Medieval Sheep and Wool Types

By M L RYDER

I

Introduction

IN THE PAPER I wrote twenty years ago on the origins of British breeds of sheep, I attempted to integrate new evidence from archaeology with older documentary evidence.[1] Medieval archaeology was in its infancy, and the bone remains from sheep gave little information. Illustrations in illuminated manuscripts and later paintings gave better evidence than records. But the most striking new and incontrovertible evidence came from within the parchments on which records had been written, viz in the form of remains of wool fibres from the animal whose skin had been used to make the parchment. In the intervening period I have found many more illustrations, but the major advance has been the measurement of the wool in the numerous textile remains from medieval excavations, so that for the first time we know exactly how fine in modern terms wool was in the Middle Ages.

The approach I propose to make in this paper is first to look at modern breeds, and their distribution in the recent past, to see how far their ancestry can be pushed back towards the Middle Ages. Then a brief consideration will be given of the meagre pre-medieval evidence, including the origin of British sheep, and finally the Middle Ages will be covered in greater detail, taking each source of evidence in turn. Although I have used new evidence from wool in textile remains, it has not been possible to relate the findings to medieval cloth descriptions used by economic historians.

It must be stressed at the outset that fleece variations, as with other breed differences, are caused mainly by genetic differences. Since there has been much discussion about the distinction between shortwools and longwools during the Middle Ages one must repeat that they are distinct groups of breeds. This point is emphasized by the fact that each fleece type has a characteristic staple form that arises from the intermingling of varying proportions of different fibre types. Although better nutrition might make a short-woolled fleece grow somewhat longer, it cannot change it into a longwool type.

II

Tracing breeds back to the sixteenth century

Table 1 shows a classification of British breeds based on face colour, the presence or absence of horns, and fleece type. It is a revised version of that given in previous work.[2] The white-faced, horned, hill group tends to comprise old breeds that are horned in the rams only. The wool is generally coarse but not hairy. The related white-faced short-woolled group has breeds with finer wool than the white-face horn, and those with horns are horned in both sexes. The longwools have a white face and no horns. These were a development of the eighteenth century.

The black-faced, horned group has breeds with longer, hairy fleeces, and horns in both sexes. The black-faced shortwools lack horns, and were mostly developed during the nineteenth century as Down breeds. The figures in this Table indicate the proportion of animals with a certain blood type, and it

[1] M L Ryder, 'The History of Sheep Breeds in Britain', *Ag Hist Rev*, 12, 1, 1964, pp 1–12; 12, 2, 1964, pp 65–82.

[2] Ryder, op cit; M L Ryder and S K Stephenson, *Wool Growth*, 1968.

TABLE I

Classification of British Breeds

Wild ancestor	Mouflon*	0.70	short tail
Brown	Soay*	0.96	short tail
Vari-coloured	Orkney†	—	short tail
	Shetland†	0.69	short tail
	St Kilda (Hebridean)	*(4) Black	short tail
	Manx Loghtan	*(4) Brown	short tail
	Jacob	*(4) Piebald	tail not short

White-faced, horned hill			*Black-faced, horned hill*		
Herdwick†	0.71		Scottish Blackface*	0.72	
Cheviot†	0.54	'Green	Rough Fell*	0.81	
Welsh Mountain†	0.54	Hill'	Swaledale*	0.85	heather
Radnor†	0.47	breeds	Dalesbred*	0.63	hills
			Lonk*	0.45	
White-faced, shortwools			Derbyshire Gritstone	0.57	
Kerry Hill	0.42				
Ryeland	0.23		*Black-faced, shortwools*		
Whiteface Woodland*	—		Clun	0.41	
Wiltshire Horn*	0.14		Shropshire	0.25	
Dorset Horn*	0.49		Norfolk	1.0	
Portland*	—		Suffolk	0.42	
Exmoor Horn*	0.65		Oxford	0.26	Down
Devon Closewool			Southdown	0.44	breeds
			Hampshire	0.54	
Demi-lustre longwools of medium length			Dorset Down	0.49	
Romney Marsh	0.53	white-	The Southdown has almost lost its face colour, and like the Ryeland has a woolly face.		
Border Leicester	0.12	faced polled			
			Lustre longwools		
			Teeswater	0.54	
			Wensleydale	0.59	
			Leicester	0.06	White-
			Lincoln	—	faced
			Cotswold	—	polled
			Dartmoor	0.13	
			Devon Longwool	0.13	
			South Devon	0.20	

* both ewes and rams horned † only rams horned (4) = 4 horns

The gene frequencies for high blood potassium shown in this table and those for haemoglobin A[1] shown in Fig 1 provide supporting evidence for the affinities of different breeds. But too much reliance should not be placed on these alone because they are iikely to change be selection in different environments. Haemoglobin A gene frequencies are likely to change less, however.

[1] Both from Evans *et al*, *Proc Roy Soc* B 148, 1958, pp 249–62.

