(Following on from Concepts A) Objective selection

There are a number of measurable characteristics which can form the basis of a breeding objective and a selection program. While you might think that this is a really modern approach to animal breeding it is not without its problems. In theory, it should be possible to select a number of key characters (**traits**) which objectively define animal quality and profitability, but it is not as simple as it may sound. Indeed, there are some serious problems which need to be considered. These revolve around adverse or antagonistic **correlated responses** and coming up with a **model/ equation/ algorithm** which delivers the desired outcome.

While we might discuss the desired characters our breeding program might be aimed at, it is another thing to achieve them by appropriate selection. It is also rather problematical that we might be able to measure the outcomes and prove that the program has achieved its goals. In a modern world, we should be able to demonstrate success or favourable outcomes for our work. This might be an advance over subjective or visual quality based programs which may well have difficulty in defining favourable outcomes since they may well be subjective – and how do you measure such outcomes?

Breeding objectives expressed in terms of measurable characteristics requires knowledge of the current herd and appreciation of where you want the herd to go. The difficulty is that traits (the characters you want to measure and select for or against) are genetically correlated. That is, selecting for say, fleece weight, will cause a change in fibre diameter – the extra keratin in fibre has to go somewhere - into thicker fibres, longer fibres or more fibres. While there may well be logical ideas as to which might happen, it requires experimentation to determine the actual outcome. Such experiments are rare and require large resources including time. There are correlations between many traits so correlated outcomes can depend on the selection pressures for each of the traits in the selection process. Nature does not necessarily follow routes which you think are logical.

Fortunately, we have some idea about correlations. **Fibre diameter** tends to be related to **Body weight**, **Fleece weight** and **Staple length** in the progeny. **Fleece weight** tends to be related to **Fibre diameter** in the progeny. **Body weight** tends to be related to **Fertility** in the progeny. The problem is that we want low fibre diameter, long staples and high fleece weights. Larger animals might also be of advantage for fertility and carcase value.

> *Note on **convention**. Geneticists have the convention that they use a capitol letter for **traits** which they might measure and select for.*

In the 1990s, Dr **Gretha Snyman** studied a large Angora herd in South Africa and came up with a selection index which used Body weight, Fleece weight and Fibre diameter. This became known in Australia as the **South African Fineness Index** (SAFI) and has been used in a selection program for both bucks and does at Cudal (see Chapter 10) and in the Buck Trials (see Chapter 9). The outcomes have been published in the Mohair News in four papers under the title **Bang for Bucks**. The index claimed to increase Body weight, hold Fleece weight steady and reduce Fibre diameter. The Cudal stud program found that the index increased Body weight and reduced Fibre Diameter but at the expense of both Fleece weight and Length.

Here is an interesting point. In combination, selection traits may well have greater or less effect than when estimated singly. It would seem that Fibre diameter is very powerful and while the index countered the negative effects of Fibre diameter on Body weight, it could not overcome the negative effects on Fleece weight (or Staple length). The result was a 20% drop in Fleece value (third shearing) over 7 years. This finding emphasised the apparent fact that the premium for finer mohair was not sufficient to overcome the loss of fleece production expressed as Fleece weight. One might ask; why should it? The market works on economic factors, not biological ones.

So, it seems that the general industry objective of finer mohair might not produce the most profitable outcome. Of course, there are a lot of assumptions made in the analysis and the experimental outcome might not hold across the industry or over a long-time period, so some care is needed. However, the warnings are there. Don't go too hard on Fibre Diameter!

Perhaps we could use **Fleece value** as an index. This involves a lot of work and makes even more assumptions. The possibility of unintended consequences or changing markets must be considered. A new index instead of the SAFI using physical measures might be considered. There are four components to consider.

1. **The Heritability.** This is the proportion of any selection which appears in the offspring. Genetic studies can deduce this measure either by experimental means (select and measure gains) or by statistical means from applying animal "models" to vast amounts of data collected over a number of generations. Most models require at least 40 sires and at least 20 progeny, as well as a number of drops to be accurate.

   Heritability values can be considered:
   - Low (0-0.2) where little gains can be made. Eg. Fertility,
   - Medium (0.2 – 0.4) where better gains are possible. Eg. Fibre Diameter and Fleece weight,
   - High (>0.4) when gains are relatively easy to make. Eg. Body weight.

