WOOL, in Natural History and Manufactures, Latin lana, lanicum, Fr. laine, signifies soft hair or down, more particularly that of sheep, but is applied to the soft hair of other animals, as of the vicuna, commonly called Vigonia wool, that of the yak of Tartary, &c.; and also to fine vegetable fibres, as cotton. The Romans applied the term extensively to the soft hair or down of all quadrupeds, and even to that of birds, as lana anserina, the wool or down of the goose; lana caprina, goat’s-wool.

They also applied the term to vegetable substances:

——“Nemora Ethiopium molli canentia lana.”
     Virg. Georg. ii. 120.

““The trees of Ethiopia, white with soft wool, or cotton.”

The distinction between wool and hair is rather arbitrary than natural, consisting in the greater or lesser degrees of fineness, softness, and pliability of the fibres. When they possess these properties so far as to admit of their being spun and woven into a texture sufficiently pliable to be used as an article of dress, they are called wool. The gradations between wool and hair on the skins of some animals are often too minute to admit of accurate distinction. The fleeces of many sheep contain fibres so hard and coarse, that they may most properly be called hair; and some hairy animals produce on part of their skins fibres poising all the properties of wool; even in fleeces from the sheep, we may sometimes observe the very same fibre to be a coarse hair at one end, and at the other end a comparatively soft wool. The power of words, when inaccurately applied in retracing the progress of improvement, may frequently be traced in the most common occurrences of life, and we are persuaded it has had no inconsiderable effect in this instance, in preventing the cultivation of wool, in Europe, on the skins of other animals besides sheep. No one will deny that it is impossible to produce wool on the backs of the ox or the as, if we restrict the term wool to the fleece of the sheep; but if by wool we mean a soft fine hair, poising all the properties which render it suitable to be spun, woven, and fulled, to make cloth, the oxen of Thibet and the afts of Chili do produce and have for centuries produced such wool. Many of the afts and oxen even in this kingdom have soft woollly tufts of hair on some parts of their skins, and if such cattle were selected, and the breed cultivated, it is probable we might obtain from them a valuable addition to the materials on which national industry might be profitably employed.

Sheep’s wool appears to be the product of cultivation; we know of no wild animal which resembles the wool-bearing sheep. The argali, from which all the varieties of sheep are supposed to be derived, is covered with short hair, at the bottom of which, close to the skin, there is a softer hair, or down. (See Argali and Sheep.) This is not peculiar to the argali; almost all quadrupeds inhabiting cold climates are covered in the same manner with a soft hair or down, which is protected by a coat of longer and coarser hair. By removal to a temperate climate, or when placed under the fostering care of man, and protected from the inclemencies of the weather, and supplied regularly with food, the coarse long hairs fall off, and the animal retains only the softer and shorter hair, or wool. It is also observed that European sheep, removed to tropical climates and much exposed, soon become languid and sickly, and lose their fleeces, which is succeeded by a covering of short coarse hair. Sheep in exposed situations in Europe often produce short coarse white hairs called kemp, intermixed with the finer wool; on removal to a warmer situation, and to a richer pasture, the coarse hairs fall off, and do not grow again. These facts are sufficient to prove the effect of cultivation on the fleece; and it must be observed that sheep’s wool of a good quality is never found but in those countries which have been the seats of the arts, and where a considerable degree of luxury or refinement exists, and has once prevailed. This is a strong presumptive proof that such wool has been originally obtained by a careful and long-continued attention to the selection of those sheep which produced the finest and most valued fleeces.

Angora, the ancient Anegria, the former seat of arts and manufactures, still retains its breed of fine-woollen animals, among which the goat at the present time produces a fleece nearly equal to silk in lustre and fineness; and the cat and the rabbit of that district yet produce fine long wool. Damascus, and the other ancient cities of Asia Minor, preserve
WOOL.

in their vicinity the traces of the former cultivation of fine-wooled animals. The Tarentine fine-wooled sheep, so much valued by the Greeks and Romans, were obtained from Asia Minor, and were on that account sometimes called Aisan. It is highly probable that these sheep came originally from the more eastern fauns of luxury, where the finest fibres are now grown, of which the shaws and cloths of India are fabricated.

In countries where manufactures have once flourished, their effects continue for a long time visible in the race of sheep which still remain there. Even in the present condition of the flocks from Barbary and the adjoining states, the experienced eye may perceive the vestiges of a fine-wooled race of sheep, degenerated by utter neglect, in a climate naturally unfavourable to the production of fine wool. In ancient Sicily and the southern parts of Italy, the remains of the original Tarentine breed prevail to the present day a race of fine-wooled sheep, but greatly degenerated by neglect. In Portugal the fine-wooled sheep retain more of their original purity, but are still much neglected. In Spain attention to the growth of fine wool appears never to have been entirely lost sight of, and it is here that the race of fine-wooled sheep excels in the highest degree of perfection, though, as we shall afterwards state, probably inferior in some important qualities to the original Tarentine race. Some writers have asserted that fine wool is the result of climate and food; but this is not the case, though we admit that both have some influence on the quality of wool. It is the breed alone that primarily determines the fineness of the fleece; this has been ably demonstrated by the experiments of lord Somerville, Dr. Parry of Bath, and others in this country, and by experiments on a larger scale in Sweden, Denmark, Saxony, and France.

It has been ascertained by Mr. Bakewell of Dihiley, in Leicestershire, that the form of animals might be changed by feeding such as had any remarkable peculiarities, and continuing to breed from them for a few generations, when a new race is established, in which these peculiarities continue permanent. It has been ascertained by careful observations, both of cattle-breeders and physiologists, that in producing a new breed from two varieties of the same species, the female has more influence over the form of the progeny than the male; but with respect to wool the cafe is reversed, the quality of the fleece depending more on the fire than the dam. Beginning to breed from a coarse-wooled ewe and a pure fine-wooled ram, the produce of the first crosses will have a fleece approaching one-half to the fineness of that of the ram; and continuing to cross this progeny with a fine-wooled ram, equal to the first in quality, the fleece of the first and crofs will approach three-fourths to the fineness of the finest of the first, and in a few crofs more will be brought to an equal quality. If we state it numerically, and suppose the wool of the ewe to be twice as coarse as that of the ram, or as 320 to 160, the first crofs have of the fibre reduced to 240, the second to 200, the third to 180, the fourth to 170, the fifth to 165, the sixth to 162, as to which number this ratio of approximation may be regarded as correct on a large scale of experiment. If we breed with a fine-wooled ewe and a coarse-wooled ram, the fibre would be reversed, and in a few generations all vestiges of the fine-wooled race would be nearly, if not entirely, extinct. The ancient Romans, in the time of Columella, seem to have been fully aware of the effects of breed on the fineness of the wool, and as much as 200. Sterling was paid for a fine-wooled ram.

When a flock of fine-wooled sheep are once formed, they can only be kept pure by feeding and prefering the finest-wooled rams, and most carefully avoiding all intermixture with sheep from coarser-wooled flocks that may exist in the country. Where this is neglected, the quality of the wool will soon be debauched.

But we now join all the flocks in a country were of the fine-wooled race, accidental varieties of coarse-wooled sheep will occur among them, or of sheep having fleeces intermixed with coarse hair. If these be not carefully examined and removed, the wool will deteriorate, and more so where the climate is variable, and the sheep are exposed to great and sudden vicissitudes of temperature.

What has been stated may suffice to explain the circumstances of fine-wooled breeds of sheep being only found in the vicinity of prent or ancient manufactures, or where they have been transported from such districts. Wherever fine-wooled sheep are neglected by man, the wool becomes either coarse, or intermixed with coarse hairs; the latter is the case in the Shetland isles, and in all countries where the arts and manufactures have been entirely destroyed, and ignorant barbarians have succeeded as the poiffers of the faun. Most ancient writers on wool, and even many moderns, seem not to be aware of any difference in woods, except the fineens or coarseens of the fibre; but the length of the fibre constitutes a far more important differential character. Long wool, or what is called combing-wool, differs more from short or clothing wool, in the ules to which it is applied, and the mode of manufacture, than flax from cotton.

Sheep's wool may, therefore, be divided into two kinds. Short wool, or clothing-wool, and long or combing wool: each of these kinds may be subdivided into a variety of sorts, according to their degrees of fineness. This proceeds is the proper labour of the wool-forter. Short wool, or clothing-wool, may vary in length from one to three or four inches; if it be longer it requires to be cut or broken, to prepare it for the further processes of the cloth manufacture. Short or clothing wool is always carded or broken upon an instrument with fine short teeth, by which the fibres are opened and spread in every direction, and the fabrics made from it are subjected to the processes of felting, which we shall afterwards describe. By this proceed, the fibres become matted together, and the texture rendered more compact.

Long or combing wool may vary in length from three to eight or ten inches; it is prepared on a comb or instrument, with rows of long steel teeth, which open the fibres, and arrange them longitudinally: in the thread spun from combed wool, the fibres or filaments of the wool are arranged in the same manner, or similar to those of flax, and the pieces when woven are not subjected to the processes of felting.

The shorter combing-wools are principally used for hosiery, and are spun softer than the longer combing-wools, the former being made into what is called hard worsted yarn, and the latter into soft worsted yarn. Comb-wool is the principal qualities deserving attention in clothing-wools are the regular fineens of the hair or pile, its softness and tendency to felt, the length and roundness of the flake, and the colour. The wool-buyer also regards as important the clean state of the fleece, and to the grower its weight is particularly deserving attention; for in fleeces equally fine, from sheep of the same size, some may be much heavier than others, the fibres of wool being grown closer to each other on the skin. The fineens of the hair or fibre can only be estimated to any useful purpose, in the woollen manufacture, by the wool-forter or wool dealer, accustomed by long habit to discern...
WOOL.

On the average, there will be in each fleece nearly three-fourths of the belt or R wool. The second and third forts, or the F and T, will also contain a considerable portion as fine as the belt; but being shorter and discoloured, or intermixed with coarse hairs, which require their locks to be separated from the belt fort, or the refina.

The value of the belt part of a Spanish fleece, or the R wool, varies greatly in different flocks. When this fort, from the most esteemed flocks, may be worth six shillings and sixpence per pound in the English market, the R wool from another flock may not be worth more than three shillings and sixpence. The F and T wools are from 25 to 50 per cent. lower than the first fort: thus, the inferior forts from the finest piles may be of greater value than the belt fort or R wool of other piles; but they are never intermixed by the dealers, as they are applicable to different fabrics. In the English mode of wool-forting, there will frequently be eight or ten forts in a single fleece; and if the belt wool of one fleece be not equal to the finest fort, it is thrown to a second, third, or fourth, or a still lower fort, which is of an equal degree of fineness with it. The best English short native flocks, such as the fine Norfolk and South Down, are generally divided by the wool-forter into the following forts, varying in degree of fineness from each other, which are called,

Prime, Choice, Super, Head, Downrights, Seconds, Fine abb, Coarse abb, Livery, Short coarse or breech wool.