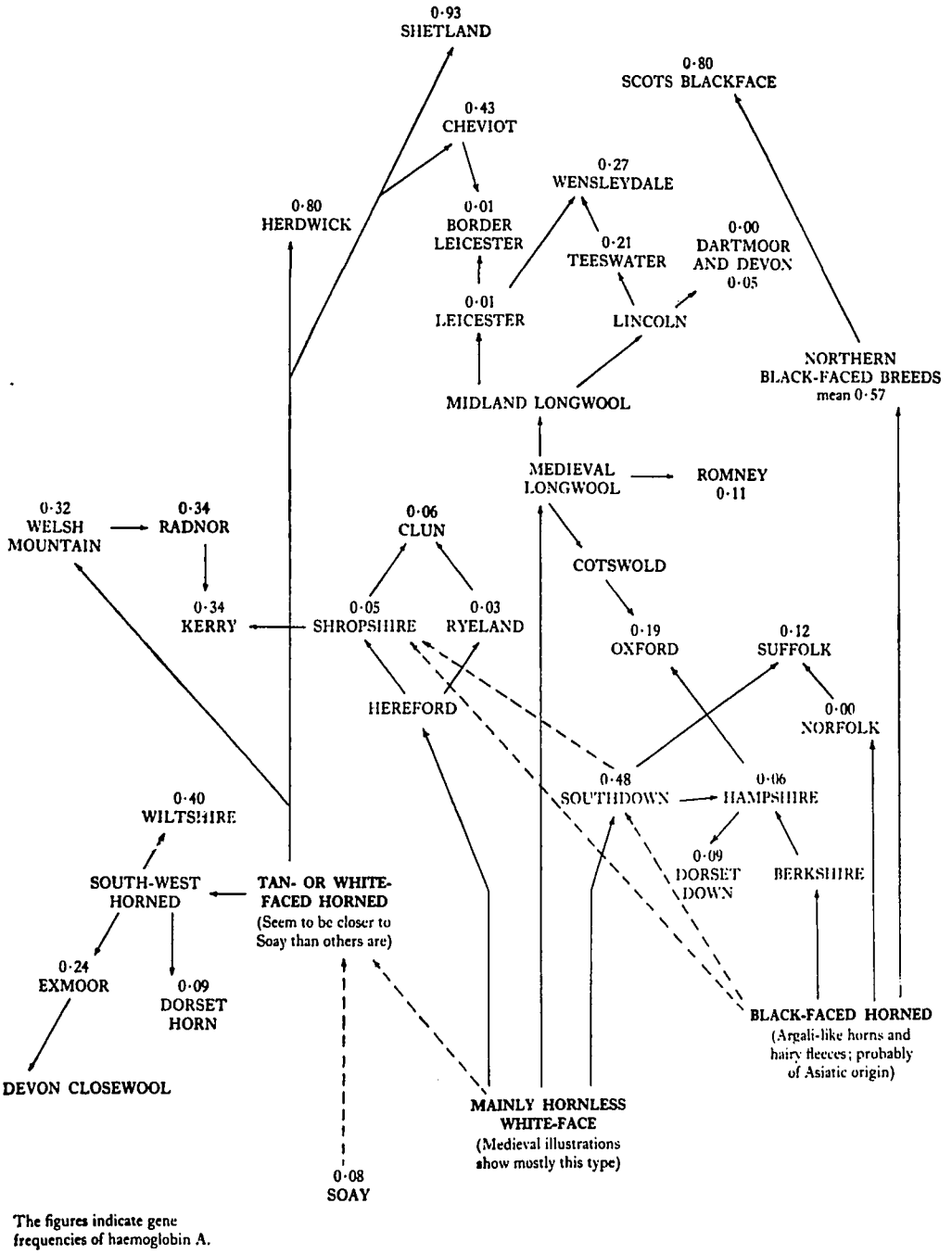

FIGURE I
Probable lines of evolution of British breeds of sheep
(from Ryder, 1964[1])

can be seen that breeds found to be similar on other grounds tend to have similar blood type figures.

Fig 1, also from my 1964 article, shows some of the relationships and lines of evolution of British breeds. The recent stages are based on breed records of the last 200 years, and so are more reliable than the earlier stages for which records do not exist. The lines do not necessarily imply direct links. Three main types of sheep or possible waves of introduction, can be discerned: First, the short-tailed prehistoric type that survives as the small brown Soay, and the vari-coloured Orkney and Shetland; secondly, there is the white-faced polled type, and thirdly, the black-faced horned. The source and evolution of these types will be discussed in greater detail later.

It is possible to plot on a map the distribution of the main types of sheep at the end of the eighteenth century when accurate breed descriptions first begin to appear. (See Fig 2 from my 1964 article which owes much to the summaries of Trow-Smith, to which are added the descriptions of sheep in each county given by such authors as Youatt).[3]

The white-faced horned type was concentrated in Scotland and western parts of Britain; this type may have been influenced most by the first sheep to arrive in Britain during pre-historic times. The longwools extended across a wide area of the Midlands, and these might derive more or less directly from stock that was introduced about Roman times. The black-faced horned type was found mainly in the east and north of England, whence it was entering Scotland to become the Scottish Blackface.

Finally, two small areas, Hereford and Sussex, were noted for fine wool. In Hereford the sheep in question had been known as the Hereford breed, and this later emerged as the modern Ryeland. In Sussex the fine-woolled breed was the Southdown which was used in the development of all other Down breeds from the late eighteenth century onwards. The Southdown is still noted for fine wool, although the fleece of course belongs to the British shortwool type and is not as fine as that of the Merino.

It appears to be possible to push back these broad groups to the sixteenth century when they formed regional types that gave rise to the native breeds of each county evident at the end of the eighteenth century.[4] The emergence of county breeds corresponds to the changes of the sixteenth and seventeenth centuries from the largely subsistence farming of the Middle Ages to the commercial agriculture carried out by yeoman farmers.

When uniformity in breed appearance came about is not known, although most medieval illustrations show moderately uniform flocks. Yet during recent visits to the Balkans I have seen flocks containing all possible combinations of face colour, horns and fleece type. Mere segregation of the animals in such a flock could produce several 'breeds', which poses the question of the extent to which some breeds differ only in their superficial appearance.

III

British sheep prior to the Middle Ages

The domestication of sheep did not take place in Britain, and so the first domestic animals were introduced by Neolithic settlers about 4000 BC. The only evidence of these sheep comes from bone remains, and they probably had a coat not very different from that of the wild ancestor, in which bristly fibres, known as kemps, obscure an undercoat of fine wool.

The Bronze Age breed of Europe is thought to be represented by the small, brown Soay sheep that survives in a feral state on St Kilda off north-west Scotland. Evidence for this comes from the similarity of skeletal remains with those of the Soay,

[3] R Trow-Smith, *A History of British Livestock Husbandry to 1700*, 1957; *A History of British Livestock Husbandry 1700–1900*, 1959; W Youatt, *Sheep*, 1840.