2. **The Selection Differential.** This is the difference between the original group average and the average of the selected group. This is a trade-off between pressure and numbers. The greater the pressure the fewer the number of selected animals. Another factor in this regard is the amount of variation available. Highly variable characters allow larger differentials and potentially more progress.

3. **Genetic Correlations.** As discussed above, this is the relationship between the selection trait and other characters in the progeny. These are not that favourable for Angora goats. While the correlations may be estimated by genetic studies it is perhaps not that simple. Hopefully, genetic studies still use large populations and the correlations will be accurate (truly reflect the real situation and have a low standard error). The correlation reflects the relationship but not necessarily the strength of the response. This might be seen as similar to the selection differential in that some correlated responses might produce big effects (eg Fibre Diameter on Fleece weight) and others, less so (Eg. Body weight on Fertility).

4. **Random chance.** This is something of a wild card. The assumption is that large populations are involved and therefore variation is able to be expressed. Unfortunately, in farm sized flocks, random factors apply (though perhaps they get smaller in larger flocks). It may well be that in say 40 bucks born, none have the exact group of characteristics required. In very small flocks of say 5 bucks it is quite likely that none even come close to having the desired combinations. Maybe this explains why show success is not necessarily continued over time. Buck drops of 80 to 100 may be necessary to have a good chance of achieving repeated success in finding superior animals. But then, they need to be found and this requires considerable and accurate effort and results in a lot of unsuccessful candidates. At least as important are efforts to find superior females and cull undesirable stock from each drop.

In developing any new **Index,** all four components are important and while animal models may give an idea, experimental efforts may be required in particular situations.

Table 1. Complete set of measurements and classing of the 2014 drop Cudal Bucks – 3rd shearing

TAG	Body Weight	Fleece Weight	Yield	Length	Diameter	SD	CV	Spin Fine	Define1	Define2	Define3	Comment	SAFI	ABTI
K601	69.5	3.45	85.00	9.99	27.3	8.40	30.8	29.2	106	2	10	LMBFH	123.003	164.873
K602	87	4.27	87.00	12.71	29.5	7.00	23.7	29.4	111	3	11	LMBFFH	303.503	189.773
K604	78.5	3.90	89.00	14.53	29.5	9.90	33.6	32.5	66	3	2	LMAFFH	191.403	128.673
K605	59	4.04	89.00	11.01	24.8	6.50	26.2	25.3	106	0	11	LBFFH	46.403	208.773
K608	83	4.54	87.00	13.62	31.8	8.60	27.0	32.7	153	6	16	LAFFH	199.803	57.1727
K610	66	3.54	87.00	13.62	29.8	7.30	24.5	29.9	131	6	6	W LMAFFH	20.403	25.7727
K613	80.5	5.72	87.00	14.53	33.9	9.70	28.6	35.5	102	6	4	LMAFH	124.203	-51.7273
K618	71.5	3.72	87.00	12.71	30.8	7.90	25.6	31.3	118	4	17	LMAFH	69.703	19.0727
K628	59	3.81	87.00	14.53	31.6	7.10	22.5	31.2	132	8	4	LMAFFH	-110.797	-104.827
K633	62.5	4.18	87.00	14.53	32.7	7.00	21.4	31.9	161	4	6	LMAFH	-88.997	-129.327
K636	56.5	4.00	87.00	14.53	29.9	7.90	26.4	30.6	75	4	0	W LMAAFH	-103.397	-43.3273
K639	46	3.27	87.00	12.71	27.1	6.40	23.6	27.0	56	2	2	W LMAYG	-178.697	8.77273
K640	70.5	4.72	87.00	14.53	33.8	7.50	22.2	33.2	63	5	3	LAFFH	-7.89697	-121.527
K641	74.5	4.36	87.00	10.90	33.3	9.40	28.2	34.7	295	11	25	LAFH	54.003	-72.1273
K642	60	3.81	87.00	14.53	30.0	8.40	28.0	31.2	75	4	1	MAYG	-60.997	-24.2273
K656	67	4.81	87.00	13.62	31.8	9.70	30.5	33.9	55	3	10	LAFH	-6.99697	-53.6273
K661	80.5	4.27	87.00	12.71	30.1	10.20	33.9	33.3	187	5	14	LMAFFH	205.203	116.673
K662	75	4.54	87.00	14.53	33.2	8.60	25.9	33.8	131	4	10	W LAFH	63.603	-63.2273
K674	62.5	3.72	87.00	13.62	29.6	6.80	23.0	29.3	88	3	7	W LMAFFH	-19.697	11.2727
K675	54	3.54	87.00	12.71	26.6	6.10	22.9	26.3	66	2	2	LAYG	-61.997	88.9727
K680	48.5	2.81	89.00	12.71	29.1	6.10	21.0	28.3	69	1	1	LAYG	-194.197	-67.7273
K681	54	4.18	85.00	11.80	30.9	8.00	25.9	31.5	137	9	17	LMBFH	-158.097	-106.027
K685	**75**	**3.22**	**85.00**	**13.24**	**29.0**	**8.40**	**29.0**	**30.4**	**95**	**7**	**2**	**W LMAYG**	**153.803**	**123.573**
K686	62.5	3.45	87.00	13.62	29.1	6.80	23.4	28.9	56	3	1	W LMAYG	-9.39697	33.0727
K691	67.5	4.49	85.00	12.84	30.7	8.80	28.7	32.1	146	14	5	W LAYG	23.203	-1.12727
K692	59.5	4.27	83.00	13.62	28.9	6.60	22.8	28.6	114	9	5	MAYG	-40.197	24.8727
K695	62.5	4.45	83.00	14.53	32.0	8.70	27.2	33.0	230	3	7	MAFFH	-71.697	-95.9273
K700	**70.5**	**3.78**	**87.00**	**15.13**	**28.8**	**9.20**	**31.9**	**31.2**	**175**	**7**	**10**	**W LMSAYG**	**102.303**	**103.673**
K714	55	3.54	85.00	14.53	28.8	6.10	21.2	28.1	61	3	1	MAYG	-99.597	-5.22727
K728	55	3.18	90.00	15.44	31.2	6.80	21.8	30.6	58	1	5	LAFH	-156.397	-117.227
K730	59.5	4.36	87.00	14.53	31.7	8.40	26.5	32.5	156	8	9	LMBFFH	-104.197	-103.527
K745	68.5	4.18	85.00	14.53	29.6	9.10	30.7	31.6	181	5	11	LMAYG	60.303	55.2727
K748	47.5	3.72	85.00	13.62	31.9	8.60	27.0	32.8	156	6	6	LMAYG	-267.597	-199.527
Mean	**65.11**	**4.00**	**86.61**	**13.52**	**30.27**	**7.94**	**26.2**	**31.0**	**118.51**	**4.87**	**7.30**	-	-	-
SD	**10.52**	**0.57**	**1.54**	**1.27**	**2.1**	**1.21**	-	-	**55.49**	**3.04**	**5.81**			