Besides these forts of white clothing wool, two and generally three forts of grey wool are made, containing locks which may be black, or intermixed with grey hairs. Some wool-forters also throw out any remarkably fine locks in the prime, and make a small quantity of a superior fort, which they call picklock. The origin of some of the above names is obscure, but the names of the finer forts appear to indicate either a progressive improvement in the quality of the wool, or in the art of wool-forting. The relative value of each fort varies considerably, according to the greater demand for coarse, fine, or middle cloths; and the variation during and since the late war in the Spanish peninsula has been much increased by temporary causes. Before that period, when the R wool of good Spanish piles sold at from five shillings and sixpence to five shillings per pound, the prime from Herefordshire flocks was sold at about three shillings and sixpence, and that from the Norfolk and South Down from three shillings to three shillings and two-pence per pound. The higher price of the Herefordshire was in part owing to its being in a cleaner state. The Spanish wool is also cleaner than any of the English wools, being scoured after it is spun; but the latter is only imperfectly washed on the sheep, previously to its being spun.

A pack of English clothing wool of 240 pounds weight, in its marketable state, will weigh about 70 pounds in the proceeds of the manufacture: the same quantity of Spanish wool, as sent to market, will not weigh more than 48 pounds.
WOOL

on the average. This contributes to enhance the difference between the prices of each, as well as the superior finefns of the latter.

Different wool-forters make a considerable variation in their modes of fortng the fame kind of fleeces; some divide them into more sorts than others; but the following table will shew what may be taken as the average relative value of each sort, when the prime is worth about three shillings and two-pence per pound, and may serve to shew the skill required to estimate the value of fine English wool in the fleece.

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<td>Super</td>
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<td>Head</td>
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<td>Fine abb</td>
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<td>Coarse ditto</td>
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The demand for coarse woolen goods having greatly increased of late, the prices of the lower sorts are considerably advanced from the above-quoted prices, and are at present as under:

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<td>Picklock</td>
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The Sfiness of fine clothing Wool is next in importance to the finefns of the fibre, though it has been too little attended to in the culture of English wool. This quality is not dependent on the finefns of the fibre; it consists in the peculiar feel which approaches to that of silk or down, but in which the wool of all European sheep is inferior to that of Eastern Asia, or to the wool of the vicunna, or lama of Peru and Chili. In foreign European wools there are different degrees of this property, where the fibre is equally fine. In our native English wools, the like difference exists between the softfns of wool possessing the fame degree of finefns, but grown in different districts. In the harder wool, the fibre is elastic and hard to the touch, and cloth made from it has the same harsh feel; it is also more loofe in its texture, and the surface of the thread is generally more bare. The difference in the value of cloth from two kinds of wool, equally fine, but one distinguished for its softfns, and the other for the contrary quality, is fuch, that with the fame process and expence of manufacture, the one will make a cloth more valuable than the other from twenty to twenty-five per cent.

Though the English woolen manufactures had been carried on for so long a period, the caufe of this difference in cloths made from wool equally fine was but very imperfectly known till the present century. Mr. Robert Bakewell, then of Wakefield in Yorkshire, first directed the attention of wool-growers and manufacturers to this subject, in a work, entitled "Observations on the Influence of Soil and Climate on Wool." The reason why the manufacturers remained so long ignorant respecting it arose, he observed, from the manner in which the woollen-trade had been carried on in Yorkshire, the great heat of the manufacture of English clothing-wool, the division of employment there not permitting the wool-dealer, or even the clothier, to witness the final result of the process. The wool-buyer in the distant counties, and the wool-forter, who divided the fleece, were equally unacquainted with the cloth manufacture. The Yorkshire clothier fold his goods in an undreffed, and often in an undyed state; they were bought and finifhed by the cloth merchant, who was formerly unacquainted with the previous proceedings of the manufacture, or the qualities of wool. In a promifuous lot of undreffed cloth bought at the fame price, and apparently of the fame quality in the rough state, if some pieces were finifhed much better and softer than others, it was attributed to lucky chance, the patron divinity of the ignorant. Mr. Bakewell proved that the hardnefs of English wools does not depend on the nature of the food, or even entirely on the breed; it is the effect of the foil acting on the surface of the fleece. The wools from chalk districts, or light, dry calcareous soils, the natural yolk or mofhure absorbed by the particles of calcareous earth that penetrate the fleece, and the wool is thereby rendered hard. The fame effect is produced on a skin where lime is used; it may also be produced by keeping wool for a longer or shorter time in a dry hot temperature; and when wool has been fo dried, no process will restore to it its primitive softness. On the contrary, wools grown on rich loamy argilaceous soils are always distinguished for their softness. The quality of grease or yolk in the fleece has a considerable degree of influence on the softness of Merino wool, the pile being fo close as in a considerable degree to prevent the earthy particles from penetrating the fleece; but in all English fleeces the wool is grown thinner on the skin, and admits the more easy access of the absorbent particles. Exposure to the direct rays of the sun has also a tendency to injure the soft quality of the wool. We shall have occasion to refer to the methods recommended by Mr. Bakewell to improve the softness of wool on soils naturally unfavourable to its growth.

Of fine European wools, the Saxony generally poififie a greater degree of softness than the Spanish, which we believe to be owing to the sheep being less exposed to the action of light and heat. The native fine Italian wool, before the introduction of the Merino race, poififie a considerable degree of softness, judging from wools which we have seen from thence, but they were deficient in foundness, and not true grown. The wools on the chalk soils in the southern and eastern side of England are generally hard, except, as in Kent, where the chalk is covered by thick argilaceous beds. Nottingham foreft, Charnwood foreft in Leicestershire, and some parts of Shropshire, produced not the finest, but some of the softest wools in England before the late inoculations. The Cheviot hills in Cumberland are not pillured by the finest-wooled English sheep, but their fleeces poififie a degree of softness exceeding any from the other districts of England, and they are rendered soft by artificial means, which we shall describe. It is still somewhat uncertain, whether there are two diftinct breeds of sheep, from which the fine flesh wool of India are grown; or whether one species of the animal which yields it is not to be claffed with the goat. The fleeces from India, which we have seen, are grown on a very small fleece; close to the skin, there is a wool as soft as the softest fur; this is covered by long coarse hairs growing through it. When the wool is once thorn, the separation of these hairs from the soft wool
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wool is a work of extreme difficulty; but on the back of the sheep we believe the separation can be made with great ease. The sootness of the Indian wool is not even sufficiently approached in the very sootest Merino fleeces from Saxony and Spain; this may be proved by comparing the finest cashmere cloth from Saxony wool, with the shawls or shawl-cloth of India. The ancient Tarentine sheep, called by way of excellence 'molles oves,' were treated with peculiar care by the Romans, and clothed in skins, which we believe was intended to preserve the sootness of the wool, as it is still practised in some parts of Asia for that purpose. In Europe no experiments have been made directly to improve the sootness of wool, though wool approaching in sootness to that of India would be a most valuable acquisition to our manufacturers. To be convinced of this, it need only be flated, that the yarn from Indian wool has been bold here at three guineas per pound, not on account of the superior fineness of the spinning, but for the sootness of the wool. For coarse goods, indeed, such as blankets, carpets, and cloths called duffelds, raifed with a hairy pile, a considerable degree of hardness or elasticity of the fibre is an advantage; but in all the finer articles of the woollen or worsted manufacture, the opposite quality is of great value.

The felting property of wool is intimately connected with its sootness, the sootest wools having the greatest tendency to felt, and the hard wools are all defective in this respect. The felting property appears to depend on a peculiar structure of the surface of the fibres, by which they are disposed to move in one direction more easily than another. This is perceptible in drawing a hair through the fingers, first from the end to the point, and again from the point to the end; in one direction the hair feels perfectly smooth, in the other direction a peculiar roughness is felt. The cause of this is supposed to be owing to the surface of the fibres having laminae, like the scales of fishes, with the edges laid over each other. Indeed in the furs of some animals we have observed with a powerful microscope, that the surface is composed of laminae laid over each other, resembling the arrangement of the leaves of the artichoke. On this property the process of hat-making depends; the short fibres of the fur being repeatedly compressed, moved and interlaced with each other, so as to form a compact substance; this motion is further aided by heat and moisture. A similar process takes place to a certain degree in cloth subjected to the strokes of a fulling-mill: the fibres cohere, and the pieces contract in length and breadth, and its texture is rendered more compact and uniform. This process is essential to the beauty and strength of woollen cloth; and it is observed, that the softer wools felt in much less time than the hardier, and form a tenderer pile on the surface of the cloth, on which account it is a common practice to mix a certain quantity of soft wool with the hard, to enable the former to felt with more facility.

The length and sootness of the staple of clothing wool is the quality next to be considered. By the staple of wool is meant the separate locks into which the fleece naturally divides in the skin, each lock confuting of a certain number of fibres, which collectively are called the staple. The length of staple for fine clothing-wool, if found, is from two to three inches; if it be longer it requires breaking down to prepare it for the process of carding. Saxony wool, being generally more tender than the Spanish, and more easily broken down, is sometimes four or five inches long; but as it works down easily, it is preferred, on account of the length of its staple, for such goods which require fine spinning, as cashmeres, pelisse cloth, and shawls. Much of the English clothing-wool of a middle quality is grown longer than is desirable for the purpose of the clothier, and when found is thrown out for the hofiery trade, if the demand for the latter be great. As the grower could not shorten the length of the staple without diminishing the weight of the staple, he has no motive to induce him to grow shorter wool; but the object might be attained with much benefit to himself by shearing twice in the same year, the latter end of April, and again the latter end of August; the wool would then be grown of a suitable length for the card, and from experiments that have been made we believe the weight would exceed what can be obtained from one clip: the increase would not be less than fifteen per cent., and the condition of the sheep thereby improved.

The sootness of the staple in clothing-wools is not so important as in combing-wools; but for some kinds of colours which injure the wool, it is particularly desirable that the fibre should be found and strong; this is judged of by drawing out the staple and pulling it by both ends. The sootness and strength of the staple depend primarily on the healthy state of the animal, and on a sufficient supply of food. The staple on some parts of the fleece will always be more tender than on other parts, but by mixture they tend to form a definite pile on the surface of the cloth. The colour of the fleece should always approach as much as possible to the purest white, because such wool is not only necessary for cloths drieved white, but for all cloths to be dyed bright colours, for which a clear white ground is required, to give a due degree of richnes and luster. It is probable that all sheep's wool was first of a black or reddish colour: the latter is often referred to by the ancients. Before the invention of dyeing, coloured wool must have had a preference to white; but after the act of communicating beautiful colours to the fleece, white wool would be in the greatest demand, and those sheep which had white fleeces would be selected to breed from. The most ancient flocks of sheep which we have any record of are those of Laban and Jacob, described in the book of Genesis. The fleeces appear to have been principally brown, or spotted and striped, which was in all probability the general colour of the flocks throughout that part of Asia. We learn that in the course of twenty years a great change was effected in the colour of a large portion of the sheep of Laban: though Jacob appears to have conceived from his father-in-law the method by which this change was effected, we are expressly told in the sequel that it was by crossing with rams which had fleeces of the colours required.

Dark-brown or black woolled sheep are not uncommon in many parts of the European flocks, but such wool being of less value than the white, thefe sheep ought always to be expelled. Some of the English fine-woolled sheep, as the Norfolk and South-Down, have black or grey faces and legs. In all such sheep there is a tendency to grow grey wool on some part of the body, or to produce some grey fibres intermixed with the fleece, which renders the wool unfit for many kinds of white goods; for though the black hairs may be too few or minute to be detected by the wool-forter, yet when the cloth is flayed they will become visible, fouling reddish spots, by which its appearance is much injured. The Herefordshire sheep, which have white faces, are entirely free from this defect, and yield a fleece without any admixture of grey hairs. We have no doubt that by carefully rejecting those sheep from the South-Down flocks, in which the grey is most apparent, this defect might be gradually removed. It is particularly desirable with respect...
WOOL.