[4] Ryder, op cit.,

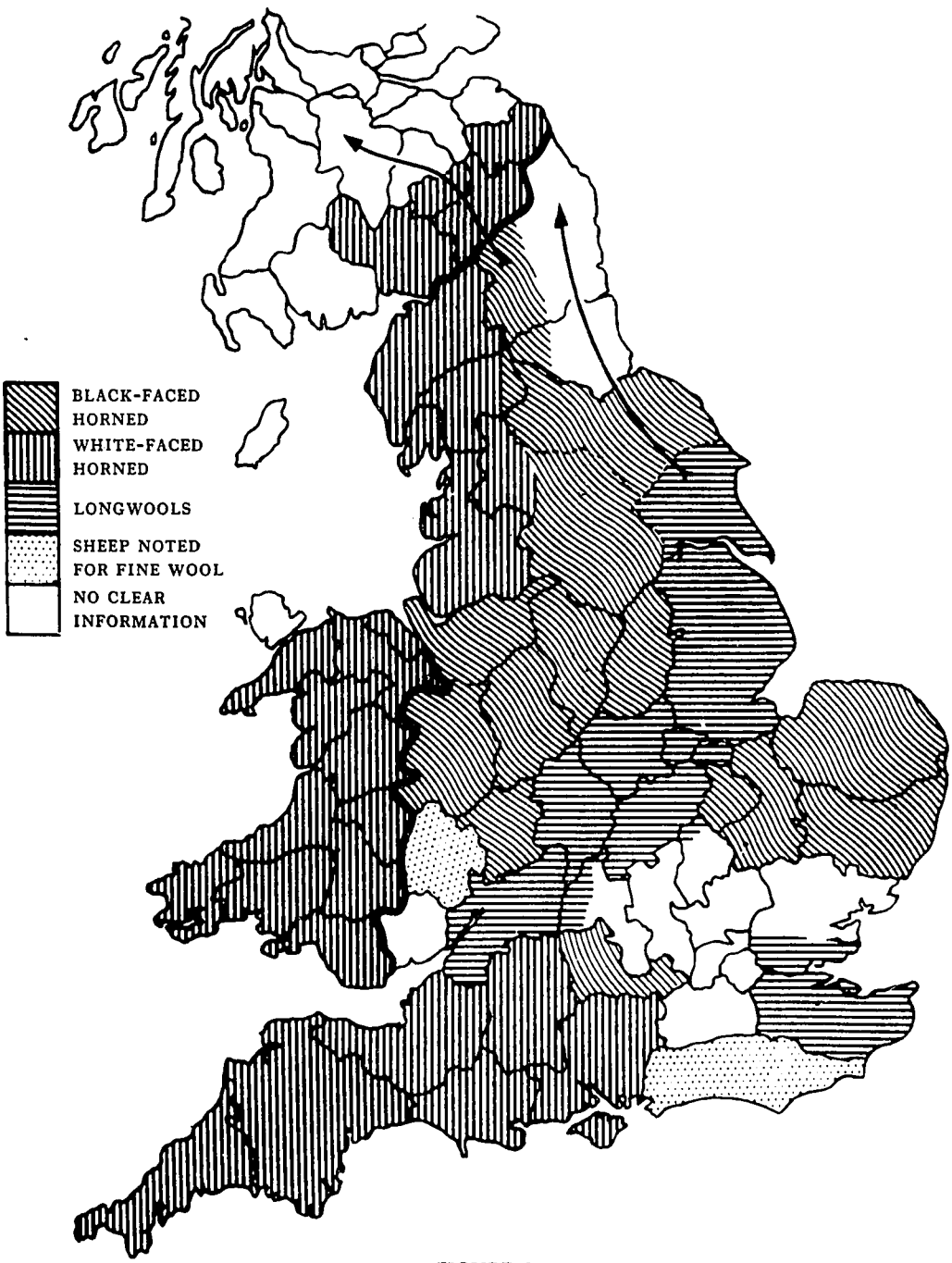

FIGURE 2
Distribution of the breed types about the year 1800
(from Ryder, 1964[1])

and the similarity of wool in Bronze Age cloth with the fleece of the Soay.[5]

The primitive features shared by the Soay with the wild ancestor are a short tail (all modern breeds have a long tail), a coloured fleece in which the belly is white (most modern breeds are completely white), and thirdly an annual moult (the wool of virtually all modern breeds grows continuously). To these major and obvious differences between wild sheep and modern domestic breeds can be added the change from a hairy coat to a woolly fleece, and the wool of the Soay is already much less hairy than the coat of the wild sheep, but there are hairy and woolly types.

The evolution of the fleece is illustrated in Fig 3[6] which shows histograms of wool fibre diameter distribution in microns (1 micron, μm = 0.001 mm). The diameter is shown along the horizontal axis, and the number of fibres on the vertical axis. The fibre diameter distribution of the wild sheep is shown at the top, and the big difference in diameter between the coarse outer coat and the fine under wool is very striking. The first evolutionary change after domestication was a narrowing of the outer coat kemps to produce the hairy medium fleece type of the hairy Soay. Further narrowing of these hairy fibres (fine kemps), presumably as a result of selective breeding by man, changed them into the wool fibres of medium diameter found in the woolly Soay.

In evolutionary terms this is a generalized type forming an important link between more primitive hairy fleeces, and the more highly-evolved modern ones. The diameter distributions of surviving breeds have been shown in Fig 3, but all except that of the wild animal at the top have been found in old textiles. The hairy medium and generalized medium types appeared first in the Bronze Age, and were common until after the Middle Ages. The modern types on the right and at the bottom began to appear in Roman times, and I will say more about these later.

Colour changed next with the appearance of white sheep in the Iron Age. Some white wool came from a Scythian burial mound in central Asia, and is dated 400 BC. But there was in fact a range of colour, black, white, and grey, in addition to the brown of the Soay. Evidence for this again comes from textile remains and surviving breeds.

Among the 57 wool samples from Vindolanda, the Roman site on Hadrian's Wall, only 9 per cent were completely coloured and so were either black or brown indicating a move away from the Bronze Age Soay type; 40 per cent had no pigment and so were white, while as many as 51 per cent had a mixture of coloured and white fibres, being therefore grey (Table 2). A sheep with this range of colours which appears to be a survival of the Iron Age vari-coloured type is the native Orkney breed that remains on the island of North Ronaldsay in the Orkney group. The wild-pattern white belly is rare, and so this marks the Soay as unique amongst domestic sheep.

The change in colour provides the main difference from the Soay, however, since the Iron Age type represented by the Orkney and Shetland breeds still has hairy and woolly fleeces like the Soay. During the

TABLE 2
Extent of Natural Pigmentation in the Vindolanda Wools (actual number)

	100% pigmented	*mixture ('grey')*	*no pigment*	*total*
Hairy	—	—	1	1
Hairy medium	3	11	5	19
Gen. medium	1	12	6	19
Fine, gen. medium	1	3	6	10
Fine	—	2	3	5
Shortwool	—	—	2	2
Medium	—	1	—	1
	9%	51%	40%	

[5] M L Ryder, 'Changes in the fleece of Sheep following Domestication', in P J Ucko and G W Dimbleby (eds), *The Domestication and Exploitation of Plants and Animals*, 1969, pp 495–521.
[6] Taken from my *Sheep and Man*, 1983.