Complete set of data for 2014 Cudal bucks, 3rd shearing, extracted from the Mohair Australia Herd-book Performance module. Note, the 3 "user defined" columns are numbers of Total Medullation, Kemp and Objectionable Medullation from the Micron Man OFDA 100 machine counting, 3000 fibres. "W" in the Comment field indicates Weaving type as well as class. ABTI is a buck trial index favouring diameter at expense of body weight. The two blue rows indicate bucks retained for breeding in 2016.

Rethinking quality.

Looking from the textile point of view quality is what buyers are prepared to pay for. It's not that simple but still it is still worth looking at just what mohair is used for; what the mills are prepared to pay; and how the breeding and marketing systems can try to match these requirements. The weaving mohair experiment is extremely instructive. For the first time, quality has been directly defined by the product user - not by either the auction buyers or the breeders.

Orderly marketing (see chapter 6) used to be thought of as the holy grail of any primary industry. The concept involved getting all the product marketed under one system where buyers came together to compete against each other to achieve the best price for the producer. Perhaps this objective was true when the market was disorderly. There was a time for mohair in South Africa in the mid 1960's when all mohair was purchased by trade representatives by private treaty. Since

there was only poor information transfer, each producer had to decide his acceptable price and try and either talk the buyer round or accept what was offered. Kahl Kritzinger and others in South Africa sought to develop an **auction system** which allowed all growers to present their fibre in one place at one time and allow buying firms and mills to bid on the lines presented. So, in 1971 the **South African Mohair and Wool Exchange** came into being. It was not compulsory, and a proportion of the clip was (and still is) purchased directly from growers.

