SAWTRI BULLETIN

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SOUTH AFRICAN
WOOL AND TEXTILE RESEARCH INSTITUTE
OF THE CSIR

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INSTITUTE NEWS

Gubb & Inggs (Pty) Ltd Donate R10 000 towards Textile Training

Gubb & Inggs, leading wool and mohair scourers, carbonisers and combers, have donated R10 000 towards SAWTRI's textile training programme for the textile industry. This was announced jointly by Mr Danie van Deemter, Executive Director of the Uitenhage-based company, and Dr Derek Turpie, Chief Director of SAWTRI.

During extensive discussions between SAWTRI and the textile industry earlier this year, an urgent and common need was identified for short textile training courses to be established in specialised fields for personnel at supervisory level. In pursuance of this need, SAWTRI, in collaboration with the Eastcape Training Centre (ETC), which incorporates the Emthonjeni Group Training Centre, is currently structuring training courses in the various textile disciplines for supervisory management.

Gubb & Inggs have demonstrated their commitment to textile training by making this generous donation, and following negotiations between these two organisations, it has been agreed that this amount will be directed towards establishing courses in the fields of scouring, carbonising, carding and combing. It is expected that these modules of the training programme will be operational by April 1988.

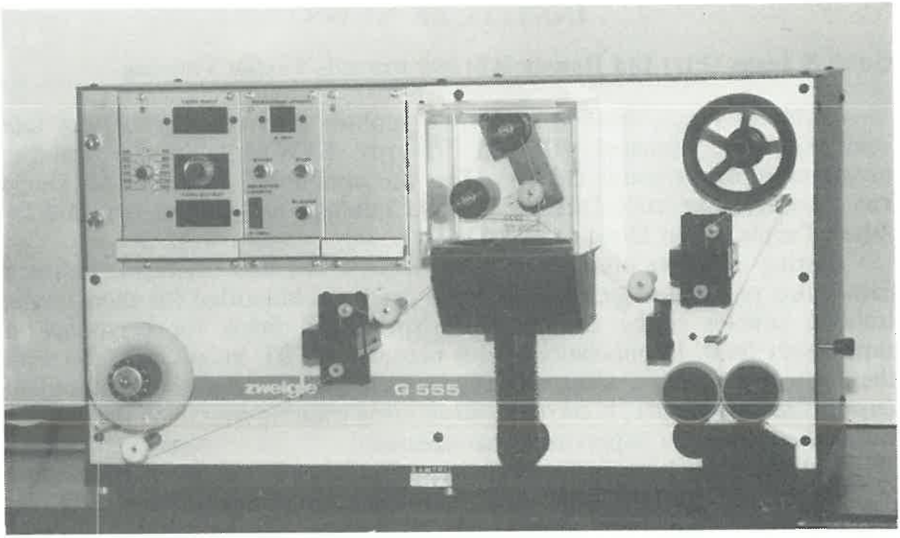
New Research Department at SAWTRI

In the light of the recent interest shown by industry with regard to research in the field of textile effluent, a Department of Textile Effluent Treatment has been formed in August under Dr T E Mozes as Departmental Head.

This department will carry out research on wool scouring effluent treatment, but also in other areas such as desizing, bleaching, mercerising, dyeing and finishing.

Predicting Yarn Nepping and Linting Characteristics

SAWTRI has recently acquired a Zweigle Staff Tester (G555) which allows the running characteristics of yarns during weaving or knitting to be estimated in terms of lint shedding, nep formation and abrasion damage. This instrument simulates yarn-to-yarn and yarn-to-metal abrasion which takes place during fabric manufacturing and then measures the lint (fibrous fly) and neps generated in the process. This testing instrument can be used for predicting certain performance characteristics of a yarn during knitting and weaving, and will be used both for research purposes and to provide a service to industry by assessing commercial yarns in terms of the above-mentioned characteristics.



SAWTRI's newly-acquired Zweigle Staff Tester (G555).

Two SAWTRI staff members, Dr N J J van Rensburg and Mr A N Douglas, were presented with long-service awards during a special function held recently. Seen from left to right: Dr N J J van Rensburg; Dr D W F Turpie, Chief Director of SAWTRI; Dr C F Garbers, President of the CSIR and Mr A N Douglas.

