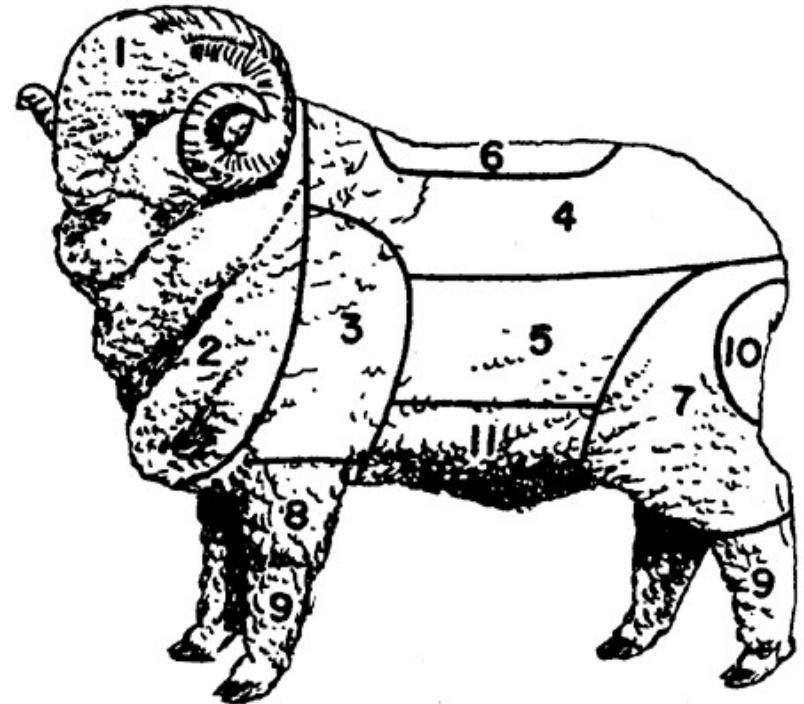
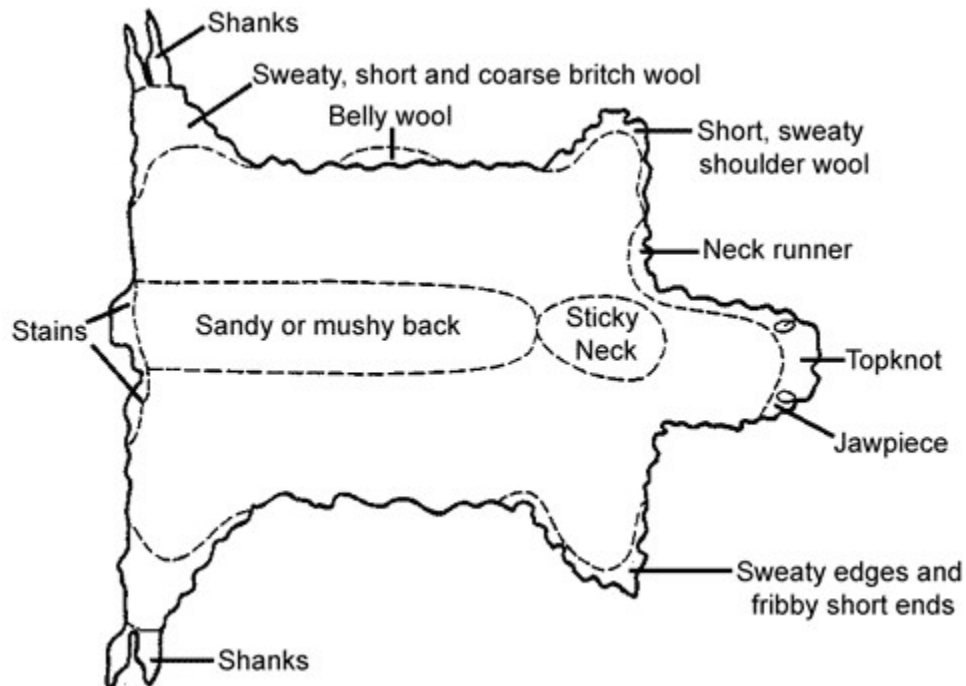