...to these sheep, as the wool grown on chalk soils, though less soft than on other soils, is generally whiter, and better suited to fuch goods which require the process of bleaching or scouring, and do not require to be so much fullled as many other cloths.

The ancients were so well aware of the necessity of expelling dark-coloured wool from their flocks, that in selecting the sheep to breed from, they did not truit to the colour of the fleece alone, but carefully examined the embon and tongue of the sheep, and if the leaf blackeds or frightfulns appeared he was immediately rejected; and though some moderns have doubted the use of this precaution, we believe it was well founded.

"Illum autom, quamvis aries sit candidus ipse,
Nigra fulet udo tautum cul lingua palato,
Rexice, ne maculis infestet vellera pullis
Nacnetem."  
Vir. Georg. iii.

Poly also flates, that particular attention was on this account had to the colour of the mouth. "Ariistan maxim
me fectantur ora." We are informed that this kind of inspection takes place in the Spansh flockes at present, a practice in all probability derived from the Roman shepherds, as well as the flock to have been from those of Italy, or the Tarentine breed. The colour of the fole on which sheep graze, if very dark or red, communicates to the wool a tint more or lees strong, which is indelible, and renders such wool less proper for cloths or hoffsery goods that are to be finished white; for though the colour may be improved by flowing, yet on washing the cloths, they soon return to a brownish or yellowish tint. The tint from the fole is, however, rarely of sufficient strength to be regarded for dyed goods, excepting for exceedingly light colours.

The cleanfes of wool is principally regarded by the purcasher, as it affects the weight. To the grower those flesces are generally the most profitable that are well filled with the greafe, or yolk as it is called, because it keeps the wool in a found flate, and improves its softnes. It ought, however, to be washed out as much as possible before it is exposd to fale. The flesces of the Merino sheep are more plentifully supplied with yolk than thole of any of our native fine-woofed breeds; indeed it is so abundant, that the English mode of washing on the back of the sheep will scarcely produce any effect upon the wool. The yolk or greafe in the flesce appears, from the experiments made upon it by M. Vanquelin, to be a native soap, consisting principally of animal oil combined with potash. It is most copiously produced in those breeds which grow the finest and softest wool, and is always most abundant on those parts of the animal which yield the finest parts of the flesce. To this subject we shall again refer in treating of the improvement of wool. This yolk, though so beneficial to the wool in a growing flate, becomes injurious to it when thorn; for if the flesces remain piled in an unwashed flate, a fermentation takes place, the yolk becomes hard, and the fibre is rendered hard and brittle. This effect takes place more rapidly in hot weather. The Spaniards remove this yolk in a great measure by washing the wool after it is thorn and forted. In Saxony fine-woofed sheep of the fame race are washed in tubs with warm water, soap-foes, and urine, and afterwards in clean water.

In England the wool is washed on the back of the sheep by immersing the animal in water, and squeezing the flesce with the hand. From these different modes of washing, the wool is left more or lees pure. Mr. Bakewell, in his Observations on the Influence of Soil and Climate on Wool, has given the following table, containing a statement of the quantity of neat wool in every hundred pounds, taken on an average of each sort, and supposing each to be free from lumps of pitch employed in marking the wool, and cleared from what are called the dog-locks. The first column represents the average weight after the wool has been scourd perfeetly clean with soap and water, and dried; the second the amount of wale.

<table>
<thead>
<tr>
<th>Description</th>
<th>Pure Wool</th>
<th>Washed on the sheep's back</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 lbs. of English wool washed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ditto Saxony fleece-wool</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Ditto Spanish R, or refine</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Ditto Spanish and Portugal unwashed</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Ditto English fleeces unwashed</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Ditto lightly greased wools of Northumberland washed on the sheep's back</td>
<td>65</td>
<td>35</td>
</tr>
</tbody>
</table>

Hence it is obvious, that the flate of the fleece with respet to cleanfes is an object of great importance to the wool-buyer. The English Merino sheep, from the difficulty of washing the wool on the sheep's back, have generally been thorn in an unwashed flate, and the wool offered for fale in this flate. The purchasers were frequently unacquainted with the great amount of the clots it would suffer by washing, and were much disappointed at the result. This circumstance, we conceive, more than any other, tended to prejudice the manufacturer against the Anglo-Merino wool. The wool is also injured by remaining in the greafe, as we have before flated, and though this has been contradicted, we have no hesitation in asserting the fact from our own experience. Indeed the French manufacurers of fine cloth affert, that the belt wools from Spain, though cleared in a great measure from the yolk, yet still retain sufficient to injure the wool if it be suffered to grow old when it is packed, the yolk becoming rancid and hard, and communicating the latter property to the wool. We have frequently observed this effect in the wools from Portugal, that retain a greater portion of the yolk than thofe from Spain.

After wool has been washed in the usual manner practised in England, and piled or packed, a certain process takes place in eight or nine weeks, called fauing. This is well known to wool-dealers and manufacturers, but has not been before noticed by any writer that we are acquainted with. It is evidently an incipient fermentation of the remaining yolk; and the inner part of the pack or pile becomes distinctly warm. This process produces a certain change in the wool, whereby it becomes in a better condition for manufacturing, being what is called in the north of England faewy. This effect results from a diminution of the natural elasticity of the fibre.

When this fermentation takes place in unwashed wool, it proceeds farther, and injures the colour and soundnes of the staple or fibre. A similar effect is produced in wool or cloth which has been oiled, and remains some time in an unscoured flate. Instances of spontaneous combustion from heaps of refuse wool remaining in a greasy flate have been known to occur, and occasion the most serious accidents in woollen factories.

The weight of the fleece is an object of great importance to the grower. It is generally supposed by the English wool-dealers, that an increase of weight implied an increase of coarfnens; indeed the words coarse and heavy are considered by them as synonymous, but this is not absolutely true.
WOOL.

The method of measurement adopted by Mr. Luccock, might be sufficiently correct with the deduction of one-fifth, were the instrument always used by the same person, and a similar degree of prejudice given in each experiment; but as this is required, it becomes uncertain in its results, and inadequate to practical purposes.

Dr. Parry’s method of measurement is effected with an instrument similar in principle to the lamp micrometer of Dr. Herchel, of which an account is published in the Philosophical Transactions for 1782. (See Micrometer.) An object of a known diameter being placed in the focus of a compound microscope, and forcibly illuminated, a piece of white paper is placed horizontally at some distance beneath it; then looking through the microscope with one eye, and keeping the other steadily open, you will see the object apparently projected on the paper, which is to be measured, while viewing it, with a pair of compasses. Divide the length of the image so measured with the known diameter of the object, which will give the magnifying power of the microscope. This being found, place the object you wish to measure in the focus, and projecting its image on the paper as before, measure it with the compasses, and divide the result by the magnifying power, which will be the real magnitude of the object required.

The light of a lamp is to be preferred to day-light, and the fibres to be measured are to be stretched on a glass, and waxed down at both ends. The under side of the glass should be blackened with Indian ink, except in three parts, the middle, and near the two ends. The unblackened spaces being placed in the focus of the microscope, ten or more filaments may be examined and measured successively, both in the middle part of the glass, and near the ends, which will give the diameter of the filament at the upper and lower end of the staple, and in the middle. Each lock of ten filaments being thus examined in three different parts, the mean of the three measurements must be taken for the mean diameter of each filament, and the mean diameter of the ten filaments may be taken for the fineness of the whole lock.

In place of the blackened glasses, we would recommend a thin slide of ivory or brafs, about five inches in length, and half an inch in breadth, with three transfere flits or openings, one in the middle, and the two others about three-fourths of an inch from each end. On this slide the filaments may be stretched, it will not be liable to break, and the edges of the filaments will be more correctly defined than when a plate of glass is placed under them.

The farther the paper is removed from the eye, the larger will be the apparent space covered by the image of the object, but it must not be too far for the hand to measure it with compasses. But if in place of the compasses we have a fret of paleboard graduated into minute divisions from a black line upwards, and a sliding index be adjusted, the paleboard may be placed at a much greater distance, the observer adjusting the fret, until the edge of it and the black line coincide with both edges of the filament. A

![](image-url)

**Table:**

<table>
<thead>
<tr>
<th>Parts of an Inch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prime</td>
</tr>
<tr>
<td>Choice</td>
</tr>
<tr>
<td>Super</td>
</tr>
<tr>
<td>Head</td>
</tr>
<tr>
<td>Downrights</td>
</tr>
<tr>
<td>Seconds</td>
</tr>
<tr>
<td>Abb</td>
</tr>
<tr>
<td>Fine livery</td>
</tr>
</tbody>
</table>

The filaments of fine wool being so minute, it requires an eye habituated by long experience to appreciate the relative fineness of two piles, which may differ in value as much as twenty-five per cent. Even those who have been long practised in such examinations find it difficult to form immediately a correct opinion of the fineness, if they are removed for a few weeks from all opportunity of viewing wool. It is not surprizing then that the wool-grower, who only directs his attention to the subject during one part of the year, should often be unable to judge whether his wool has improved or not since the preceding summer. On this account it would be highly desirable that some easy and correct method of admeasurement by the micrometer could be invented, which might enable the observer to decide this with certainty. Mr. Daubenton employed a graduated scale, adapting it to the eye-piece of a compound microscope; but his method does not admit of accuracy. Mr. Luccock made use of a more simple instrument, which we have seen; it consisted of a lens about half an inch in focal length, adjusted to a graduated scale. On this scale a number of fibres were stretched and compressed by a slide and screw into a given space; the filaments covering this space were then counted by the aid of the lens, and a number of admeasurements being taken of the same fort, the mean of the whole was supposed to give the correct diameter of the filament. In this method, however, some of the filaments must unavoidably overlap part of the others, on which account a greater number will be seen in a given space than would be were the whole diameter of each fibre visible. The error resulting from this may be atoned at one-fifth. Thus Mr. Luccock makes the best English wool to measure the fourteen-hundredth part of an inch, which is finer than the best Spanish, as measured by Dr. Parry, by a more accurate but more laborious method. According to Mr. Luccock, a sample of moderately fine Spanish wool reached to the sixteen-hundredth part of an inch; according to Dr. Parry, the very best Spanish is not smaller than the fourteen-hundredth part of an inch.

With the above deduction of one-fifth, which we believe to be a near approximation to correctness, the diameter of the fibres of the best English wool, as ascertained in the usual method, will be nearly as follows:
WOOL.

horizontal position for the microscope will be the most convenient, illuminating the object with a lamp and lens. In this way, the apparent diameter may be greatly increased, and we think the observations might be made with greater ease and accuracy.

By the above method the diameter of very minute filaments may be ascertained, and minute differences detected, which the unaided eye is unable to detect. We are aware, however, that it requires some address and time to enable the observer to manage the instrument, on which account it cannot, we fear, be made generally useful.

The following measurements of different fine wools were taken with Dr. Parry's instrument; the first column represents the outward end of the filament, the second the middle, and the third the bottom, in fractional parts of an inch; the latter column the mean of ten filaments of the same wool.