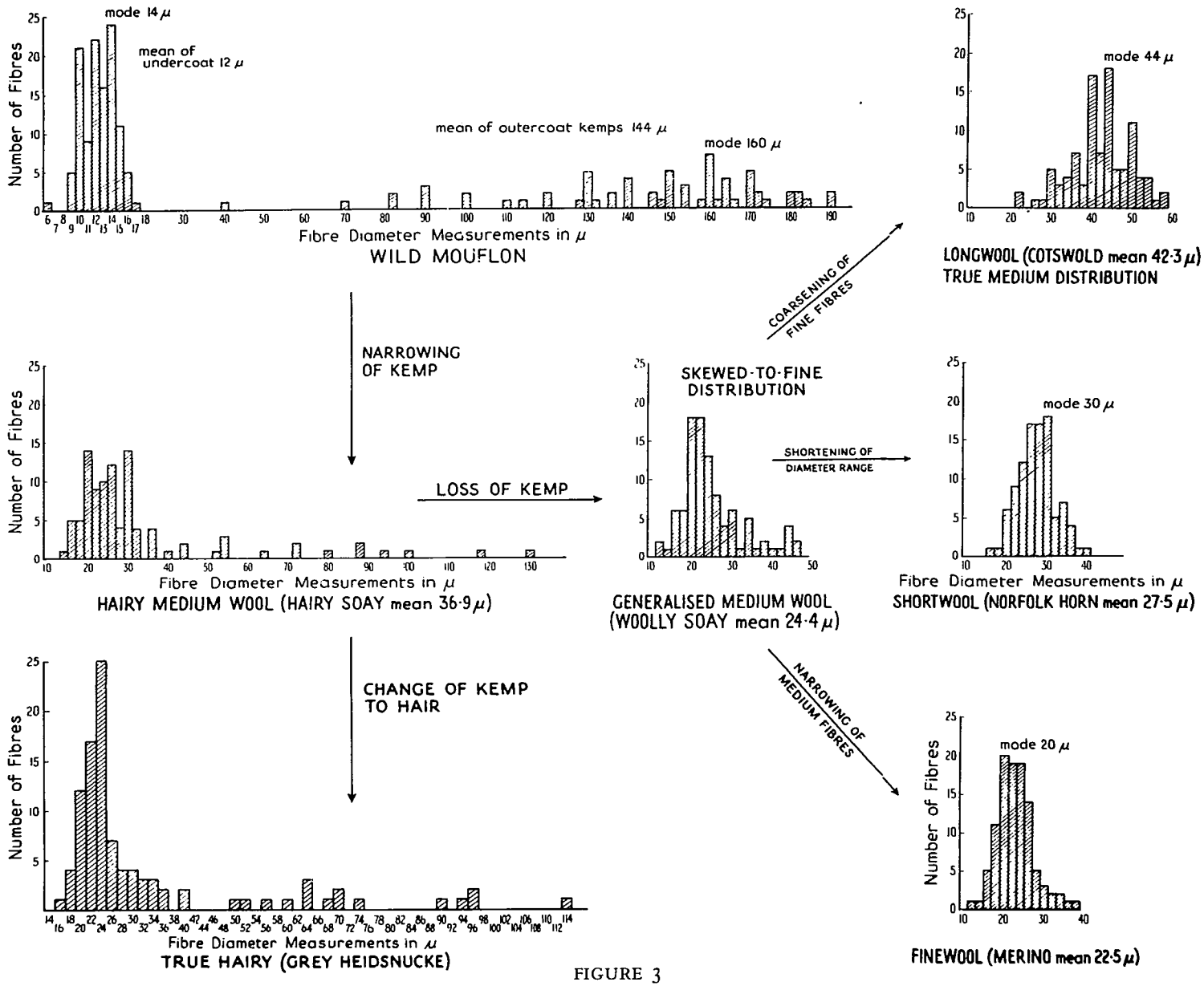

FIGURE 3

Changes in fibre diameter distribution during fleece evolution (from Ryder, 1983[6] modified from Ryder, 1969[5])

nineteenth century the Orkney and Shetland breeds formed a single population, but the Shetland has since been bred for white, woolly fleeces, so the Orkney now represents the ancestral type. They also have a tendency to moult so that in the past these breeds were plucked instead of being shorn. These breeds also have a short tail like the Soay, but many of the ewes are polled. The skeleton is otherwise similar to that of the Soay.

Roman textiles from Britain and the Continent show that more changes in the fleece type were taking place at that time (Fig 3). The predominant wool type during the Roman period, in addition to being white, is fine to the naked eye, but microscopic examination reveals that the wool contains medium fibres, and so is of generalized medium type. Hairy medium wools were still common, however, at Vindolanda for instance (Table 2).[7] The way in which the new types probably evolved by selective breeding is shown in Fig 3.

If the medium fibres had become narrower by selective breeding then the fibre diameter distribution of the true fine type seen in the modern Merino would have been produced (bottom right). The development of the true fine wool began in the Middle East probably soon after 1000 BC,[8] but the emergence of the Merino as a distinct breed occurred in the late Middle Ages in Spain.

If, on the other hand, the finer fibres had become coarser by breeding, then the true medium wool diameter distribution of the modern longwool would have been obtained (top right). Thirdly, if both changes had taken place together, and the range of fibre diameter become shortened to give a mean between the fine and medium values, the distribution would be comparable with that of the modern shortwool (middle right). Textile remains indicate that a few medium (diameter) wools and shortwools had developed during Roman times in Britain, but neither became common until after the Middle Ages.[9]

Another line of development involved a change of the short, shedding kemps of the hairy medium wool into long, continuously-growing hairs, to produce the true hairy type of fleece (bottom left). This appeared during the Iron Age, but it was rare until after the Middle Ages, and today wool of this type is used mainly in carpets. Its development appears to have been associated with selective breeding for continuous fleece growth following the invention of sheep shears.

These changes can be considered along with other evidence in terms of breed types (Fig 4). Following the prehistoric types, the next main influx of sheep may have occurred immediately before or during the Roman period. Textile remains show that many Roman sheep were white, and evidence from illustrations and sculptures on the Continent indicates white-faced sheep with a tail of medium length. There were also horned and polled animals which appear to be the rams and ewes of a single type. It is possible that crosses between these sheep and native animals produced a new type that later emerged in breeds such as the Cheviot and Welsh Mountain.