# Wool Sorting and Grading



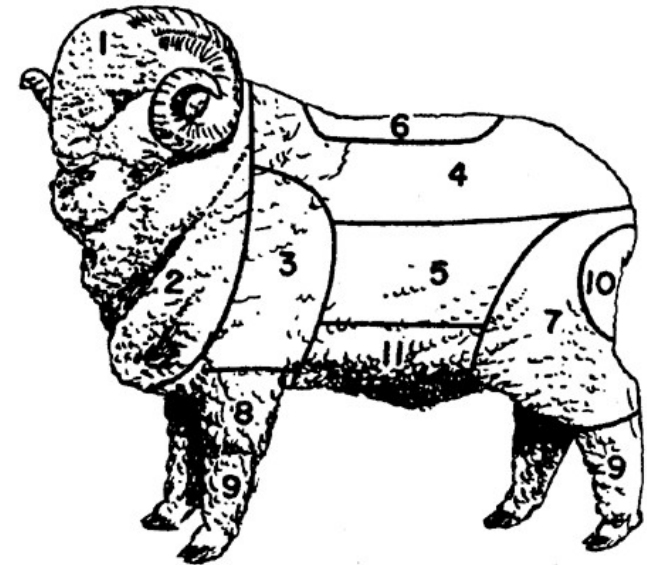
# Classification of based on Sorting



# Classification of based on Sorting

The number and name of the parts for the drawing are as follows:

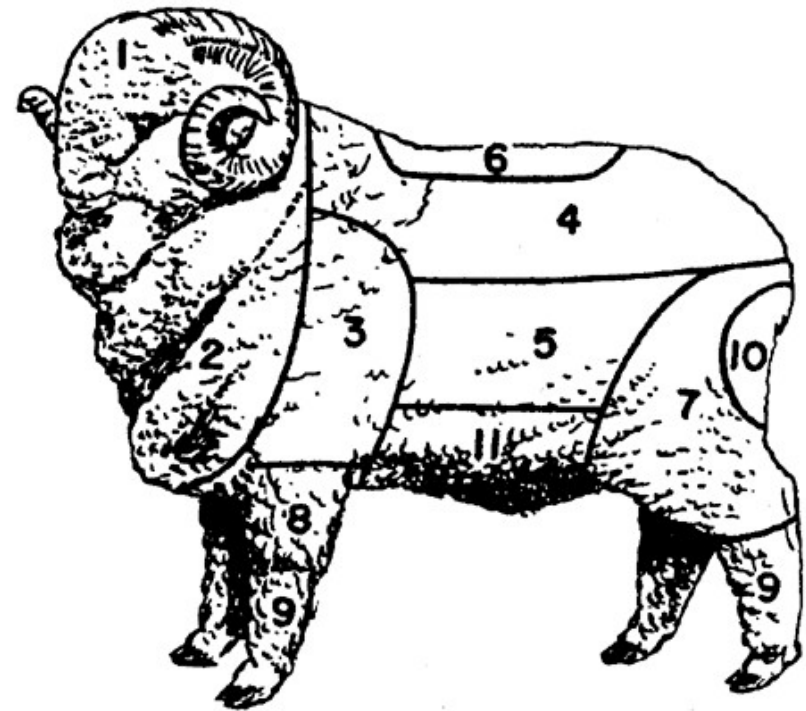
1. **Top knot:** This area has inferior wool that is very light, short, and dirty.
2. **Neck wool:** This wool is very light conditioned and long-stapled. It often contains coarse, matted lumps of inferior wool on the folds.
3. **Shoulder wool:** The best wool grown by sheep is obtained from the shoulder. Sheep judges usually take the shoulder wool as a standard and see how the wool on the other portions of the sheep compare with it.





# Classification of based on Sorting

4. **Fleece wool:** This area contains good, average wool that is usually free from vegetable matter.
5. **Breast wool:** This wool is similar to shoulder wool, but is usually a little heavier in condition.
6. **Back wool:** This wool is inclined to be open, weathered, and musky.
7. **Britch wool:** This is a coarser wool than the other portions of the fleece and is inclined short, coarse and wavy fibre. This wool can also be matted with burrs and seeds.