Table of comparative Diameters of the Filaments of various Clothing Wools, by Dr. Parry.

<table>
<thead>
<tr>
<th></th>
<th>Outward End.</th>
<th>Middle</th>
<th>Inner End.</th>
<th>Mean.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spanish Ewe</td>
<td>7/100</td>
<td>5/100</td>
<td>3/100</td>
<td>3/100</td>
</tr>
<tr>
<td>Laintara Pile</td>
<td>5/100</td>
<td>3/100</td>
<td>1/100</td>
<td>1/100</td>
</tr>
<tr>
<td>Ewe</td>
<td>7/100</td>
<td>5/100</td>
<td>3/100</td>
<td>3/100</td>
</tr>
<tr>
<td>Coronet Pile</td>
<td>7/100</td>
<td>5/100</td>
<td>3/100</td>
<td>3/100</td>
</tr>
<tr>
<td>Native Merino Ram</td>
<td>7/100</td>
<td>5/100</td>
<td>3/100</td>
<td>3/100</td>
</tr>
<tr>
<td>Saxon</td>
<td>7/100</td>
<td>5/100</td>
<td>3/100</td>
<td>3/100</td>
</tr>
<tr>
<td>Piétet's Merino Ram</td>
<td>7/100</td>
<td>5/100</td>
<td>3/100</td>
<td>3/100</td>
</tr>
<tr>
<td>Beft Negrette Pile</td>
<td>7/100</td>
<td>5/100</td>
<td>3/100</td>
<td>3/100</td>
</tr>
<tr>
<td>Alva Pile</td>
<td>7/100</td>
<td>5/100</td>
<td>3/100</td>
<td>3/100</td>
</tr>
<tr>
<td>Rambouillet Ewe</td>
<td>7/100</td>
<td>5/100</td>
<td>3/100</td>
<td>3/100</td>
</tr>
<tr>
<td>Imperial Pile</td>
<td>7/100</td>
<td>5/100</td>
<td>3/100</td>
<td>3/100</td>
</tr>
<tr>
<td>Morte</td>
<td>7/100</td>
<td>5/100</td>
<td>3/100</td>
<td>3/100</td>
</tr>
<tr>
<td>Ryeland</td>
<td>7/100</td>
<td>5/100</td>
<td>3/100</td>
<td>3/100</td>
</tr>
<tr>
<td>South Down</td>
<td>7/100</td>
<td>5/100</td>
<td>3/100</td>
<td>3/100</td>
</tr>
<tr>
<td>Anglo Negrette Ram</td>
<td>7/100</td>
<td>5/100</td>
<td>3/100</td>
<td>3/100</td>
</tr>
<tr>
<td>Negrette Ram, Marquis</td>
<td>7/100</td>
<td>5/100</td>
<td>3/100</td>
<td>3/100</td>
</tr>
<tr>
<td>of Bath</td>
<td>7/100</td>
<td>5/100</td>
<td>3/100</td>
<td>3/100</td>
</tr>
<tr>
<td>Charenton Ram</td>
<td>7/100</td>
<td>5/100</td>
<td>3/100</td>
<td>3/100</td>
</tr>
<tr>
<td>Ryeland Ram</td>
<td>7/100</td>
<td>5/100</td>
<td>3/100</td>
<td>3/100</td>
</tr>
<tr>
<td>Cape, 4th Crofs</td>
<td>7/100</td>
<td>5/100</td>
<td>3/100</td>
<td>3/100</td>
</tr>
<tr>
<td>Wilts Ewe</td>
<td>7/100</td>
<td>5/100</td>
<td>3/100</td>
<td>3/100</td>
</tr>
</tbody>
</table>

Long Wool, or Combing Wool, being prepared for spinning by a process entirely different from that of short or clothing wool, and the pieces made from it being finished in a very different manner, the qualities most required in this kind of wool are length and foundness of the staple, without which the fleece is unsuitable for the comb. The foundness of the hair is a secondary quality, required only in certain kinds of goods. The wool-comb is an instrument of simple construction, consisting of a wooden handle, with a transverse piece or head, in which are inserted three rows of long steel teeth. The wool, which is to be combed after being cleaned, curved, dried, and oiled, is first drawn upon these teeth with the hand, until the comb is sufficiently loaded. It is then placed on the knee of the combor, and another comb of a similar kind is drawn through it, and the operation is repeated till all the hairs or fibres are combed smooth in one direction. This operation requires considerable strength, but the comb being previously heated, and the wool thoroughly oiled, facilitates the process. When completed the combed wool is drawn off with the fingers, forming what is called a flaxer; the shorter part of the wool sticks in the teeth of the comb, and is called the noil: this is sold to the clothiers.

From the above description, it is evident that if the staple of the wool be not found, the greater part of it will be broken by the process of combing, and form noils. The staple much also have a sufficient degree of length for the combs to operate upon it. Length and foundness of the staple are therefore the most essential and characteristic qualities of combing-wools.

Long wools may be called into two kinds: first, those suited for the manufacture of hard yarn for worsted pieces; and second, those suited for the manufacture of soft yarn used for hosiery. The former require a greater length of staple than the latter. The first may therefore be called long combing-wool, and the latter short combing-wool; between these there are gradations of wool, which may be applied to either purpose.

Long combing-wool should have the staple from six inches to eight, ten, or even twelve, in length. Before the recent improvements in spinning by machinery, a very great length of staple was considered as an excellence in long combing-wools; and on this account the hog-wool, or the first fleeces from sheep which had not been shorn when lambs, was more valuable than the wether wool from the same flock, and bore a higher price than the former, by at least fifteen per cent. Since that time the wether wool has risen in relative value on account of the evenness of the staple, each lock being nearly equally thick at both ends; but the staple of hog-wool is pointed, or what is technically called 'pier.' Eight inches, if the wool be found, may be regarded as a very proper length for heavy combing-wools. The longer flapped wool was formerly worked by itself, and used for the finer spun yarn, or mixed in small quantities with the wether wool, to improve the spinning.

It is found that an equal length of staple contributes to the evenness of the thread when spun by machinery, and a very great length of staple is rather injurious than otherwise in the processes of machine spinning. To the wool-grower, however, it must always be desirable to increase the length of his heavy combing fleeces, as it thereby materially increases the weight; and we have not yet learned that the price has ever been reduced on this account, for if the wool be too long for some branches of the worsted manufacture, there are others in which it may be worked with advantage.

The length of the staple may be increased by a plentiful supply of nutritious food. The same effect may also be produced by letting the wool remain a longer time on the sheep before it is shorn. We have seen a staple of Lincolnshire wool which was twenty inches in length; it had grown two years without shearing. This, however, would be unattended with any advantage to the grower. The more frequently sheep are shorn, provided the wool is sufficiently long, the greater will be the weight grown in a given time on the same animal; for, from observations which we have made, we are satisfied that wool is grown more rapidly immediately after the sheep are shorn than at any other time.

Length of staple in wool depends primarily on the breed, but may be more affected by culture than many other qualities of the fleece. The foundness of the staple may be easily judged by pulling both ends of it with the fingers with considerable force. In weak or unfastened wool the staple easily breaks in one or more parts, and on observing it, it will be seen that the fibres are much thinner in the part which breaks. This is occasioned either by a deficient supply
PLY OF FOOD, BY DISEASE, OR BY INCLEMENT SEASONS, WHICH CAUSE A FLAPPAGE IN THE GROWTH OF THE FLEECE. THIS GOES ON TO A GREATER OR LESS DEGREE. IN SOME INSTANCES, THE FLAPPING HAS BEEN SEEN ENTIRELY THE UPPER PART OF THE FLEECE IS SEPARATED FROM THE LOWER, AND IS ONLY CONNECTED WITH IT BY A FEW FILAMENTS: IN SUCH CASES, THE FLAPPING HAS CONTINUED FOR A CONSIDERABLE TIME, AND THE BOTTOM PART OF THE FLEECE MAY BE CONSIDERED AS A NEW FLEECE, PROTRUDING FROM THE OLD ONE FROM THE SKIN. CONNECTED WITH THE FOUNDLENS OF WOOL, THERE IS ANOTHER PROPERTY REQUIRED; THIS IS, THAT THE FLEECE BE FREE AND OPEN, OR THAT THE FIBRES SHALL NOT BE MATTED OR FELTED TOGETHER; AN EFFECT WHICH TAKES PLACE FREQUENTLY WHEN THE WOOL IS UNFOUND. IT IS IN FACT A NATURAL FELTING OF THE WOOL ON THE BACK OF THE ANIMAL, WHEN BY ANY CAUSE IT HAS CEASED TO GROW. SOMETIMES THE LOWER PART OF THE FLEECE NEXT THE SKIN WILL BE SO COMPLETELY MATTED AS TO FORM A SUBSTANCE NEARLY AS HARD AS A HAT, AND WILL HOLD TO THE SKIN BY A FEW HAIRS ONLY. THESE ARE CALLED COTTON FLEECE; ALL APPROACH TO THIS STATE IS PECULIARLY INJURIOUS TO COMING-WOOLS.

THE WOOL-BUYERS GENERALLY THROW OUT THE COTTON AND UNFOUND FLEECE WHEN THEY PICK THE WOOL FROM THE GROWER, AND BUY THEM AT A VERY REDUCED PRICE. THE FOUNDLENS OF COMING-WOOL, THOUGH OF LESS IMPORTANCE THAN IN CLOTHING-WOOL, YET ENHANCES ITS VALUE, AS IT IS FOUND THAT FUCH WOOL MAKES A CLOSER AND FASTER THREAD, AND IN EVERY PROCESSION OF THE MANUFACTURE, FINISHES MORE KINDLY. COMING-WOOLS GROWN ON LIGHT CALCAREOUS SOILS ARE DEFICIENT IN THIS RESPECT; SUCH ARE THE COMING-WOOLS OF OXFORDSHIRE AND THE COTSWOLD HILLS, WHICH ARE FORMED OF SPECIES OF LIME-STONE CALLED ZOILITE, OR ROE-STONE. A COPIOUS SUPPLY OF THE YOLK IS NECESSARY TO THE HEALTHY CONDITION OF THE FLEECE, AND AS THIS IN MANY FLOCKS IS NEARLY EQUAL IN WEIGHT TO THE WOOL, THE FLEECE CONTAINS FROM SIX TO EIGHT POUNDS OR MORE OF IT BEFORE THEY ARE WASHED, FOR IN THE UNWASHED FLAT THEY OFTEN WEIGH EIGHTEEN POUNDS IN MANY OF THE LONG-WOOLLED FLOCKS IN ENGLAND.

THE FOUNDLENS OF THE FLEECE IS LESS IMPORTANT IN THE LONG COMING THAN IN CLOTHING-WOOL, PROVIDED IT BE FREE FROM GREY HAIRS. THE LATTER CIRCUMSTANCE DOES NOT FREQUENTLY OCCUR IN COMING-WOOLS. THERE IS, HOWEVER, A PECULIAR COLOUR COMMUNICATED BY THE YOLK, WHICH IS SOMETIME SO DEEP AS TO INJURE THE WOOL FOR PARTICULAR USES, AND WHAT IS OF MORE IMPORTANCE, THERE IS A DINGY-BROWN COLOUR GIVEN TO THE FLEECE BY IMPROPERLY KEPTING OR DISEASE, WHICH IS CALLED A WINTER FLAX; IT IS A FURTHER INDICATION THAT THE WOOL IS NOT IN A THOROUGHLY FOUND FLAT, AND SUCH FLEECE ARE CAREFULLY THROWN OUT BY THE WOOL-FORER, BEING ONLY SUITABLE FOR THOSE GOODS WHICH ARE TO BE DYED DARK COLOURS.