The Wool Industry in Australia was better organised and while there were **private buyers** operating the majority of wool was sold by auction organised by the big **wool brokers**. There were still a lot of unknowns when it came to valuing wool and buyers protected their skills vigorously claiming to be the sole arbiter of "real" wool value. Clearly there was a lot of "noise" in the system and what with pastoralists, their agents, independent wool (and animal) classers, Technical and Further Education **(TAFE)** experts and the newly developing scientific group of wool experts, there was considerable confusion and protectionism when it came to discussing ways to improve the wool selling process. It still came down to some trusted individuals working in the shearing shed to define the best way to handle huge numbers of fleeces. Classing methods centred on the **Bradford system** of "like with like" based on counts (theoretically the number of 560-yard hanks which could be spun from a pound of clean top) based on crimp frequency as an estimator of fineness. Average Merino wool was given a count of 64s and this was later equated with a 21micron wool. Finer wools had a higher count.

By 1972, wool scientists at Universities and Departments of Agriculture had developed wool testing to a point where sale lots of 3 bales (450kg+) could be tested accurately, and together with a classing strategy referred to as **Objective Clip Preparation (OCP)** and with **presale testing,** was introduced to the **auction sale** process arranged by wool brokers. The **Australian Wool Testing Authority (AWTA)** was established to carry out the testing and certification process.

Pre-sale certification was not without its critics – especially from buying houses (which obviously felt threatened) and traditional growers and classers. The testing was voluntary and fine wool growers were advised not to test their wool (because, though not openly discussed, much high-count wool was not as fine as believed, just slower growing and possibly more sound because of it). Fine wool buyers and mills continued to believe that fineness was something they knew about and a measured micron caused these "not so fine" wools to be discounted. Yield, VM, scoured colour and Length and Strength measurement was made available.

So, began a decade or more of debate about testing; what it meant, how accurate it was and what might happen if the wool failed to perform or achieved different test result later in processing (note that many lots could be placed together for processing and given a combined test certificate). Prices were set all the way down to intervals of 0.1 of a micron which was, in practical terms, ridiculous.

Orderly marketing of Mohair. In the early 1970's centralised mohair auctions were established in South Africa and a few people, like me, were wondering about the applications of measurement and even pre-sale testing for mohair. Quite obviously the buyers were not amused since it challenged their power and ability to dictate "quality".

Of course, the fineness issue for mohair is more serious because animals get stronger (broader or courser) with age, at least to the 5th shearing. Shearing whole flocks then require the classer to make many decisions on the fineness of individual (or parts of) fleeces.

In practice, a shed may have almost equal quantities of AKID, BKID, AYG, BYG with larger amounts of BFFH from adults and lesser amounts of FK and FH as well as KIDSTN, STN, HSTN, CK, CYG, CFH, FHK,

COT, KV and FHV - all created by visual assessment. Some could add “super” lines. Because lines were made up from different mobs and different aged animals all pressing had to wait till the end of shearing and so sheds quickly became rather congested.

Figure 16. Janet Leigh (Phezulu/Topbok) examining binned fleece before pressing

Figure 17. Mark Gillgren (NZ shearer) with some of the Cudal

The **Bradford philosophy** “like with like – it processes the way it looks” presents the mohair classer with a problem because the other side to the advice is that “keep age groups separate – KID from kids is not the same as KID from young goats or adults etc”. This advice seems to have turned out to be rather prophetic but at the time was impractical and not regarded as necessary. Obviously, there was not only confusion but also some conflict in the visual approach. Clearly, there were only a limited number of lines which were practical in a **shed**, or in a **bale**, or in a **broker’s warehouse**, or even **lots** in a sale.

The graph below demonstrates the age effect on classed lines. While error bars have not been given, the trends are obvious. Within visual types, there is an age effect with micron increasing by as much as 3 microns per shearing. Perhaps it is not as bad as it looks within a single shearing shed because adjacent shearing numbers don’t fall in the same (summer vs winter) shearing but there are issues

with YG and FFH for at the winter shearing (2 and 4) and the summer shearing (3 and 5). With a single age group (particularly at shearing 2 and 3), differences between classes may not be as great as believed. Incidentally, this is what **OCP** was all about in wool classing. Classers tend to make too finer distinctions based on crimp and count.