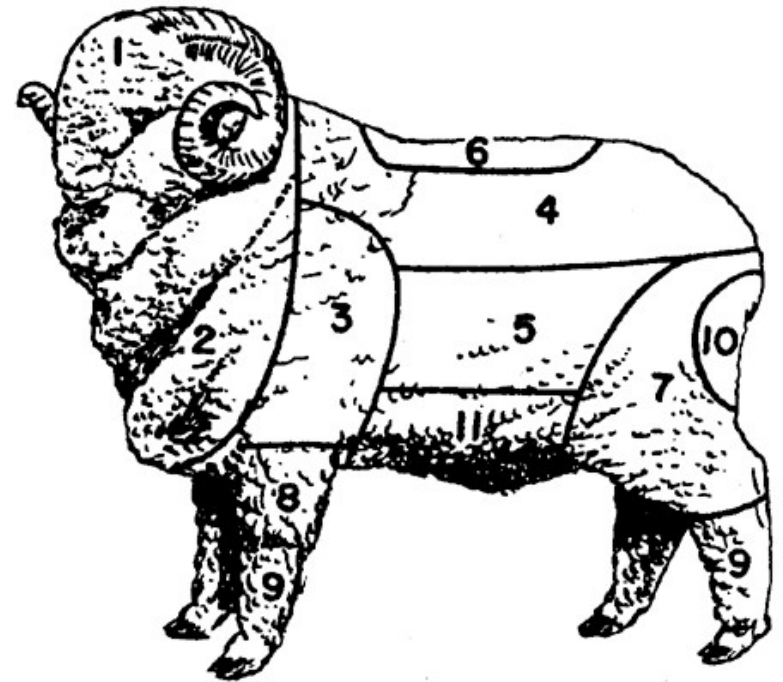
# Classification of based on Sorting

8. **Arm piece:** This wool is very short and has very short, open fiber (fribby) edges; burrs or seeds collect heavily on this portion of the fleece.

9. **Hairy shanks:** Hairy fibers containing very little wool are found in these areas; when blended with other wools, they are used for rugs manufacture and low quality goods.

10. **Stained wool:** This wool will not wash white and is very heavy in condition.

11. **Belly wool:** This is a bulky wool, heavy in condition, and usually very burry or seedy.



# Classification of based on Sorting

- In general, the shoulder provides the best wool and the shanks a slight lower quality. The belly, the tail and legs yield the poorest quality of wool.
- The fleece is sorted into grades by individuals who have developed a keen sense of touch.
- They sort the **fibers according to fineness, length, and color.**
- Each wool product is made from a different type of fiber, and the sorter divides the fleece accordingly. Thick, short fibers are used in tweeds.



# Wool Sorting and Grading

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- **Different Types of Wool :**

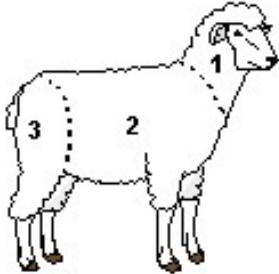
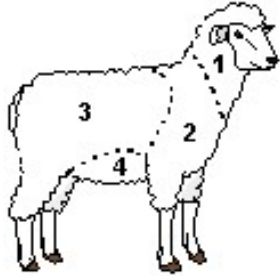
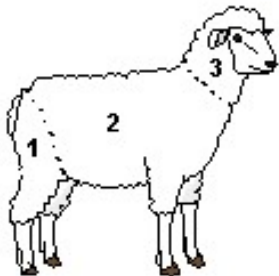
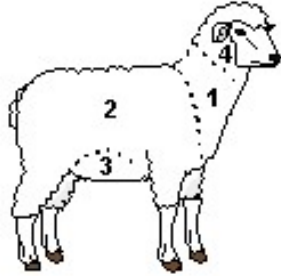
- Fine wool
- Medium Wool.
- Long breeds wool
- Cross breeds wool
- Carpet wool



- **Classification of Wool By flees :**

- Normal wool.----- ( 6 to 8 years of sheep )
- Hagget wool -----( 12 to 14 years of sheep)
- Pulled wool -----( 15-16 years of sheep)
- Cotty wool -----( very low quality sheep)
- Tag lock wool -----( Discolor sheep )
- Dead wool ----- ( Nearly dead sheep)
- Weather wool -----( Collecting after one collection)