THERE IS, HOWEVER, A FINE LONG COMING-WOOL WHICH IS REQUIRED FOR BOMBAX, AND THE FINE KINDS OF WORLDOED WOOLS; THIS IS MOST FREQUENTLY SEPARATED FROM THE LONGER PARTS OF CLOTHING FLEECE, AND ADMITS A DIVISION INTO FOUR OR FIVE FORTS, THE Finest being Equal in Hair to the Head of the Super in Clothing-Wool; Whereas the Beaufort of the Common Heavy Coming-Woos seldom ranges higher in point of Fineness than the coarsest Fort of Clothing-Wool Above the Breast Locks; viz. the low abb and the livery.

Short coming or hollyer wool requires a different length of staple, according to its fineness: For the better sorts, the staple should not be shorter than four or five inches; the lower sorts may range as high as eight inches. A greater length than this is not desirable for any kind of soft worsted. What has been said of the foundleens and fineness of staple required for long coming-wool, applies equally to the hollyer wool, but in this the fineness of the hair and foundleens are of more importance. Most of the ewes which yield fine coming-wool produce nearly an equal quantity of short wool, which is thrown in the same manner as the regular clothing wools. The coming wools for the hoffery are generally called, Super matching, Fine matching, Fine drawing, Altered drawing, Brown drawing, Saycait.

The names of these sorts derive their origin from ancient pro cesses of the manufacture, with which we are unac quainted at present. The lower fort, or saycait, was prob ably at first the long coarse coming-wool, thrown out for the manufacture of lays, of which we have frequent mention in the earliest history of the woollen trade in England. The relative value of these sorts, compared with each other, varies according to the demand for the finer or coarser kinds of hoffery, and is also affected by the clothing trade. When any clothing wool which ranges in fineness with one of the coming wools is in great demand, the wool-forer will break down the shorter coming-wool of this sort, and throw it to the clothing-wool, which enhances the price of the former by making it scarce. The fineness of these sorts of the wool combing-wools, flated numerically, as compared with clothing wools, will be nearly as under, in the fraction parts of an inch.

Super matching Fine matching Fine drawing Altered drawing Brown drawing Saycait

Most of the better sorts throw out the hog coming-wool from the better sorts, making a superfine hog for the bombax trade, hog-wool being less suitable for the hoffery, which does not require yarn so finely spun as for hard yarn.

As all the different sorts of short coming-wool, together with several sorts of clothing-wool, will frequently occur in one English fleece, it is obviously the interest of the grower that his fleece should produce as great a proportion of the better sorts as can be done without materially diminishing the weight.

Skin wool, or felt wool, is the wool separated from the skins of matted sheep by the fellmonger. The quantity of this wool, in a country like England, where much animal food is consumed, is very considerable, and has been estimated at near 50,000 packs of 240lbs. per annum, for England and Wales. Soon after shearing, the skin-wool is too short to be worked by itself, and is generally kept and mixed in with the longer wools. The processed by which wool is separated from the skins has a tendency to make it hard, and destroy or injure its felting or milling property, on which account short-skin wools are seldom used for the manufacture of cloth, but more generally for flannels, serges, and those kinds of goods which require little or no milling.
the finest kinds are much used for flockings made of yarn from carded wool. In the spring, when the wool on the skin has acquired a considerable length, it is thrown into combing forts; the finer kinds are used for knitting hoseyarn, and the coarser for hard yarn for the warps of serge's and other goods, having a warp of combed and a weft of carded wool. The value of skin-wool is seldom equal to that of fleece-wool of the same degree of length and fineness, owing to the felting property being injured, which renders it more unfit for the manufacture of woolen cloth.

Lamb's Wool.—The wool of the lamb is, with certain exceptions, softer than that of sheep's-wool, from the same flock. It possesses the property of felting in a remarkable degree, and on this account is principally manufactured into hats, except skin lamb's-wool, which loosing its felting property in a great degree, is employed in the manufacture of flannels and woollen yarn for lamb's-wool hosiery. In the northern parts of Europe, the lamb of some of the breeds of sheep poises a fleece so delicately soft, that it constitutes a most valuable fur, being dressed on the skin, and used as a costly article of attire. According to Pallas, the inhabitants of the Ukrain and Podoli, as soon as the lamb is dropped, (which comes into the world with a pretty wavy skin, even without the effluence of art,) to augment its beauty, and make it bring a higher price, few it up in a sort of coarse linen shirt, so as to keep up a constant gentle preflure on the wool, pouring warm water over it every day to make it soft and sleek; only letting out the bandage a little from time to time as the animal increases in size, but still keeping it tight enough to effect their purpose, which is to lay the wool in beautiful glistening ringlets, and thereby produce a delicate species of fur in great request for lining clothes and morning-gowns. By this treatment, the staple of the fine soft wool which rises in the infancy of the lamb takes a handsome arrangement; and the animal is killed younger or older according to the species of fur intended to be produced; from a short glossy nap, like fatin, only fit from its thinnest for the purpose mentioned above, to a warm thick fur for a winter great-coat. The first of these furs in estimation and price is a fine black, that looks like silk damask; an inferior black fur comes next, much thicker, used for pelisse, or fshades, as the upper winter garb worn out of doors is called; and the least in estimation is the white, except it be very pure colour and filmy appearance, where it is a rival to the first; especially for night-gowns, a very common drees both morning and evening among the Russians; particularly in the interior parts of the empire.

The Boucharian sheep, as described by Pallas, grows a compact, soft, and elastic wool, which is elegantly formed into frizzled ringlets. In the lamb, the wool is formed into delicate little circular waves, as if prefiled close to the skin by art; but when taken from the mother, or killed immediately after birth, they are still more beautiful, and often elegantly marbled with feathered waves, like silk damask. These three furs are the finest and most precious of the kind known to Europe and the East; they are brought to us by the Boucharian Tartars and Persians, who sell them dear. The most prized are, the blue, the black, and the silver grey; but of the unborn lamb-fins, as the fine glossy thin furs are called, which so much resemble felted silk damask, the fine black is dearest and most esteemed. To obtain these valuable furs, the Boucharian Tartars purchase whole flocks of male lambs just dropped from their mothers; as to kill a female till past the age of breeding is held as a kind of crime by all Tartar hordes; such is their reverence for an animal which constitutes their greatest riches, and the propagation and care of which are the great business of their lives; so that all the fur we see of this species sold by the Tartars is from young rams. The Boucharians are of opinion, that art is necessary to preserve these furs in their greatest beauty; and under that idea, keep the lambs under shades, &c. during the meridian ardour of the sun; but Dr. Pallas has reason to think, that these precautions are useless, as he observed that the same variety of sheep produced the same fine hues equal in every respect, without any fort of care, in the hands of the Kirgizite Tartars.

It is very remarkable that the lamb's-wool, in many of the Merino flocks, is coarser than the sheep's-wool. In some of the flocks, the lambs are at first covered with coarse hair, which falls off afterwards, and they produce the finest wool.

Wool from other animals besides the sheep is employed in manufactures, and spun and woven into fabrics of various kinds, either unmixed or mixed with sheep's-wool. The Tibetan, which grows the fine shawl wool, produces it as a fine down at the bottom of the long coarse hair, with which the animals are covered. Many of the common goats in Europe grow a similar down, which, by cultivation, might become a valuable article of commerce. It is not, however, yet clearly ascertained, whether the shawls and shawl cloth of India are all manufactured from goat's-wool; part of it appears to be made from sheep's-wool peculiarly soft and fine. The Angora goat grows a hair extremely fine and filky, which is much used in some of the French worsted goods mixed with silk. This hair is properly a long-wooled animal. Dr. Anderdon says, that the Angora goat will prosper and preserve its peculiarities in France and Sweden. The wool of the vicuna, called Vigonia wool, is generally of a reddish-fawn colour; it is peculiarly soft and filky, but intermixed with long coarse hairs, which are very difficult to separate. (See Vicuna.) From the lama and pacos of Peru a longer and longer interlaced wool is obtained, which is sometimes white. Under a liberal government which protected and encouraged commerce, we have no doubt the fhees of these animals might be greatly improved, and would become an article of great value. The wool from the yak of Tartary, and the mulk ox of Hudson's bay, has yet received little attention. We have seen flockings made of the latter, and which are worn in that country; the wool was soft but not fine, and much intermixed with long coarse hairs.

The quantity of sheep's-wool annually grown in England and Wales was estimated, by perfoins in the wool trade examined before the house of commons in the year 1800, at six hundred thousand packs. Mr. Luccock, in his Treatise on Wool, seems to consider this estimate as greatly exceeding the real amount, and has given an estimate founded on the supposed extent of surface parfured by sheep, and the quantity of sheep per acre in each county. This table we give as the only attempt that we know of to determine the question on certain data; though we consider it only as an approximation to truth, and are inclined to believe that the quantity is under the real amount. Such is also the opinion of the most intelligent persons in the wool trade, whom we have had an opportunity of consulting.

From this table, it will appear that the total amount, including skin-wool and lamb's-wool, is somewhat short of four hundred thousand packs, which is probably one-fourth below the true quantity, could it be ascertained. Mr. Luccock is inclined to believe that the flocks of sheep in England and Wales are not so numerous as formerly, but he says thofe of Ireland and Scotland are rapidly increasing. Even in England and Wales, he says, we have
WOOL.

more than three millions of acres capable of being improved, and carrying a more numerous flock. We have two millions of sheep whose fleeces are scarcely wool, and which might be brought to contribute their share to support the woollen manufacture, and to increase the wealth of the country.

It may be proper to remark, that the quantity of wool grown annually in England is more variable than is generally supposed, owing to the variable temperature of our climate. In long-continued and severe winters, the sheep not obtaining the same quantity of food, and being also rendered lefs vigorous by the cold, do not grow so much wool as in milder seasons. The difference between the weight of the fleeces grown in severe and in very mild seasons, may be stated at one-fifth of the whole annual clip; indeed we believe this exceeds that proportion. About the year 1700, the annual value of English wool was estimated at two millions sterling. If we suppose the average price at that time to have been eight-pence per pound, or eight pounds per pack, this will make the total weight of wool two hundred and fifty thousand packs. Indeed when we consider the improved state of our agriculture, the great increase of our population, and of our woollen exports, we may fairly flate the present weight of wool grown to be double the amount of what it was at the period referred to.

In a subsequent part of this article, it will be seen that the cloth manufactures of Yorkshire, principally from English wools, have increased eight-fold in the last eighty years; and though the woollen manufactures have removed from some other situations, yet the great increase on the whole in England cannot be doubted. Since the date of Mr. Luceock’s table in 1805, in consequence of the high price of long combing wool, the growers have paid more attention to the weight of their fleeces; and many who had rendered their fleeces lighter by exchanging the Lincolnshire for the Leicester breeds of sheep, have since been reverting to the former breed, or rather to a mixed breed, endeavouring to combine the improved form of the Leicester sheep with the heavy fleece of the Lincoln. The quantity of long combing wool grown annually is greater than it was even ten years since; the high and increasing price and demand operating naturally as a premium for its cultivation.