Then, as already indicated, evolution within the Roman type itself could have produced a primitive longwool. It is possible that this was similar to the modern Romney breed, which has a shorter and less lustrous fleece than the true longwools, and I shall say more about this later. The other type that could have developed from the Roman sheep is the shortwool for which I will be reviewing evidence in the Middle Ages. A survivor of this type appears to be the Ryeland breed.

The third main British type is the Blackface horned, and whether or not this evolved locally, or was introduced during Saxon or

FIGURE 3
Changes in fibre diameter distribution during fleece evolution (from Ryder, 1983[6] modified from Ryder, 1969[5])

[7] M L Ryder, 'Wools from Vindolanda', *Jour Arch Sci*, 8, 1981, pp 99–103.
[8] Ryder, 'Changes in the fleece . . .' op cit.
[9] Ibid.

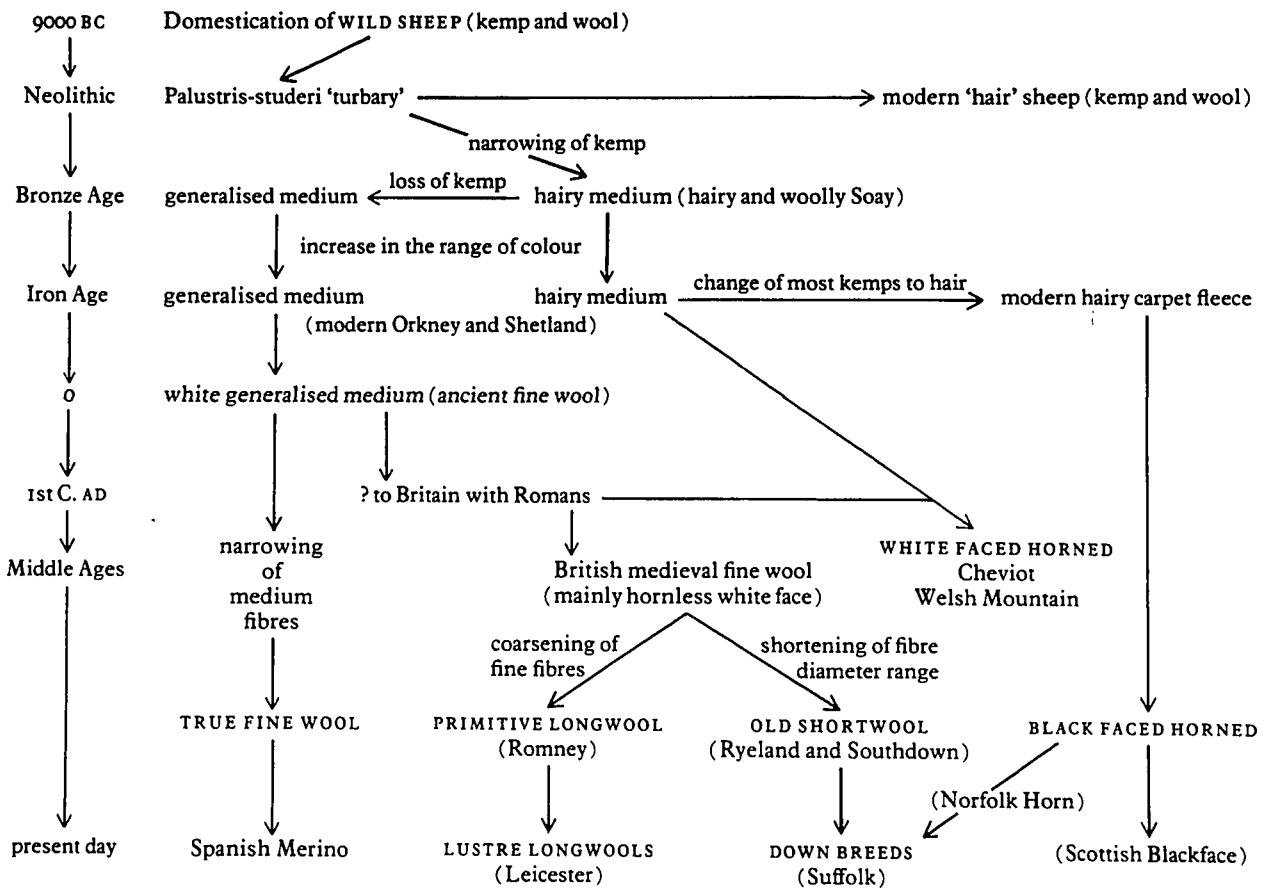

FIGURE 4
Suggested lines of evolution of fleece types and some main breed types (from Ryder, 1983[6] modified from Ryder, 1969[5])

Danish times, is not yet clear. An example of this type is the Scottish Blackface.

Sheep were found everywhere in England during Saxon times, as judged by the number of place names that embody a reference to sheep. The Saxon wools I have examined[10] were comparable with those of the Roman period[11] (Table 3), ranging from hairy medium wools through the generalized medium type to the true medium fleece, and the Sutton Hoo burial yielded some interesting examples of fine wools.

[10] Ibid.
[11] M L Ryder, 'Wools from Antiquity', *Textile History*, 5, 1974, pp 100–10; 'Wools from Vindolanda', op cit.

TABLE 3
Comparison of Roman and Saxon Wools

	Vindolanda	*all other Roman (incl Europe)*	*Saxon (England only)*
Hairy	(1)	—	—
Hairy medium	34%(19)	14%(12)	23%(10)
Generalized medium	34%(19)	15%(13)	23%(10)
Fine, generalized medium	18%(10)	39%(34)	30%(13)
True medium	2%(1)	3.5%(3)	5%(2)
Shortwool	4%(2)	1.5%(1)	—
Fine	9%(5)	27%(23)	19%(8)

Many northern areas were occupied by Vikings, and it is possible that the Herdwick breed of the Lake District contains Norse influence. Most of the Norse wools measured were from Scotland,[12] and the general impression is that these are more hairy but have less pigmentation than Roman and Saxon wools. Orkney and Shetland were occupied by Norsemen until the fifteenth century, but although the sheep husbandry of these islands contains considerable Norse influence, the sheep (as already indicated) appear to date back to an earlier period. Even if Norse settlers introduced sheep, they are unlikely to have been very different from those already there.