# Wool Sorting and Grading

<p style="text-align: center;"><b>FINENESS</b></p>  <p>Three groups of fineness, with rankings from finest to coarsest:</p> <ol style="list-style-type: none"> <li>1. The <u>head</u> wool,</li> <li>2. The <u>dominant</u> or <u>bulk</u> wool over the body, and</li> <li>3. The <u>rump</u> and <u>butch</u> wool.</li> </ol>	<p style="text-align: center;"><b>DENSITY</b></p>  <p>Three groups of fiber density with rankings from most dense to least dense:</p> <ol style="list-style-type: none"> <li>1. The <u>head</u> wool,</li> <li>2. The <u>neck</u> and <u>shoulder</u> wool,</li> <li>3. The <u>dominant</u> wool, and</li> <li>4. The <u>belly</u> wool.</li> </ol>
<p style="text-align: center;"><b>LENGTH</b></p>  <p>Three groups of fiber length with rankings from longest to shortest:</p> <ol style="list-style-type: none"> <li>1. The lower <u>butch</u> wool,</li> <li>2. The <u>dominant</u> wool, and</li> <li>3. The <u>head</u> wool.</li> </ol>	<p style="text-align: center;"><b>CLEANWOOL YIELD</b></p>  <p>Four groups of yield, with rankings from highest percent yield to lowest percent yield:</p> <ol style="list-style-type: none"> <li>1. The <u>neck</u> wool,</li> <li>2. The <u>dominant</u> wool,</li> <li>3. The <u>belly</u> wool, and</li> <li>4. The <u>head</u> wool.</li> </ol>

# Classification of based on Milling

- The supply of the wool available to the world every year is insufficient to meet the world's needs, and the supply is maintained to some extent by re-using wool which has already been made in to yarns and fabrics.
- Recovered wool of this sort are usually mixed with fleece wool and used for medium or lower quality goods. Some times, fabric is woven with cotton warp and recovered wool weft.
- The rags and waste fabric are used as raw material for recovered wool are sorted and oiled before being opened out or teased to fibers between rollers covered with wire teeth. There are three main types of recovered wool.



# Classification of based on Milling

**Shoddy:** wool recovered from the fabric which has not been excessively milled during manufacturing. Cloths of knitted goods and worsted fabric provide the bulk of shoddy supplies.

**Mungo:** wool from the cloth such as velour, which have been milled during manufacturing. They are more difficult to disentangled, and suffer more damage in the process.

**Extract:** wool recovered from the cotton+wool blended fabrics. The cotton is removed by treating the fabric with hydrogen chloride or dilutes sulphuric acid; the wool is remains teased apart.

# Other Classification based on Use

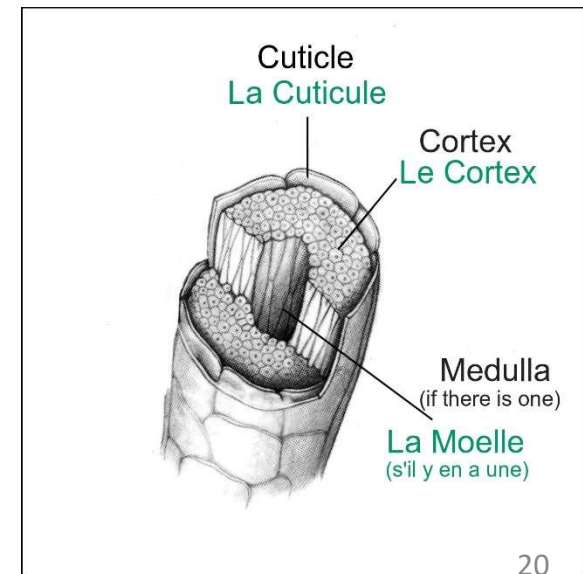
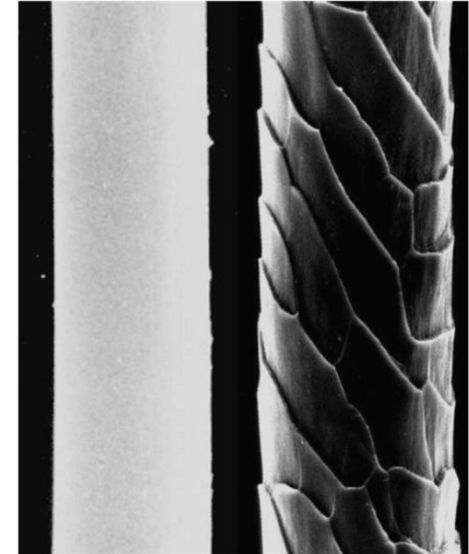
- **Recovered wool** is lower in quality than the fleece wools. The so called “rag-grinding” and for yarn waste ‘garneting’ processes used for teasing the fibers apart tends to snap the fibers and remove some of their surface scales. The short length of the fibers, together with the uneven surface and other damages, cause a lack of firmness and poor handle in the fabric with high content of recovered wool. Garment made from the recovered wool tends to lose their shape in wearing and its use is found less as compare to fleece wool.
- **All wool:** A fabric or garment label as “all wool” is not necessarily made from new fleece wool; it may contain a proportion of the recovered wool.
- **Virgin wool:** It is customary to refer to new wool materials as “virgin wool”. The “wool mark”, which designates such virgin wools, guarantees that a fabric is made from the new wools.