Table I.—Shewing the Produce of English Long Wool.

<table>
<thead>
<tr>
<th>District</th>
<th>County</th>
<th>No. of Acres</th>
<th>No. of Sheep</th>
<th>Weight of Fleece</th>
<th>No. of Packs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teeswater</td>
<td>Durham</td>
<td>100800</td>
<td>67200</td>
<td>9</td>
<td>2520</td>
</tr>
<tr>
<td></td>
<td>Yorkshire</td>
<td>61250</td>
<td>14310</td>
<td>8</td>
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</tr>
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<td>Holderness</td>
<td>127680</td>
<td>84000</td>
<td>8</td>
<td>2800</td>
</tr>
<tr>
<td>Lincoln</td>
<td>Lincoln rich land</td>
<td>413875</td>
<td>1241625</td>
<td>9</td>
<td>46501</td>
</tr>
<tr>
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</tr>
<tr>
<td></td>
<td>miscellaneous land</td>
<td>758485</td>
<td>507637</td>
<td>8</td>
<td>16505</td>
</tr>
<tr>
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<td>Cambridge</td>
<td>55428</td>
<td>38500</td>
<td>7</td>
<td>1390</td>
</tr>
<tr>
<td></td>
<td>Huntingdon</td>
<td>187600</td>
<td>41688</td>
<td>7</td>
<td>2552</td>
</tr>
<tr>
<td></td>
<td>Leicefeter</td>
<td>87500</td>
<td>87500</td>
<td>7</td>
<td>11100</td>
</tr>
<tr>
<td></td>
<td>Northampton</td>
<td>398650</td>
<td>380258</td>
<td>7</td>
<td>11100</td>
</tr>
<tr>
<td></td>
<td>Rutland</td>
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<td>6</td>
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<tr>
<td>Leicefeter</td>
<td>Warwick</td>
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<td>114000</td>
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<td>2370</td>
</tr>
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<td></td>
<td>Stafford</td>
<td>182875</td>
<td>160000</td>
<td>5</td>
<td>3333</td>
</tr>
<tr>
<td>Kent</td>
<td>Romney Marsh</td>
<td>46020</td>
<td>180000</td>
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<td>5400</td>
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<tr>
<td></td>
<td>Other Marshes</td>
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<td>Devonshire</td>
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<td>193750</td>
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<td>6488</td>
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<tr>
<td>Cotfwoold</td>
<td>Gloucester</td>
<td>200000</td>
<td>200000</td>
<td>8</td>
<td>6666</td>
</tr>
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</table>

| Slaughtered   | 1176770 Sheep   | 196128 Producing long-skin wool 5720 Packs. |
|              | Carrion wool 286 |                                           |
|              | 5434           |                                           |
| Neat Total   | 137228         |                                           |

Table
### WOOL.

#### TABLE II. — English Short Wool.

<table>
<thead>
<tr>
<th>District</th>
<th>County</th>
<th>No. of Acres</th>
<th>No. of Sheep</th>
<th>Weight of Piece</th>
<th>No. of Packs</th>
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<td>817600</td>
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<td>547000</td>
<td>3</td>
<td>6837</td>
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<td>6684</td>
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<td>233000</td>
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<td>South Wales</td>
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\[
\begin{align*}
\text{Totals:} & \quad 28412202 \quad 14854299 \quad 202737 \\
\end{align*}
\]

### Pack’s Skin Wool.

<table>
<thead>
<tr>
<th>Description</th>
<th>No.</th>
<th>Weight</th>
</tr>
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<tr>
<td>Slaughtered sheep</td>
<td>472148</td>
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</tr>
<tr>
<td>Carrion</td>
<td>211067</td>
<td>1429</td>
</tr>
<tr>
<td>Slaughter of long-wool sheep</td>
<td>986042</td>
<td>12258</td>
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<tr>
<td>Carrion of ditto brought forward</td>
<td>286</td>
<td></td>
</tr>
<tr>
<td>Total of short wool</td>
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</tr>
<tr>
<td>Ditto long ditto</td>
<td>137228</td>
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</tr>
<tr>
<td>Wool from lambs slaughtered</td>
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<td></td>
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<tr>
<td>Ditto shorn</td>
<td>7860</td>
<td></td>
</tr>
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<td>Grand total</td>
<td>393236</td>
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</tr>
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</table>
WOOL.

The whole of the imported wool, with scarcely an exception, is worked on the card, none of it being suited for the comb. The coarser kinds are principally employed for carpets, &c.; and the fine from Spain, Germany, Portugal, and France, supply our manufactures of superfine broad cloths, camisoles, &c. So large a portion being of these finer kinds, the total value cannot be less than one million and a half pounds sterling.

Wool of New Holland.—The annual value and amount of the fine wool imported into England for our own manufactures being so great, we must fully applaud the meritorious exertions of those who attempt to supply the demand with the produce of our own country, or of our dependent colonies, and more particularly if they can raise this supply from parts where no wool was before grown. In this view, it cannot fail to be highly interesting to learn, that the exertions of one enlightened agriculturist have been eminently successful in spreading over an immense region dependent on England the very finest-wooled sheep, where the soil had never before yielded any produce serviceable to civilized man.

John Macarthur, esq. descended from an ancient family in Argyleshire, captain in a regiment then commanded by general Wolfe, went to New Holland in 1788. Fortunately for the future prosperity of the colony, he entered on inquiry and enterprise to direct his attention to the natural advantages which the soil and climate presented to the agriculturist, and having by purchase and grants obtained a considerable tract of country, he quitted the service in 1793, and commenced his farming operations. His flock at first consisted only of a few oxen and thirty Bengal ewes, growing a coarse kind of wool or hair. About the year 1795, he obtained from captain Kent, of the Royal Navy, one Merino ram and two ewes, purchased from the Dutch governor of the Cape of Good Hope. With these he began to cross his coarse-haired sheep, and to select the finest-wooled progeny to breed from. Having occasion to return to England in 1802, he brought over specimens of his wool, which were shewn to a body of the clothiers from the west of England, then in London on public business, who were so sensible of the advantages which might result from encouraging the growth of fine wool in the colony, that they presented a petition to the privy council, by whom Mr. Macarthur was examined. His plans being approved, the privy council recommended the secretary of state for the colonies to give him an additional grant of land, in a tract of country, from its fertility, called the cow-palettes, forming part of Camden county. On his return he took with him three Merino rams and two ewes, purchased from his majesty’s flocks; and thus encouraged, he proceeded with rapid steps in the increase and improvement of his flocks, the climate being every way suited to secure the healthy condition of the sheep, and preserve the fineness of the wool.

The numbers increase four-fold every five years, so that his flocks already amounted to about four thousand sheep and lambs, including the fine and mixed breeds, when the unfortunate disputes with governor Bligh, and the subsequent arrest of the latter, obliged Mr. Macarthur once more to return to England, and in some degree interrupted the progress of improvement. In 1817 his flocks had increased to about seven thousand, and the wool which has been sent to this country at different times, is become an important source of profit, the better fort being equal to the best Merino piles from Spain or Saxony. What we have seen more nearly resembles the finer kinds, the most experienced eye could not discern any difference between them in fineness of hair, length of staple, foundations, colour, or other properties.

<table>
<thead>
<tr>
<th>Countries from whence imported.</th>
<th>Year ending 5th January 1817.</th>
<th>Quality.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>lbs.</td>
<td></td>
</tr>
<tr>
<td>Russia</td>
<td>228,673</td>
<td>Coarse.</td>
</tr>
<tr>
<td>Denmark</td>
<td>86,346</td>
<td>Coarse.</td>
</tr>
<tr>
<td>Iceland and Feröe</td>
<td>33,395</td>
<td>Coarse.</td>
</tr>
<tr>
<td>Prussia</td>
<td>16,712</td>
<td>Coarse.</td>
</tr>
<tr>
<td>Germany</td>
<td>2,816,655</td>
<td>Fine.</td>
</tr>
<tr>
<td>Holland</td>
<td>143,930</td>
<td>Ditto.</td>
</tr>
<tr>
<td>Flanders</td>
<td>77,625</td>
<td>Ditto.</td>
</tr>
<tr>
<td>France</td>
<td>221,595</td>
<td>Ditto.</td>
</tr>
<tr>
<td>Portugal, &amp;c.</td>
<td>49,277</td>
<td>Ditto.</td>
</tr>
<tr>
<td>Spain</td>
<td>2,958,607</td>
<td>Ditto.</td>
</tr>
<tr>
<td>Gibraltar</td>
<td>25,620</td>
<td>Ditto.</td>
</tr>
<tr>
<td>Turkey</td>
<td>108,234</td>
<td>Coarse.</td>
</tr>
<tr>
<td>Ireland and Isle of Man (produce)</td>
<td>600,377</td>
<td></td>
</tr>
<tr>
<td>(foreign)</td>
<td></td>
<td>Various,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>very fine.</td>
</tr>
<tr>
<td>New Holland</td>
<td>13,611</td>
<td>Fine Merino.</td>
</tr>
<tr>
<td>Cape of Good Hope</td>
<td>9,623</td>
<td>Ditto.</td>
</tr>
<tr>
<td>United States of America</td>
<td>43,435</td>
<td>Various.</td>
</tr>
<tr>
<td>Spanish colonies in South America</td>
<td>206,474</td>
<td>Ditto.</td>
</tr>
<tr>
<td>Brazil</td>
<td>5,512</td>
<td>Ditto.</td>
</tr>
<tr>
<td>British West Indies</td>
<td>6,329</td>
<td>Ditto.</td>
</tr>
<tr>
<td>Total</td>
<td>8,117,864</td>
<td></td>
</tr>
</tbody>
</table>

VOL. XXXVIII.
WOOL.

The wool has been hitherto washed on the sheep's back in the English method, by which it is not rendered so clean as by the Spanish or German mode; but making allowance for the additional wafes, its value is equal to that of the very best Merino wool imported from any part of Europe.

The quantity imported this year is about eighteen thousand pounds weight, and a further arrival is expected. The laudable example of Mr. Macarthur has been followed by other persons in the colony, and the total amount of wool sent from thence this year is about fifty thousand pounds weight; and such is the spirit of agricultural improvement, that at the annual sales of sheep established by Mr. Macarthur, rams and ewes have been sold at from ten to thirty guineas each. Though the absence of Mr. Macarthur impeded the progress of improvement, yet this will be more than compensated by the valuable information he has obtained with respect to the management and improvement of his flocks, from observations made on the continent; and he has further benefited the colony by taking back with him a felection of olive-trees, vines, and oranges. The dryness and mildness of the climate of New Holland, and the almost total absence of briers and underwood, are extremely favourable to sheep. His flock is divided into flocks of about four hundred, with shepherds and Spanish dogs to each. Under these propitious circumstances, and as the flocks double in number every thirty months, we may anticipate, that in the course of twenty or twenty-five years, the importation of fine wool from this colony will be fully equal to the total amount at present imported into England from all the different countries of Europe. It might repay the exertions of this enlightened agriculturist, and of the British government, could they procure from India the animals, whether sheep or goats, which yield the peculiarly soft wool for shawls. This would be a moft valuable article, and is much wanted by our manufacturers.