The explanation might well be "**no, mohair does not process as it looks, and it doesn't test as it looks across age groups but it probably processes like it measures**". The stage is set for a serious adoption of **EGT (Every Goat Tested)** at least across the first 4 shearings. (see below)

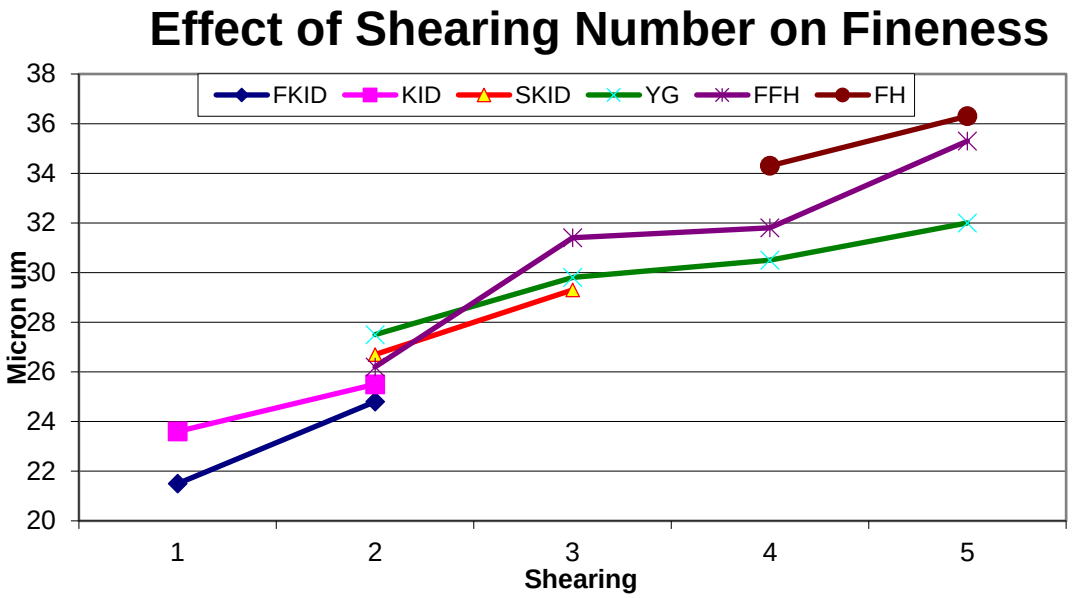

Figure 18. The key argument for resolving issues of visual classing. Age is very important, and classes made from one age group (shearing number) are different from the same description from another age group. Indeed, there is an argument stating that you could all the fleeces from one age group together despite its appearance, and not change the micron.

The situation becomes considerably more complicated in the **brokers warehouse** particularly for mohair which is almost all **bulk classed** (Pooled). In this case it is possible that summer and winter shorn mohair is mixed (though perhaps not that often). But still mohair from different properties and different climates is subject to bulking to make saleable lots. Likewise, in the **buyer's (or mills) warehouse,** lots are combined on visual characters. In **wool marketing**, much of the fibre is sold in growers lots thereby getting around some of the problems of visual appraisal between clips. OCP and pre-sale testing helps standardise the fibre types but it can be seen that it is not surprising that some buyers and mills have problems with accepting that lots with the same tests don't necessarily look the same (or the reverse).

Does it matter? There are several issues here. The most obvious is that the market should accurately describe its products so that all producers can be assured of a fair reward for their efforts. This was the role that the pool classer took from the buyer under pooling. It became the grower's representative who made the quality call on classing. This was often hard for both the wool grower and the mohair buyers to accept when wool growers looked at the small clip size and many lines required for bulking mohair. Indeed, the wool auction system probably grew out of a distrust of anyone other than the wool buyer placing a value on his fibre. But, for mohair it was a necessity, though one might argue that broader mohair is mostly processed with a wider tolerance, and maybe we don't need to be as pedantic with its classing.

But, yes, it does matter when it comes to high priced premium fibre. This fibre is required for specialist processing where limits are pushed and while we hoped that we had enough lines to satisfy buyers and reward growers for their efforts, when it came to worsted manufacturers for special superior lines, the pooling/bulk classing based on visual classing largely failed but maybe it has not been recognised yet.

Try harder. Eventually it was realised that "super" styled lines (created visually) were discounted because they were invariably stronger than the ordinary lines of the same fineness description.

So, what do you do when a grower delivers a set of spectacular super styled lines which each test 4 microns too strong for their appearance and grower's description? You put them in as special grower's lines and watch the **buyers pay for micron, not appearance**. In short, there is a very real limit to a visual system of quality assessment. Measurement can be a two-edged sword.