The area occupied by the Danes before the Norman Conquest roughly coincides with the area in which the black-faced, horned type of sheep emerged into history. This led to the suggestion that this main stock was introduced by the Danes. In the past Denmark had a similar type, like the surviving Heath breed of Germany, and some of the Danish wools from York were of true hairy type. But the Continental Heath sheep appear to have more affinities with the vari-coloured type than with the Scottish Blackface and, as we shall see, there are no illustrations of the black-faced horned type before the eighteenth century, so it could have evolved locally.[13]

Five raw wool staples from Coppergate, York, had no natural pigmentation, but the fibres had soft root ends indicating that this was skin wool pulled from skins after slaughter. One was a true hairy type, two were hairy medium wools, one was a generalized medium fleece, and there was also one shortwool. Nineteen yarns from Pavement, York, examined earlier[14] comprised three true hairy fleeces, seven hairy medium wools, five of generalized medium type, and four of true medium type.

[12] M L Ryder, 'The Evolution of Scottish breeds of Sheep', *Scottish Studies*, 12, 1968, pp 126–67.
[13] See Ryder, *Sheep and Man*, 1983, p 192.
[14] Ryder, 'Wools from Antiquity', op cit.

IV

Medieval sheep (1066-1550)

(a) *evidence from records*

The main function of sheep in the early Middle Ages was to provide milk to make cheese for winter food; wool, manure and meat were by-products in that order of importance. The *Lutrell Psalter* dated 1340 shows some sheep being milked. They appear to have a white face, and only two are horned. Their curls suggest a longwool sheep having wool of medium diameter, but a longwool with such a short fleece today would have been recently shorn.

Records of that date provide no clue as to the size and type of livestock. The similarity in price between rams and ewes in the twelfth century suggests a lack of breeding policy, but there was a difference in price between fine-woolled sheep at 10*d* each, and coarse-woolled sheep at 6*d*. This indicates an interest in fine wool, but less than 1 per cent of manors had such a flock.[15]

I originally debated whether these coarse-woolled sheep were of true hairy type, and the fine-wools of shortwool type. The new evidence from textiles that I shall be summarizing suggests rather than the coarse ones were hairy medium wools, and the fine ones generalized medium wools. In an illustration in a twelfth century psalter from York, the wool staples have a pointed tip indicating hairiness, but the relatively short length suggests a hairy-medium rather than a true hairy fleece.

Since breeding in isolation and wide out-crosses are regarded by geneticists as two important ways in which breeds originated, the considerable stock movements that took place during the Middle Ages are important. Introductions of new, and possibly better, stock into an area, such as when monasteries were established in the north and west during the twelfth century, constituted one form of selective breeding. But monastic records give no indication of

[15] Trow-Smith, 1957, op cit.

selective breeding for wool despite its economic value. They merely list the numbers of animals kept, and the value of their sheep and wool, with hardly anything to show what the animals were like.

In the mid-fifteenth century, 70 per cent of the wool production of Fountains Abbey was of 'optima' quality, and among the poorer qualities, 4 per cent was black. Now medieval illustrations show occasional black sheep. Also listed at Fountains Abbey was 8 per cent 'grisia' wool, which can be translated as grey and brown. An English bestiary of the thirteenth century has a hint that two of the sheep are grey, and one brown. The wool is shown wavy, but it is short, and the only polled adult is suckling a ewe, so it may be that the horned animals are wethers — castrated males — that were used for wool production during the Middle Ages. The records at any rate show that coloured sheep persisted into the Middle Ages, but perhaps not in such great numbers as in earlier times.

Although breeds in the modern sense did not exist, a classification of sheep by fleece type was already in use by wool buyers. During the Middle Ages Britain grew the wool with the finest fibres, and this fetched the highest price since the supply did not meet the demand. Much wool of inferior type was also produced. There was plenty of fine wool on the Continent, and English wool was apparently unique because of its greater length, which enables it to be combed to make worsteds.[16] The question of wool length is a recurring theme in English medieval wool, and although staple length is basically determined by heredity, better nutrition can make the fleece grow longer and therefore heavier, a fact which was known as early as the sixteenth century. Some of the extra length recorded may therefore be due to the richer British pasture acting on a sheep with basically short wool.

The range of fleece weight recorded by Trow-Smith from 1.1 to 2.1 lb, seems to be too great to be accounted for by pasture differences. More fleece weights quoted by Postles pointed to an average figure about mid-way between these two values.[17] But it does accord with the much-repeated statement of Eileen Power that long wool was produced by a different breed from that which grew short wool.[18] I consider that this statement is only acceptable if the long woolled breed was like the modern Romney.[19] This is a primitive longwool with a fleece no more than about 7 in in length today, whereas the lusture longwools such as the Leicester have curly wool a foot or more in length. There is no conclusive evidence for the existence of lustre longwools during the Middle Ages, and I shall say more later about their origin.

Wool price lists provide the main documentary evidence of sheep type, and one can express the prices cartographically. In the list of 1343 the most highly priced, and presumably therefore the finest wool, came from the Welsh Border. In the list of 1454 the dearest wool came from around Leominster in Herefordshire, and much has been written about the fineness of 'Lemster' wool. It seems likely that Leominster wool was grown by the ancestor of the Ryeland breed.

The Ryeland was known in the past as the Hereford, and this area had a reputation for fine wool at least as late as 1800. But Hereford also grew coarser wool during the Middle Ages that did not fetch such a high price. This breed lacks horns and has a white face like most medieval illustrations.

The next highest priced wools in 1454 were Cotswold and Lincoln wools. This must mean that these were shorter and finer than the fleeces so named today, which are lustre longwools. Canterbury wool from Kent and Sussex was, on the other hand, relatively low in price. The export of 'Canterbury' fleeces from the Midlands in

[16] E Lipson, *A Short History of Wool and its Manufacture*, 1953.

[17] D Postles, 'Fleece weights and the wool supply, *c* 1250–*c* 1350', *Textile History*, 12, 1981, pp 96–103.

[18] E Power, *The Wool Trade in English Medieval History*, Oxford, 1941.

[19] Ryder, 'History of Sheep Breeds', op cit.

the thirteenth century suggests a link between the Midland longwool and the forerunner of the modern Romney. The wool elsewhere in Kent and Sussex was of average price, and here the fine-fleeced Southdown breed emerged later.

(b) *evidence from skeletal remains*

Skulls which were excavated at Kirkstall Abbey in the 1950s indicate the presence of polled as well as horned sheep. The first surveys of medieval sheep bones revealed little difference in stature between the animals of earlier periods and surviving Soay and Shetland sheep.[20] And more recent measurements have not altered this conclusion.[21] Noddle, however, found that the length of the neck of the shoulder blade varied between primitive short-tailed breeds, and modern breeds with a long tail, and she found that most shoulder blades from medieval sheep had a neck of intermediate length, with some being of short-tailed type, and some approaching the modern type.