# Properties of Wool Fibre

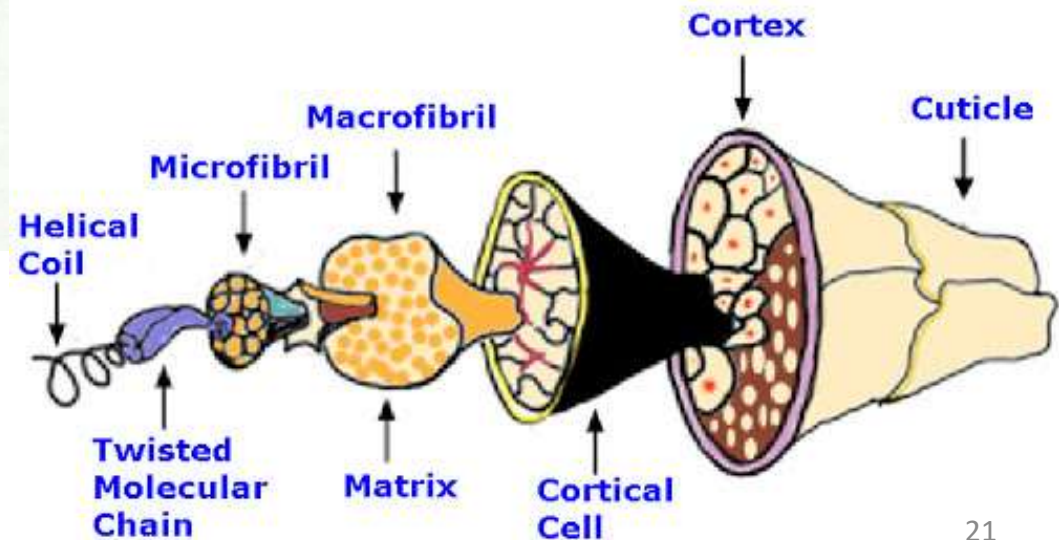
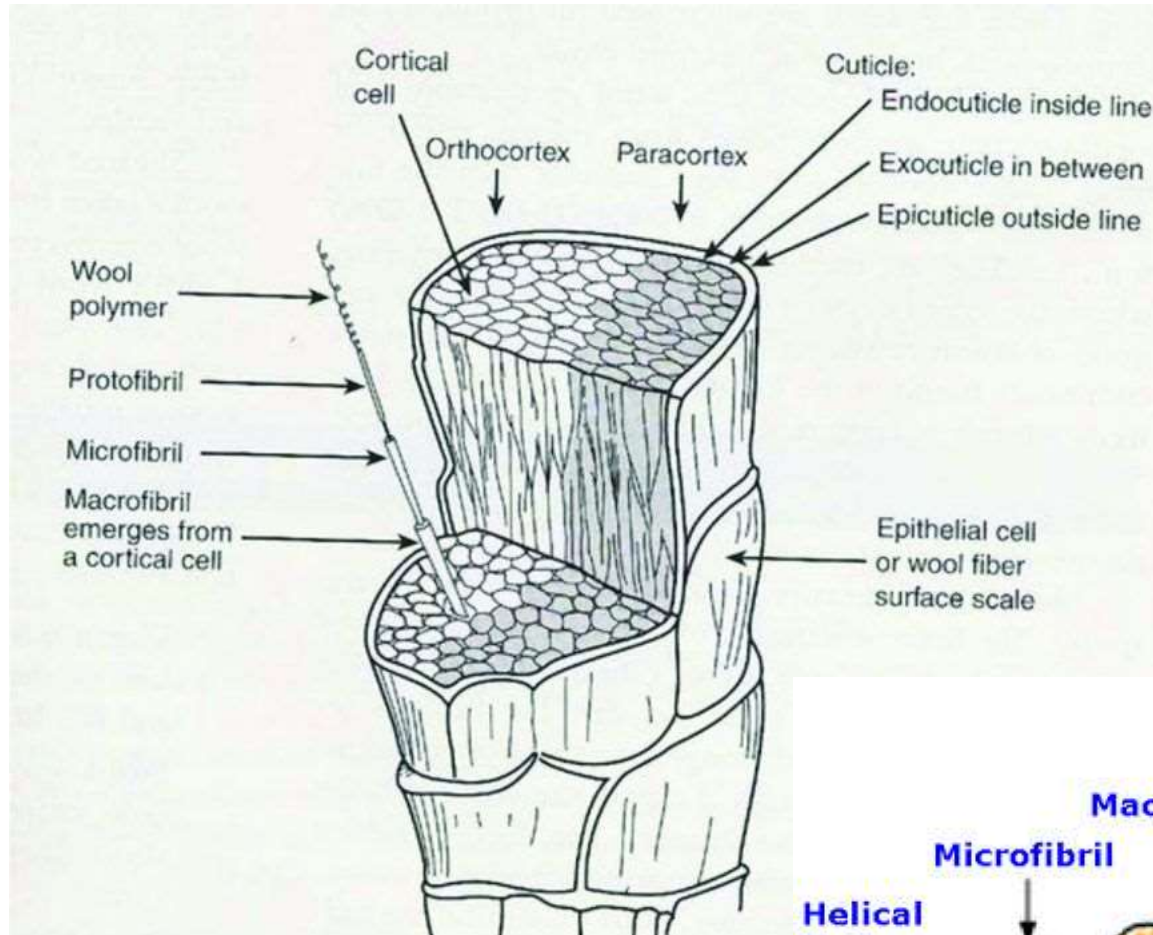
**Composition of Wool Fibre:** Wool largely consists of keratin a protein matter.