Every Goat Tested (EGT). Another Holy Grail of classing was the possibility of a machine to test fineness in the shearing shed during shearing. While at least one hand-held machine was developed, the need for accuracy meant that at least 400 fibres needed to be measured and this was beyond the capacity of hand held machines which could only manage about 20 fibres at a time. Other methods are required if measurement at the single fleece level are to be used in classing. The **OFDA 2000** was developed which scanned the length of a staple teased out on a frame. This machine was relatively expensive but still within most growers' price range - but only a few were purchased. Another method which was implemented, particularly to support ram sales, was the mid side sampling and testing by commercial fibre testers in their labs. Both **Laserscan** and **OFDA 100** machines were available. A later application of the Laserscan was the portable version which micro cored whole fleeces, then scoured and tested the cores. (see photo at the end of Chapter 4).

In any event the application was **EGT**. Instead of visual appraisal, a test could be used to place fleeces of mohair.

In 2008, I used a portable Laserscan machine to create sale lots from 1200 finer fleeces. The project was termed **High Specification Mohair Classing** and sought to reduce variation in sale lines by using whole fleece measurement to place mohair with similar mean diameter together. As part of the project I measured mid side samples and compared them to whole fleece tests. I also looked at fleeces (termed renegades) which appeared to test dramatically differently from visual appearance. This claim of "I don't believe the test" (by both exhibitors and judges) is not uncommon when show fleeces are tested for judges.

There were 4 key results.

- A reduction in measured fibre variation (CVD) was achieved,
- Mid side tests were some 1.5um finer than whole fleece tests,
- renegade fleeces proved to have repeatable fibre diameters and
- at auction, buyers were only slightly impressed with the lines and paid only marginally higher prices for the lines which failed to cover the cost of testing each fleece.

Buyers claimed that the volume of EGT lines was insufficient to provide enough fibre for processing and so required bulking with other lots anyway. This is a significant claim which has been repeated and belies the behaviour in South African sales of paying premiums for "well-prepared" grower lots. This issue will be discussed further.

I come again to the **Australian Weaving Mohair Initiative** and the **"Pure Australian Mohair"** project. Not only is this an EGT method but it is combined with animal inspection and direct marketing to

high end processors. Undoubtedly GT Ferreira, was and is, the inspiration and mover for this program. The key issues are the direct contact with Italian spinners, the inspection concept based on silkiness of face and ears being correlated with low medullation, the EGT application, and the supervision of lot building which has enabled a contract price which is considerable higher than the auction price.

It must to be asked why a mill would guarantee and pay such prices? This is not a simple situation. Obviously direct contact and guarantees of delivery are important. There is an argument (unproven except by the mills' approval) that the resultant fibre is better performed. Perhaps it is the combination of claims and communication which has secured the deal. This is revolutionary when compared to the "orderly marketing" and uniform classing claims of the now traditional market.

This is the result of rethinking the marketing process. All growers can take part but it requires a compliance with inspection and preparation techniques. It requires testing either after bagging of fleeces or prior to shearing by means of mid side sampling, and then the delivery of bagged fleeces with test results. It requires careful classing and compliance with length specification. It is also of interest that fibre shorter than the 12.5cm length and at the broader end of the range is still acceptable for knitting types at higher prices than offered at open auction.

