







1.2.4 Animal Fibres: Wool (2)

Classification of Wool

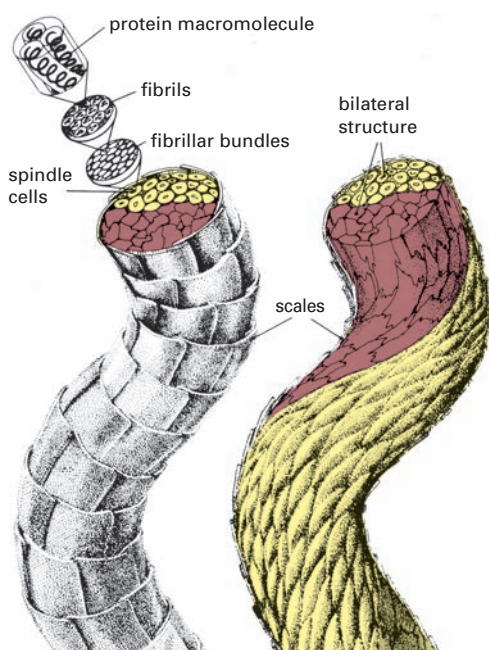
There are hundreds of different types and breeds of sheep. They are classified according to their wool into five basic types: Fine, Medium, Crossbred, Long, and Coarse.

Wool Type	Fine	Medium, Crossbred	Long, Coarse
Breed (examples)	Merino, Rambouillet	Southdown, Corriedale	Lincoln, Romney, Karakul
Fineness, Diameter	finest wools, 15...23 μm ¹⁾ 	medium fine, 24...30 μm 	coarse, over 30 μm 
Length	50 ... 120 mm	120 ... 150 mm	over 150 mm
Crimp, Waviness	 highly crimped	 normal crimp	 low crimp, straight
Sources (examples)	Australia, South Africa, ex USSR	Argentina, Uruguay	New Zealand, Great Britain
Applications	fine outerwear, knitted and woven, shawls, socks	heavier, more robust, sporting clothing	carpets, traditional furniture coverings

¹⁾ 1 μm = 1 millionth of a metre = 10^{-6} m

Apart from its fineness, length, crimp, and breed, wool can also be classified according to:

- **Shearing:** **Lambswool** is from the first shearing, after six months, whilst **Yearling wool** is from the first or second shear after 10-12 months. They are fine, soft, not very strong, with fine tips. **Six-month, Eight-month, Twelve-month wools** are from sheep shorn at intervals of 6, 8 or 12 months.
- **Source:** **Australian, New Zealand, etc. Cape wool** is from South Africa; **Shetland** is typical coarse wool from Scotland.
- **Extraction:** **Virgin wool** is from living, healthy sheep or lambs. **Dead wool, Fallen wool** is from sheep that have died from natural causes. **Skin wool** has been taken from the skins of slaughtered sheep.
- **Spinning:** **Worsted wool** is usually fine Merino, spun into fine, smooth, uniform, combed yarns. The very finest and most expensive wools are made into extra-fine combed yarns designated as **super 100s to super 200s**. **Woollens** are heavier, more voluminous yarns prepared on the woollen spinning system. **Carpet wool** is long, coarse wools for carpet yarns.
- **Recycling:** **Recovered Wool** is wool that has been recovered mechanically by teasing apart production waste and second-hand clothing. Recovered wool is damaged and is of low quality.



1: Model of the wool fibre

Construction of the Wool Fibre

The wool fibre is made of protein molecules (**keratin**). It is rather similar to human hair. The long-chain protein molecules are formed into fibrils. These combine into fibrillar bundles which form the mass of the spindle cells. This construction gives the wool fibre an extraordinary elasticity. The bulk of the fibre is made from two separate components. These have different chemical constitutions, and they wind in a spiral around each other (bilateral structure). Moisture and temperature have different effects upon the two components, which swell to different extents, causing changes in the overall fibre shape. It is the bilateral structure which causes the fibres to be crimped; finer fibres develop more crimp. Heat and moisture can relax bonds between the protein chains. The bonds are re-formed during cooling and drying, and this is the source of the good smoothing and shaping properties of wool.

Wool absorbs moisture (is hygroscopic). It can absorb about $\frac{1}{3}$ of its mass of water vapour without feeling wet. The moisture is released only slowly. In spite of the strong affinity for water of the fibre interior, its surface is water repellent (hydrophobic) because it is covered by an extremely thin skin, the epicuticle. This skin causes liquid water to roll up into droplets whilst allowing the passage of water vapour.

The **scales** on the fibre surfaces are capable of hooking onto one another to cause felting, under the influence of water, heat, and mechanical action.