There can scarcely be a doubt, that under the favourable climate of the British settlements in New Holland, all the Asiatic wool-bearing animals, particularly those of Cashmere and Thibet, might be introduced with every prospect of success. The coarse wool grown in the colony is chiefly manufactured in the country for domestic use. It is estimated that there are at present fifty thousand sheep in the colony, and a little perseverance and attention would suffice to change the coarse-woolled breeds into finer ones; a change which is at present rapidly taking place, and deserves the greatest encouragement, as wool is the only article of produce which the colonists have at present to export in exchange for British manufactured goods.

The Improvement of Wool depends primarily on attention to the breed of sheep, but there are various circumstances of soil, climate, and food, which are important to be regarded. The experiments that have been made in various parts of Europe within the last half century, have sufficiently removed the prejudice that long prevailed, respecting the impossibility of growing the finest clothing-wool in almost every part of the globe where sheep will flourish and thrive. It is different with the long combing-wools, to grow which in perfection, luxuriant pastures seem absolutely requisite, and these cannot be obtained under a parching sun, nor could the animal flourish in tropical climates, covered with such a load of wool as is grown on our sheep in Lincolnshire. Under such circumstances, an entire change seems to take place in the animal itself; the long-woolled sheep become diseased and feverish, and only recover by casting the fleece, which is replaced by a coat of short hair. The rich pastures in England, and the opposite coasts of Flanders, seem more favourable to the growth of heavy combing fleeces, than any other country in the known world; and the Leicestershire and Lincolnshire sheep seem every way well suited to these pastures, and the prices of the wool obtained at present are sufficient to secure attention to its cultivation. At one period, indeed, during the American revolution, the price of long combing-wool not being equal to about ten shillings a pound, the growers turned their attention principally to the improvement of the carafe, and neglected the weight of the fleece. At present the price is about eighteen-pence, and the average weight being about eight pounds, the wool forms an important object, and the growers are endeavouring to increase the weight of their fleeces. For the common purposes of the worsted manufactures, this wool is so well suited as to leave nothing further to be desired; and it is this kind which foreign manufacturers are so devious to obtain from us. In many situations, however, where heavy long-woolled sheep are introduced, and where the soil is not sufficiently rich to grow it in perfection, it would be possible to grow a fleece weighing five or six pounds of very fine combing-wool, by croulling the long-woolled ewes with the Anglo-Merino rams. The increasing demand for finer goods, and the great improvement made in the spinning of combing-wool by machinery, make such a change more desirable to the growers, and they are expected to bear the heavy long-woolled breeds of Leicesters and Lincoln.

In many cold and exposed situations it would be desirable to provide better shelter for the flocks; and the practice of greasing, hereafter described, might be introduced with great advantage, and would tend to preserve the fleece and improve the quality of the wool.

The experiments made on the fine-woolled sheep on a large scale in different parts of Europe, prove that the peculiarities of food and climate have comparatively small influence on the quality of clothing-wool, and that it may be grown equally fine in situations where the sheep are confined and kept on dry meat a great part of the year, as in Saxony, Sweden, and Denmark. It may also be grown in the richest pastures, provided the pastures be over-flockaded, to keep the herbage bare. There cannot, however, be a doubt, that a dry light soil, particularly in the moist climate of England, is most favourable to the health of the sheep, and to the quality of the wool.

The experiments that have been made in England on the Merino sheep have not been so successful as in other countries, principally arising from two causes.

In the first place, the demand for men in England will always make the wool but a secondary object with the grazier, and no efta of the Merino sheep with the English has yet produced a race that is equal in symmetry of form the South Down sheep, or that will produce the same quantity of meat to the butcher in the same space of time, and with the same food. In the second place, the mode of washing the Merino and Anglo-Merino wool in England will, for long as it is practiced, prevent the wool from obtaining its proper value in the market. From the great quantity of natural oil or grease in the Merino fleece, it is impossible to wash the wool on the sheep's back by mere immersion in water. In Spain no attempts are made to wash the wool upon the sheep's back, but all the fleeces of a pile are regularly forted, and the different forts scoured and dried before the wool is packed. But where the quantity of wool which any one grower possessses is small, as in England, it would not answer to send for wool-lorters from a distance; and to wash the wool before it is forted, would fo intermingle the fine with the coarse locks, as to render the regular forting extremely difficult and expensive. In Saxony
of the same degree of fineness. The same preference is also given to the cloths in the halls, where they are sold in an undressed flate. When these cloths are finisht, their superiority is more apparent, possessing a degree of softness far beyond the ungreasfed wool. These wool appear to improve in every process of the manufacturer, and yield a cloth of greater value by twenty or thirty per cent, than the ungreasfed hard wool, though the latter may be equally fine.

But even in Northumberland, where the wool is so greatly improved by the practice, its good effects in this respect are not sufficiently known, and the operation is delayed till the approach of winter. By this delay, the upper part of the staple which is first grown, is deprived of the advantage of being kept in a moist, soft state during the summer heat. When the operation has taken place, a perceptible improvement may be observed in the wool which is afterwards grown. The line of dilution is clearly marked by the flax which the urgent leaves in the staple, the bottom part of which, where it is applied, is finer and softer than the upper part which was grown before its application. This difference is so great, that a careful examination of the fine greased wools of Northumberland might alone be sufficient to demonstrate the advantage of the practice, and the inconvenience of delaying the operation to the end of the year. To derive the most advantage from the ointment both to the wool and the sheep, it should be applied immediately after shearing, and again at the approach of winter. By the first greasing, the wool will be kept soft and moist during the sultry heats of July and August, and the top of the staple would not become harsh and discoloured, which is frequently the case with English wool. One acknowledged advantage of greasing immediately after shearing should not be overlooked; it destroys the sheep-tick, and has a tendency to prevent cutaneous diftempers, and to protect the skin from the bite of the fly. The manner of preparing the ointment in Northumberland is as follows:—From sixteen to twenty pounds of butter are placed over a gentle fire, and melted; a gallon of tar is then added, and the mixture stirred with a stick until the tar and butter are well combined, and form a soft tenacious ointment. Some skill is required in its application, the want of which has prevented the practice from prevailing more generally. If the ointment be rubbed on the wool, it collects on the top of the staple, where it detains the loose foil, and becomes hard, and is injurious to the wool. The proper method is to divide the staples or locks with one hand, and apply the ointment with the finger immediately upon the skin; it is thus kept constantly moist by the warmth of the animal, and is equally diffused through the fleece. Attention to this circumstance is of the greatest importance to the success of the practice. The quantity laid on each animal varies in different districts. In the lighter mode of greasing, one gallon of tar and twenty pounds of butter will be sufficient for fifty sheep. In Scotland, where greasing is applied merely to preserve the animal against the inclemency of the climate, a much larger proportion of tar is used; this would be very injurious to the wool, were it of any other than the very coarsest kind.

Could a cheap substitute for tar be found, which would possess equal tenacity, the ointment might be applied with great advantage to all our native breeds of English sheep, both for the preservation of the animal and the improvement of the wool. Mr. Bakewell states, that long combing, which have been greased in this manner, produce a softer and superior yarn to any ever made from wool of the native English breeds which have not undergone the pro-
Wool

cells. On all chalk and light calcareous soils, the wool is always much harsher than wool of the same degree of fineness grown on argillaceous or siliceous soils; and this arises from the calcareous earth penetrating the fleece, and absorbing the natural grease, and thus rendering the fibres hard and elastic. These fibres cover a large portion of the finest counties of England, and of some of the midland counties; and it is well known to cloth manufacturers that the wool from these districts do not work so well, nor make so soft a cloth, as wool on siliceous or argillaceous soils. Nor will this wool felt in the fulling-mill like the softer wools. The practice of greasing would be of undoubted advantage in calcareous districts, applying the oatmeal more sparingly than in the northern counties. Perhaps twenty-five pounds of butter, and one of tar, or two of bees-wax, might be sufficient for one hundred Southdown sheep; and if the mixture were applied once after shearing, and again in October, the expense would be abundantly compensated by the improved condition both of the sheep and wool. The softness of wool appears to be essentially connected with the property of felting, and depends partly on the structure of the surface of the fibre, and partly on its podelling but a moderate degree of elasticity. The process of felting is best illustrated in the hat manufacture, where the fibres of wool or fur are brought into contact by prefluff and warm, and form a compact substance without the aid of spinning and weaving. In some parts of Tartary, coarse cloth for tents is manufactured by spreading the wool on the ground, and prefluff it in warm water with the feet; this was probably the first mode of making cloth. All good woollen cloth is full-woven comparatively loose, and is made firm and close in the fulling-mill. The fibres of wool or fur have a tendency to move more easily in one direction when prefluffed, than in the opposite direction. This motion has been compared to that of an ear of barley placed under the coat-sleeve, with the points of the beard downwards; by the action of the arm the ear is moved in a retrograde direction, until it has advanced from the wrist to the shoulder. When we draw a hair of wool or fur through the fingers in a direction from the points to the root, we can feel a sensible degree of roughness, which is not felt if the hair be drawn from the root to the point. Hence we may suppose that the surface is covered with a number of points or rings, which are too minute to be observed by the microscope, except in some kinds of fur, as in that from the South-sea seal, in which, with a powerful microscope, we have seen the surface covered with distinct leaves or points, shaped like those of the artichoke. We have a striking illustration of this tendency of the fibre to move in one direction in that particular process of hat-making, where it is intended to cover the felt or substance of the hat with fur of a superior kind. The felt on which this fur is to be laid being finisched, the hair of the beaver is uniformly spread upon the surface, and being covered with a cloth, it is prefluffed and agitated by the hand for a certain time. The fibres of beaver hairs introduce themselves by their roots into the felt, and proceed to a certain depth, and become firmly fixed in it. If the prefluff were continued for a longer time, the hairs would pass entirely through the felt, going out at the under surface, as each hair follows the direction it acquired at the beginning of the process.

As the felting property, therefore, seems to depend on the minute structure of the surface of the fibre, it is easy to conceive how this may be injured by a dry calcareous soil, and how this property is best preferred in those furs which are grown under a covering of coarse hair, and protected from external injury. The process of greasing is in some respects a substitute for such a covering, and not only defends the surface, but prevents the fibre from becoming dry, harsh, and elastic. The ancient Greeks and Romans were in the practice of covering their soft-wooled sheep, called molles ovis, with skins: this has been supposed to have been intended merely as a protection from briars and underwood; but we have no doubt that wool so covered would be much softer than wool exposed to the action of light, and of the soil. That the rays of the summer sun have a tendency to make wool both coarser and harsher, may be seen in the effect produced on sheep that are exposed to it without shelter immediately after shearing. The top point of the staple which was grown at that time is almost always coarser and harder than the bottom of the staple which has been grown under the cover of the upper part of the fleece, and consequently more protected from light. An analogous effect is produced on the skins of horses kept in coal-mines, which become sleek and soft. These facts may suggest to wool-growers desirous of improving their wool, the advantage of providing shade for their flocks during the sultry heats of summer. The natural influence of sheep might teach them the propriety, not to speak of the cruelty, of keeping their sheep in summer inclosed in pens, and unsheltered, upon a dry soil, where the animals are almost roseted alive; a practice not less injurious to the health of sheep than to all the best qualities of the wool. Next to a regular supply of food, protection from the effects of heat and wet are objects of the first importance in the management of sheep; and it may be stated as an undoubted truth, that whatever contributes to the comfort of the animal, will enable it to fatten with a smaller quantity of food, will tend to preserve it in a healthy state, and will also increase the quantity and improve the quality of the wool.