**Structure & Appearance:** Wool fibres have a unique surface structure of overlapping scales called cuticle cells. The cuticle cells anchor the fibre in the sheep's skin. Wool's surface is very different to typical synthetic fibres, which have a very smooth surface.

Under magnification wool fiber are seen to be covered epithelial scale. Wool fibers are not straight but have a crimp which varies with the quality of wool. The best Marino wool has high crimp/cm.



# Wool Fibre Structure Details





# Properties of Wool Fibre

**Fiber length:** The staple length varies from less than 10 mm-30 mm for wool fibers used in clothing.

**Luster:** The best quality wool has only a slight luster but the cheaper qualities are more luster as they have fewer epithelial scales.

**Strength:** Wool fibers are not very strong. Tenacity range is 0.9 -1.4 g/tex.

**Extensibility:** Wool is more extensible of the natural fiber and wool fabrics have crease resistance property (Elongation at break 40 %).

**Elasticity:** Wool has an elasticity recovery of 99% at 2 % extension and 63% at 20% extension.

# Properties of Wool Fibre

**Effect of Heat:** Woolen garments are bad conductor of heat and therefore, they keep the body warm. Wool scorch easily it has to iron with care. It is not flammable fiber.

**Effect of Moisture:** Wool is very absorbent and will hold about 30 % of its weight. it does not dry quickly SMR = 17 %. It shrinks & felt easily on washing.

**Effect of Sun light:** White wool becomes yellow on exposure to sunlight.

**Effect of Insects & Micro-Organism:** It is attacked by moths & damaged by mildew & bacteria.

# Properties of Wool Fibre

**Scouring/Carbonizing:** Raw wool is dirty and contaminated with natural substances that must be removed before processing can be carried out. Often, as much as 50% weight of the raw wool consist of impurities. Raw wool is washed or scoured by being agitated gently in the tanks filed with warm water containing detergents. Dilute acid are most commonly used for scouring/carbonizing of raw wool.

**Bleaching:** It is easily damaged by chlorine bleaches.

**Effects of Alkalis:** Wool is rapidly attacked by alkalis.

**Effects of Acids:** Wool is resistance to the action of dilutes acids.

**Dyeing:** It can be dyed well with variety of dyes, such as Basic dyes, Acid dyes and reactive dyes are most commonly used.

# Cost and Uses of Wool Fibre

- Wool is expensive about three times the price of cotton.
- High quality worsted fabrics are still produce is UK and majority of these fabrics are exported to other part of Europe and USA.



# Physical properties, region and uses

Wool name	Fleece	Region	Characteristics	Length	Cross-section	uses
Mohair	Angora goat	India U.S.A., South Africa, Turkey	Long length, softness, Springy nature, excellent luster, very little ability to felt	4-10 inches	25-55 $\mu$	vast variety of textiles
Cashmere	Tibetan goat	India Tibet	Downy handle, fluffy nature, brown or grayish white colour	1.5 – 3 inches	15 $\mu$	shawls
Alpaca	Peruvian goat or llama	India Peru, Bolivia	Brown, gray or black in colour	10 inch	10– 35 $\mu$	lining or men's wear