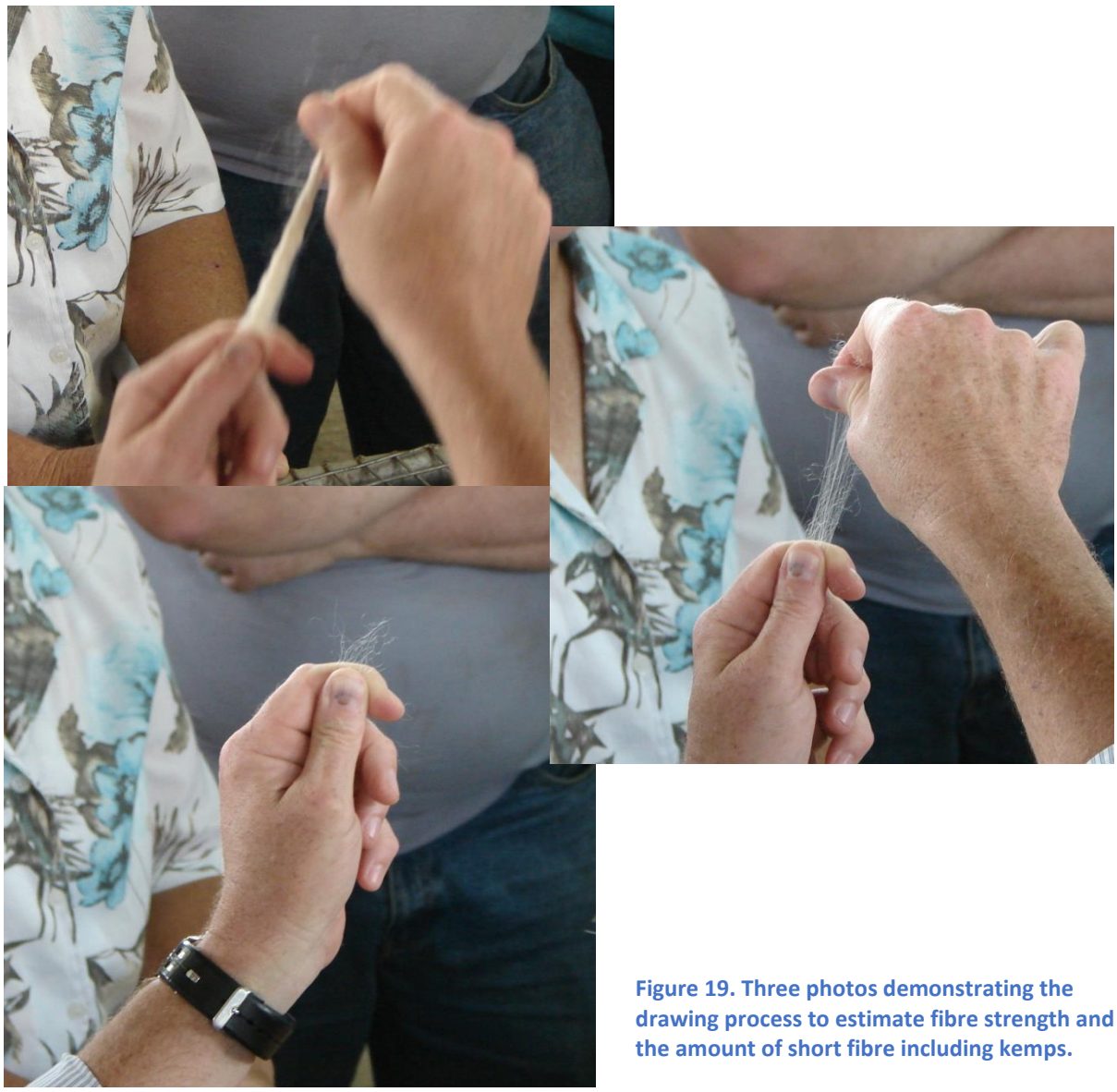

Figure 19. Three photos demonstrating the drawing process to estimate fibre strength and the amount of short fibre including kemps.

But wait, there's more. Weaving mohair is not just a restricted mean diameter and therefore a low CVD. And it's more than a 12.5cm plus staple length. It's also noted for uniform skirting of faults, its good style and its **high combing yield**. This last characteristic is certainly important. The photos above illustrate the drawing process to assess fibre length, soundness and the residual kemp and short fibre. This is part of the high combing yield objective was required to impress **worsted spinning mills**.

Combing yield combines the waist from scouring and the amount of short fibre which is lost as **noils** when combing. These are the new quality characteristics required for weaving mohair production. So, we may have to go back to

- single fleece bagging possibly from washed animals
- the efforts of the shearing shed classer both in skirting and improving length compliance
- fault removal
- the assessment of short fibre content (or better, long fibre content).

Auction vs Private Treaty vs Contract Production

There are endless discussions between growers, brokers and buyers when it comes to organising the sale of mohair. It is worth pointing out that any system which is developed can be perverted in one way or another to the advantage of one side or the other. **Public auctions** can be short circuited by **private treaty** and **contract production** (weaving mohair in this case) can be threatened by other buyers who would like the chance to make offers on the special lines. Contract production may be overtaken by a spike in auction prices and **private treaty** may suffer from poor market inelegance. Perhaps, most importantly, auctions (especially in Australia) suffer from lack of competition for lots of special merit only required by one mill.