Wool. Chemical Examination of the chemical properties of wool are very similar to those of hair, and as we omitted to speak of these in their proper place, we shall introduce them here. From the experiments of Achar and Hatchett, it appears that hair contains gelatine, to which it owes its suppleness and toughnese. When hair is boiled in water, this principle is separated, and the hair becomes much more brittle than before. Indeed, if the process be continued long enough, the hair crumbles to pieces between the fingers. The portion insoluble in water poises itself to Mr. Hatchett, the properties of coagulated albumen. Mr. Hatchett has concluded, from his experiments, that the hair which loses its curl in moist weather, and which is softest and most flexible, is that which yields its gelatine most readily; whereas strong and elastic hair yields it with the greatest difficulty, and in the smallest proportion. This conclusion has been confirmed by a very considerable hair merchant in London, who ascertained that the firrt kind of hair was much more injured by boiling than the second.

Vauqueian has published a curious set of experiments on human hair of different colours. He found it completely soluble in a Papin's digesiter. During this process, sulphuretted hydrogen was evolved. The solution thus obtained contains a kind of bituminous oil, which is deposited very slowly. This oil was black when the hair was black, but yellowish-red when red hair was the subject of experiment. When this oil was removed, naphthal and chlorine produced copious precipitates. Silver was blackened, and acetate of lead precipitated brown. When concentrated by evaporation, it did not concrete into a jelly.
WOOL.

Water containing only four per cent. of potash dissolves hair, while hydro-sulphuret of ammonia is evolved. If the hair be black, a thick dark-coloured oil, with some sulphur and iron, remain undissolved. If the hair be red, this oil is yellowish. Acids throw down from this solution a precipitate, soluble in excess of acid.

Sulphuric and muriatic acids become red when first poured on hair, and gradually dissolve it. Nitric acid turns hair yellow, and dissolves it, while an oil separates, varying in colour, as before-menioned, according to the colour of the hair employed. The solution contains a great deal of oxalic acid, besides bitter principle, iron, and sulphuric acid. Chlorine reduces it to a sublimate of the confidence of turpentine, partly soluble in alcohol.

Alcohol, digested on black hair, extracts from it two kinds of oil. The first, which is white, subrides in white shining scales as the liquor cools; the second is obtained by evaporating the alcohol. It has a greyish-green colour, and at last becomes solid. From red hair alcohol also extracts two oils, one white, as above, the other red as blood. After this latter has been extracted, the hair becomes brownish. Hence its red colour appears to depend upon this oil.

Hair on incineration yields iron and manganeze, sulphate and carbonate of lime, muriate of soda, and a considerable proportion of silica. The ashes of red hair contain less iron and manganeze. Thse of white hair still less; but in those we find magnesia, which is wanting in the ashes of other hair. The ashes of hair do not exceed .015 of the hair.

Hence, according to this analysis, hair consists of
1. Animal matters constituting the greatest part.
2. A white solid oil, small in quantity.
3. A greyish-green oil, more abundant.
4. Iron, salt unknown.
5. Oxide of manganeze.
6. Phosphate of lime.
7. Carbonate of lime, very scanty.
8. Silica.

Vauquelin infers from these experiments, that hair depends for its colour upon a kind of oil, which varies according to the colour of the hair in which it is found. He also supposes, that sulphuret of iron contributes to the colour of black hair. The sudden change of colour in hair from grief, he thinks, is owing to the evolution of an acid. Bichat, however, attributes this change, perhaps with greater probability, to the absorption of the colouring principle. To whatever cause it be owing, the fact appears undoubted; and it shews a closer connection between the living powers and the hair, than many physiologists are inclined to admit.

Wool appears, according to the experiments of Berthollet, to coincide almost exactly in its chemical properties with those of hair above-mentioned. When growing on the back of the animal, it is enveloped in a greyly matter, called the yolk, and which appears to be a kind of soap; or, more properly speaking, according to the experiments of Vauquelin, who has examined it, of
1. A soap of potash.
2. Carbonate of potash.
3. A little acetate of potash.
4. Lime.
5. A little muriate of potash.
6. An animal matter.

This substance appears to have the property of protecting the animal from infects to a certain degree, and of preferring the softs of the wool, which are perhaps its chief uses. It is removed from the wool before it is manufactured, by the process termed scouring. The affinity of the animal matter of wool for all colouring principles is very great, and in general far exceeds that of the different vegetable fibres, as cotton, flax, &c. for such principles. There is one kind of coarse wool, however, which, according to Dr. Bancroft, does not possefs this property, and receives colours with great difficulty. See Dyeing, and the preceding article.

Wool, laws relating to. The jealousy entertained on the subject of our wool, may be learnt from the legal refirection which has been made in relation thereto; as also with the view that as much employment as is possible may be found for the labouring classes. This is effected by the prohibition of the exportation of wool in an unmanufactured state, as will be seen below. It must be obvious, however, that it would be to little purpose to be thus strict respecting the article itself, if that which produced it was not equally guarded; therefore as early as 13 & 14 Ch. II. c. 18. it was made felony to export sheep from England or Ireland, or even to Scotland: now however the penalty is forfeiture of every ram, sheep, or lamb, and the vessel in which such is shipped with intent to exportation from Great Britain and the islands belonging thereto; and offenders are to forfeit 3l. for every sheep, &c. so shipped, and to suffer three months solitary imprisonment, and till the forfeiture be paid, not to exceed twelve months; and for any second offence 5l. for each ram, &c. and six months imprisonment, and till the fine is paid, but not to exceed two years. 28 Geo. III. c. 38. § 2.

By the 9th and 37th sections, no wool, woolfells, morgings, yarn, or worsted made of wool, woollflocks, coverings, cruise, waddings, or other manufactures, or pretended manufactures slightly wrought up so that it may be reduced to wool again, or mattrises, or beds stuffed with wool combed or fit for combing or carding, may be shipped or exported, or carried or moved for that purpose, from Great Britain, or Guernsey, Jersey, Alderney, Sark, or Man, to any foreign place, on forfeiture of the wool, with the carriage, ship, or cattle on which it is laden or removed; but 300 sheep may be sent annually from Liverpool or Whitehaven to the Isle of Man (51 Geo. III. c. 50.); and the person offending to forfeit 3l. for every pound weight, or 50l. in the whole, and to be imprisoned three months, and till the penalty is paid, but not to exceed six months; but for a second offence he is to forfeit the like sums, and to be imprisoned for six months, and till such fine be paid, not exceeding two years; but this is not to extend to lambkins drested for furs and linings.

And perons qualified by the governors of the following islands may export the respective qualities set against them from Southampton to those places in every year:

<table>
<thead>
<tr>
<th>To</th>
<th>28 Geo. III. c. 38. § 16, 17.</th>
</tr>
</thead>
<tbody>
<tr>
<td>To Jersey</td>
<td>4000</td>
</tr>
<tr>
<td>To Guernsey</td>
<td>2000</td>
</tr>
<tr>
<td>To Alderney</td>
<td>400</td>
</tr>
<tr>
<td>To Sark</td>
<td>200</td>
</tr>
<tr>
<td>Tods.</td>
<td>20000</td>
</tr>
</tbody>
</table>

28 Geo. III. c. 38. § 16, 17. And 20,000 pounds weight of worsted and woolen yarn may be exported annually from London to Lower Canada, by permission of his majesty in council. 47 Geo III. c. 9. 52 Geo. III. c. 55.

By the 48 Geo. III. c. 44. wool may be shipped in England for exportation to Ireland, on being duly entered and bond given for its true exportation there; and upon obtaining a licence under the hands of the commissioners of the customs to allow it.
No wool shipped to be sent coastwise from one part of
Great Britain to another, until due notice be given and bond
entered into, and a licence obtained under the hand of three
commissioners of the customs. Penalty, forfeiture. 28
Geo. III. c. 38. § 34. And wool must also be shipped
costwise in British ships, British owned and manned, the
owner of which does not reside out of Great Britain. § 19.
and 12 Car. II. c. 18. Formerly there were penalties and
forfeitures for keeping or removing wool in Kent and Suf-
fex within certain distances of the sea (ten and fifteen miles),
without entry and bond, and procuring certificates or per-
mits, and also for removing wool within five miles of the
sea-cost of Great Britain before fun-rising and after fun-
set; but by the 54 Geo. III. c. 78, all the regulations
formerly required antecedent to the removal of wool on land
throughout England are repealed.

Wool to be packed in packs, or trusses of leather, or can-
vas, called 'Pack-cloths,' or in linen or woollen, and to be
marked 'Wool,' in letters three inches long, on forfeiture
of the wool, and 1r. per pound. 28 Geo. III. c. 38. § 28.
Perfons packing wool, &c. into boxes, barrels, casks,
or chefts, and other than as above, or prefing or steeping
the same, to forfeit the goods, and 5l. per pound. Ibid.
§ 30, 31.

Informations for the conveyance of wool contrary to this
act void, and the parties may be punished. § 45, 46, 47, 48.

King's ships empowered and required to search ships for
wool shipped without licence. § 49, 50, 51.

No perfon can feize wool unlawfully removing but
officers of customs, excife, and salt-duces, or perfons ac-
companied by a constable (§ 52.); and perfons neglecting
their duty to forfeit 20l., and making collusive seizures or
agreements to be subjeft to like penalties as exporters.
(§ 53, 55.) Hindering, obstructing, or beating officers,
suspects offenders to transportation; and bribery of them,
whether accepted or not, to the penalty of 300l. § 56, 57.

If any question arifes upon the growth of the wool, the
onus probandi is to lie upon the owners. § 60.

Informations may be laid in any court of record, and
penalties, &c. under 200l. may be determined before two
justices of the peace; and justices at quarter-sessions may
direct ships, goods, wool, &c. to be sold. § 62, 63.

Proceedings to be commenced within three years.
§ 77.

Wool the growth of Ireland may be exported to Eng-
lend, and no where else. 1 W. & M. c. 32. 7 & 8 W. III.
c. 28. 10 & 11 W. III. c. 10. 26 Geo. III. c. 11.

And the Admiralty is to appoint three ships of the fifth
rate, and eight or more armed vessels, to prevent the ex-
portation of wool from Ireland to foreign ports. 5 Geo. II.
c. 21.

Wool the produce of any of the colonies, &c. in America,
or countries on the continent of America, subject to any
foreign European states, imported into certain British West
India islands, may be imported into Great Britain under the
regulations of the 12 Car. II. c. 18.

Those places are, Jamaica, Granada, Dominica, Antigua,
Trinidad, Tobago, New Providence, Crooked island, St.
VINCENT, Bermuda, Caicos, Tortola, CURACAO, and the
Bahamas. 27 Geo. III. c. 27. 45 Geo. III. c. 57.
47 Geo. III. c. 2. & 4. § 44.

British hare or coney wool may not be exported, (except
to Ireland, 39 & 40 Geo. III. c. 67.) on penalty of
forfeiture. The owner or shipper to pay 100l., and the
master of the ship 40l. 24 Geo. III. c. 21.