More recent work has confirmed the presence of a sheep that was hornless in both sexes.[22] This was identified with the medieval fine wool described by me in 1964,[23] which I now regard as being a generalized medium wool. There was also a type that was horned in the rams only, as well as more than one type horned in both sexes. That is despite the fact that there are hardly any medieval illustrations showing a horned ewe. The three modes of horn inheritance seen today were therefore in existence, but this does not necessarily indicate distinct breeds since they could have been present in an inter-breeding population.

(c) *evidence from wool in cloth remains*

More direct evidence comes from wool in textile remains, but material has been made available for study only from recent excavations in Southampton, Winchester, London, York, Perth, and Aberdeen. The measurements made are difficult to illustrate and summarize (Table 4), but from the overall percentages at the bottom it can be seen that the generalized medium fleece type predominated.[24] This is the type that appears fine to the naked eye and it formed over one-third, and there were nearly as many hairy medium wools. Most sites had a few true hairy fleeces, and on nearly half the sites the generalized medium wools were particularly fine.

There were a few true medium wools, that is having the fibre diameter distribution of the modern longwool. But what had been thought to predominate in the Middle Ages, either the shortwool or true fine type, formed overall only 8 per cent and 6 per cent respectively. The fine wools need not have been imported from the Continent since occasional fine fleeces with a symmetrical fibre diameter distribution are found in such primitive breeds as the Orkney. The wool evidence therefore indicates that the predominant sheep type during the Middle Ages was of hairy-medium/generalized-medium type. It was probably comparable with the surviving short-tailed and varicoloured Orkney and Shetland breeds, which we noted in earlier periods, and in which it is mainly the rams that are horned. The bone remains accord with such an animal, but the illustrations show that the tail had already increased in length. Records and textiles confirm the persistence of some coloured sheep, although illustrations tend to indicate only the occasional black animal. Skeletal remains indicate a greater range of horn type than suggested by the illustrations. But such anomalies are probably due to the considerable variation that must have existed

[20] M L Ryder, 'The Livestock Remains from four medieval sites in Yorkshire', *Ag Hist Rev*, 9, 1961, pp 105–10.

[21] B A Noddle, 'A Comparison of the animal bones from eight medieval sites in Southern Britain', in A T Clason (ed), *Archaeozoological Studies*, Amsterdam, 1975.

[22] P L Armitage and J A Goodall, 'Medieval horned and polled Sheep: the archaeological and iconographic evidence', *Antiq Jour*, 57, pp 73–89; B A Noddle, 'The Animal Remains', in H Clarke and A Carter, *Excavations in King's Lynn 1963–1970*, 1977, pp 378–400.

[23] Ryder 'History of Sheep Breeds', op cit.

[24] Ryder, 'Medieval sheep and their wool types', in D W Crossley (ed), *Medieval Industry*, 1981.

TABLE 4
Summary of Fleece Types in British Medieval Wools

		Hairy	*Hairy medium*	*Generalized medium*	*Fine generalized medium*	*True medium*	*Short*	*Fine*
Winchester	11th cent	14%(1)	57%(4)	29%(2)	—	—	—	—
London, Baynard's Castle	1200	—	25%(2)	63%(5)	—	—	—	12%(1)
York	12th–13th cent	27%(3)	37%(4)	27%(3)	—	9%(1)	—	—
Southampton	13th–14th cent	—	11%(2)	58%(11)	—	5%(1)	5%(1)	21%(4)
Baynard's Castle	14th cent	13%(3)	8%(2)	8%(2)	38%(9)	4%(1)	13%(3)	16%(4)
Baynard's Castle	15th cent	7.5%(2)	11%(3)	15%(4)	18%(5)	11%(3)	30%(8)	7.5%(2)
Yorkshire	15th cent	—	33%(2)	66%(4)	—	—	—	—
Perth	12th–14th cent	19%(17)	44%(39)	18%(16)	6%(5)	8%(7)	5%(4)	—
Aberdeen	13th–14th cent	12.5%(2)	19%(3)	44%(7)	6%(1)	12.5%(2)	—	6%(1)
	overall	13%	30%	26%	10%	7%	8%	6%

among medieval sheep, coupled with some evolution towards modern breeds.

If the actual measurements from Perth and Aberdeen are compared one can see that hairy medium wools were more common at Perth, and generalized medium wools predominated at Aberdeen (Table 5). Only 30 per cent of the Perth wools lacked pigment, another 30 per cent were black or brown, and the remainder were varying shades of grey. Eleven of the sixteen Aberdeen yarns were light grey. This high proportion of coloured wools, and particularly grey fleeces, supports the conclusion from diameter measurements that the Orkney-Shetland type maintained its predominance from the Iron Age into the Middle Ages.

There were four unspun wools from Perth comprising one hairy medium fleece 25 mm (1 in) long, and three hairy fleeces, two of which were 40 mm (1.6 in) long, and the other 60 mm (2.4 in) long. These lengths are the same as found among staples from Baynard's Castle, London, but are shorter than the modern woolly Shetland fleece, and only half the length of hairy Shetland wool.

(d) *evidence from illustrations*

Most medieval paintings show white-faced hornless sheep, with occasional horned animals that are probably rams. The sheep are invariably shown with short wool, and often appear like the modern Merino, Ryeland or Romney breeds. Although no illustrations of longwoolled sheep have been recorded, some fleeces have short curls like those of a recently-shorn longwool. Likewise no picture of a sheep with a true hairy fleece, or a black face was found before the eighteenth century.

Although I was criticized by Armitage and Goodall for grouping Continental illustrations with English ones,[25] I have now recorded 40 illustrations originating in England between the ninth and eighteenth centuries, and they have not greatly altered the original conclusions of my 1964 article. These authors, however, did confirm my suspicion that bestiary illustrations and zodiac signs tend to follow patterns and traditions, and so are less reliable than nativity scenes and depictions of farming operations. Such paintings are a valuable source of historic information regarding such items as clothing, and used with discretion I think they can provide biological evidence, too.

The polled sheep on the brass of an unknown woolman in Northleach church,

[25] Armitage and Goodall, op cit.