Quality is not unidimensional, and neither is demand, so there is a need for continual revision and genuine contact between marketer organisers and the mills to agree on quality features and assist in the supply of the most appropriate fibre at the best possible price. The benefits of this type of contact have been demonstrated by the results achieved so far by the weaving mohair initiative.

Is character and style what it's all about?

Perhaps this is a heresy but just what does character and style mean? Is it really that important?

Over nearly 120 years, Angora goats have been shown for their mohair and judges have opened their fleeces by inserting their fingers and lifting the staples to look at the skin and the structure of the staples. It is undoubtedly true that staple structure is related to fineness and opening the fleece at the neck, mid side, rump and down the hind leg can give an indication of fineness of the fleece and evenness of the character over the body of the animal.

BUT, judges seem to be obsessed with the clarity of the locks and the combination of **style (twist) and character (crimp**). Up until about 1940, Texan Angoras were classified as **B and C type** and show classes were divided on this basis ie. Flat Locked B type and ringlet C type. The practice was discontinued because it could not be shown that the differences were meaningful. Indeed, many animals in the Sonora Buck trial were classified as mixed type. The Texan imports to Australia had a mixture of lock types but Australian breeders soon decided that the **ringlet type** was preferable. However, there has not been any clear evidence that type is related to performance. Comments have been made that one type or the other was longer - ringlets fall longer but flat locks have fibre in waves under some straight fibres. There were comments about grease content but these comments appeared to be confused by the source and breeding of individual animals.

Figure 20. Two photos of opened fleece, one good but the other, better

There is little doubt that the ringlet type is universally favoured in Australia and both breeding and show preparation has emphasised this character. By itself, or in conjunction with breeding for fineness, ringleted mohair now appears finer and it is uncommon to find **flat locked** (or character based) fleeces on show animals.

Why has the ringlet style been favoured? It is a general belief that ringleted mohair is finer. It would also seem that breeders and judges are attracted by the **aesthetic appearance** of open, free flowing fine locks. **Over-twisted locks**, or mohair without character or a **twist reversal,** are of concern because they are very difficult to open during processing and lock into carding drums. There is good reason to move away from this characteristic.

Figure 21. "Balanced" character and style vs over-twisted (undesirable) staples

As with the SRS classification system, there is a belief that **tertiary fibre structure** is important to mohair quality. First, we have single fibres growing from the skin, then we have what SRS advocates refer to as "**coiling and bundling**" which is assumed to be how fibres grow from single follicle groups and behave in ways which might relate to follicle group layout, and finally we have **flat locks** or **ringlets**. It might be that **flat locks** result from long ribbons of follicle groups since I have observed "**penta-groups**" and even longer patterns of follicle groups. Keen observers have identified that staples can be character based (flat) or style based (ringlets). It is argued that extremes of either result in flat layers in the fleece, or rope like spirals of fibre – both, it is claimed, cause problems in carding with tangles of fibre (causing fibre breakage) or tight coils, often with greasy fibre in the centre, being pulled to the bed of the carding material and not being removed by the "doffer".

There is another piece to this tertiary structure seen in ringlets. I have mentioned it before and it has been questioned. I refer to **twist reversal**. Why it should be criticised I cannot tell because anyone can see it in ringleted mohair. If you take a ringlet and pull it from each end, parts of the staple uncurl. At one or two places along the staple, the twist turns around so that the fibres do not coil into a tight rope. Such staples open easily compared to mohair with excessive style (twist).

If we concede that there might be some residual lock structure remaining in the yarn from the extreme examples of lock structure after scouring, we might then ask, "just what is the issue with less extreme structures and do they remain after scoring or even, spinning"? The answer might be "yes" for home spinners who wash individual fleeces, but manufacturers have "**willies**" or "**openers**" or "**pickers**" to break up staples and remove coarse vegetable matter before scouring and drying. Yes, there is still some structure in the scoured mohair but carding (and combing) is aimed at producing a parallel array of straight mohair fibres and there is nothing left of the tertiary structure by this stage. Judges might think about this when attributing quality differences to marginally different staple structures.

If there was a characteristic in raw mohair which would favour a structure, it might be expressed in terms of open locks, not tight, ringleted staples. So, all this effort to breed ringlets and prepare animals for shows in the belief that "ringlets equal quality" might well be a huge distraction or just a side-tracking fad. The argument might come down to a preference for open staples with free fibres vs stylish tight locks. No doubt the processors are used to dealing with these differences.