TABLE 5

Wool Fibre Diameter Measurements and Incidence of Hairy and Pigmented Fibres (the measurements are in microns, ie thousandths of a mm)

Fleece type		*No.*	*overall diam. range*	*Modal diam. range*	*Modal diam. mean*	*Mean diam. range*	*Mean diam. Overall mean*	*Medullated (hairy) fibres % range*	*Medullated (hairy) fibres % mean*	*Pigmented fibres % range*	*Pigmented fibres % mean*
Hairy	P	17	12–124	20–30	24.5	33.4–46.8	39.8	1–57%	22%	0–100%	35%
	A	2	12–128	54&66	60.0	52.6&54.9	53.8	19&31%	25%	7&13%	10%
Hairy med	P	39	12–100	20–40	26.3	26.4–43.3	34.5	0–51%	17%	0–100%	57%
	A	3	14–90	24–30	26.6	26.8–32.8	29.6	5–9%	7%	2–10%	5%
Gen med	P	16	10–60	20–31	24.9	24.4–33.3	29.5	0–10%	4%	1–100%	25%
	A	7	10–58	20–24	22.6	21.6–30.8	26.7	0–11%	3%	0–21%	6%
Fine gen medium	P	6	12–52	23–24	23.8	24.2–28.8	26.7	2–20%	4%	0–100%	7%
	A	1	12–56	—	16	—	23.6±9.6	—	—	—	8%
True med	P	7	10–66	26–40	32.3	31.0–38.6	33.7	0–65%	15%	0–100%	14%
	A	2	14–60	30&32	31.0	28.2&32.5	30.4	1&4%	2.5%	0&4%	2%
Short	P	4	10–50	24–30	27.0	26.0–28.9	27.6	0–46%	22%	0	0
	A	—									
Fine	P	—									
	A	1	12–36	—	18	—	21.0±4.3	—	0	—	0

P = Perth A = Aberdeen

dated about 1485, has wavy but pointed staples indicating a hairy, or rather a hairy medium, fleece, since it is shorter than the true hairy type. It is well known in wool biology that staples with a pointed tip indicate hairiness, and so I think that Armitage and Goodall were wrong to identify this as longwool. Another polled sheep on the brass of John Taylour (*c* 1490) has a fleece indicated by wavy lines, which they consider indicate long wool, whereas I have always thought that this common way of depicting wool was too generalized to indicate a particular fleece type. This sheep has a tail of medium length, which Armitage and Goodall consider has been docked. But docking usually results in a short tail, and a tail of medium length results either from breed variation or from a cross between a long-tailed sheep and one with a naturally short tail.

The Bushe brass at Northleach (1526) has several small, horned sheep shown with shorter staples, which therefore appear to be shortwools. The fleece of three of the animals is shown by short flecks which Armitage and Goodall consider indicates that they have been shorn. The tail length is either long or only of medium length, and whereas one sheep has ram's horns, those in the other animals are smaller and of a different shape, and I agree with the interpretation of Armitage and Goodall that this indicates wethers.

The sheep on the Fortey brasses (*c* 1450), also at Northleach, are large, polled animals. The wool is shown by short curls like those on a shorn longwool, and is uncannily like that of the modern Cotswold breed. Armitage and Goodall sum up the evidence from the brasses with the statement that although they indicate different types of sheep, they are unlikely to indicate regional variation since they were all made in London.

Since they consider that there is no medieval illustration of horned ewes, it is worthwhile pointing out what appears to be a horned ewe in the late sixteenth-century Bradford Table carpet in the Victoria and Albert Museum. This has a heavily-horned ram, the sex of which is confirmed by the depiction of a scrotum. There are also five

polled ewes, together with a sheep with smaller horns than the ram. Although the detail is insufficient to make one sure that this is not a wether, it was usual to run wethers in separate flocks. Again the animals are white-faced shortwools with a moderately long tail. These illustrations also give husbandry details. The shepherd shown has a pouch and carries a crook, and he runs to throw earth beyond two straying ewes in order to startle them back into the flock.

I conclude with a brief consideration of the post-medieval evolution of the longwool. The modern Cotswold breed may be quite different from the fine-woolled breed so named in the sixteenth century. It is unmistakenly of curly lustrous type, but it seems less-highly developed than other lustre longwools. The fleece is only 10 in long, whereas that of the Lincoln breed for example can exceed 13 in.

Bowden thought from the increased supply of long wool during the sixteenth and seventeenth centuries that longwoolled sheep were a direct result of improved pasture resulting from the enclosures.[26] But we have already seen that there is a limit to the length of wool that can be grown as a result of better nutrition, and in any case the lustre longwool is a different type of sheep. The biologist's interpretation of the historical evidence is therefore that the better pasture allowed larger longwoolled sheep to be kept. Enclosure also allowed the segregation of inferior animals so that selective breeding could take place.

The origin of the lustre longwool is such an intriguing biological problem that it is worthwhile mentioning one or two of the possibilities. One suggestion is that the lustre longwool originated as a mutant in the Romney type. But although a lustre mutant has been observed in the fine-woolled Merino breed in Australia, the only mutant that has been observed in the Romney, in fact in New Zealand, is a true hairy type known as the N-type or Drysdale. Another suggestion is that it could have originated through the introduction of exotic stock into native British sheep in a complicated genetic change. And this complex biological mystery provides a suitable note on which to end.

[26] P J Bowden, *The Wool Trade in Tudor and Stuart England*, 1962.

Summary

The wool in the earliest textile remains (from the Bronze Age) indicated a fleece type like that of the modern brown Soay sheep (hairy medium, and woolly-generalized medium). By the Iron Age it appears that there were black, white, and grey sheep, in addition to brown fleeces, but they were still of primitive hairy and woolly type. Roman wool remains indicate that the modern true hairy, true medium (longwool), shortwool, and fine types were evolving.

During the Middle Ages the predominant sheep type still appears to have had a hairy medium/generalized medium fleece type, the animals perhaps being comparable with the surviving short-tailed and vari-coloured Orkney and Shetland breeds in which most of the ewes lack horns. Skeletal remains support this conclusion, but virtually no illustrations of short-tailed sheep have been recorded. Records and the wool in cloth remains confirm the persistence of some coloured sheep, although illustrations indicate only the occasional pigmented animal. In most illustrations the only horned sheep appear to be rams (or at least wethers) whereas skeletal evidence suggests two other types in addition, either horned in both sexes, or polled in both sexes. This, and other anomalies in the evidence, can probably be explained by the greater variability of the animals in the past, coupled with evolution towards new types as shown by the medium and shortwool fleece remains.