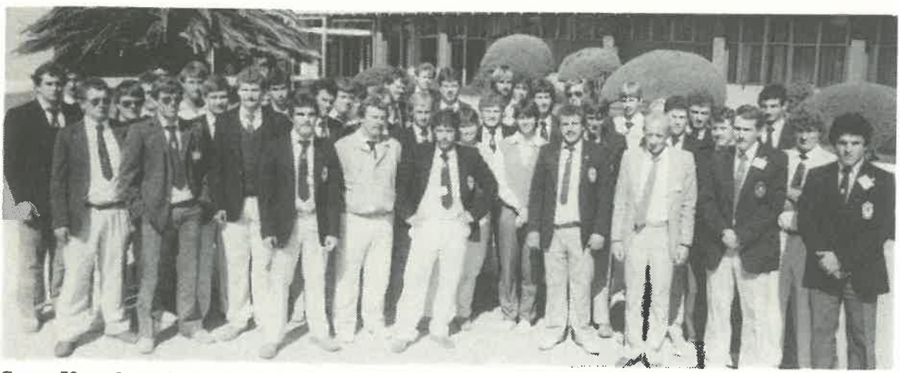
Long-service Awards presented to two SAWTRI Staff Members

Two members of SAWTRI staff, Dr N J J van Rensburg and Mr A N Douglas, were awarded gold watches for 25 years of service in the CSIR during a ceremony held recently at the Institute. The presentations were made by Dr C F Garbers, President of the CSIR.

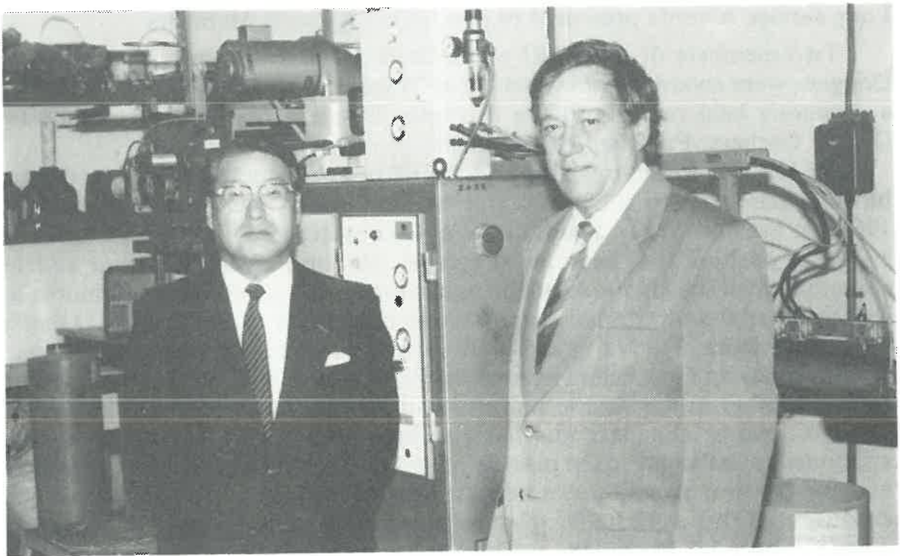
Dr Nic van Rensburg joined SAWTRI in 1962 as a researcher, and after having been awarded a D.Sc. degree by the Orange Free State University in 1966, he became Group Leader of Wet Processing and Textile Chemistry in 1974, the position that he holds at present. Dr van Rensburg, author and/or co-author of some eighty scientific publications, has acted as co-promotor as well as internal and external examiner to a number of M.Sc, and Ph.D theses in textile science. He is a member of various professional textile bodies and organisations and has been awarded the Service Medal of the Textile Institute for his services to the Textile Industry and the Textile Institute in particular.

Mr Andrew Douglas, who has also been with SAWTRI since 1962, was appointed in the stores in the pioneering days of the Institute in Grahamstown, and for the next twenty years he was intimately involved in the growth and expansion of this department from its humble beginnings when SAWTRI had a staff of only 18. During the period 1982 — 1986 Mr Douglas was a member of the Short Staple Processing Department at SAWTRI before returning to his present position in the stores. Mr Douglas, holder of a number of first-aid qualifications, is a member of the SAWTRI First Aid Team and is a candidate Emergency Medical Assistant.

The SAWTRI Executive extend their appreciation and gratitude towards both gentlemen who have served the Institute so well in their respective capacities, and wish them a fruitful and happy further association with SAWTRI and the CSIR.



Some 50 students from the Grootfontein Agricultural College, Middelburg, C.P., accompanied by their lecturers, photographed together before being taken on a conducted tour through the Institute.



Photographed together with Dr D W F Turpie, is Mr Hiroki Itoh, Wool Sales Manager of Toyobo Co. Ltd., Osaka, Japan, who paid a visit to the Institute to familiarize himself with the processing and research facilities at SAWTRI.

Captured in jovial mood is a group of third year domestic science students from the University of the Orange Free State, seen together with their lecturers and a representative of the Wool Testing Buro, Mr Johan Coetzer.

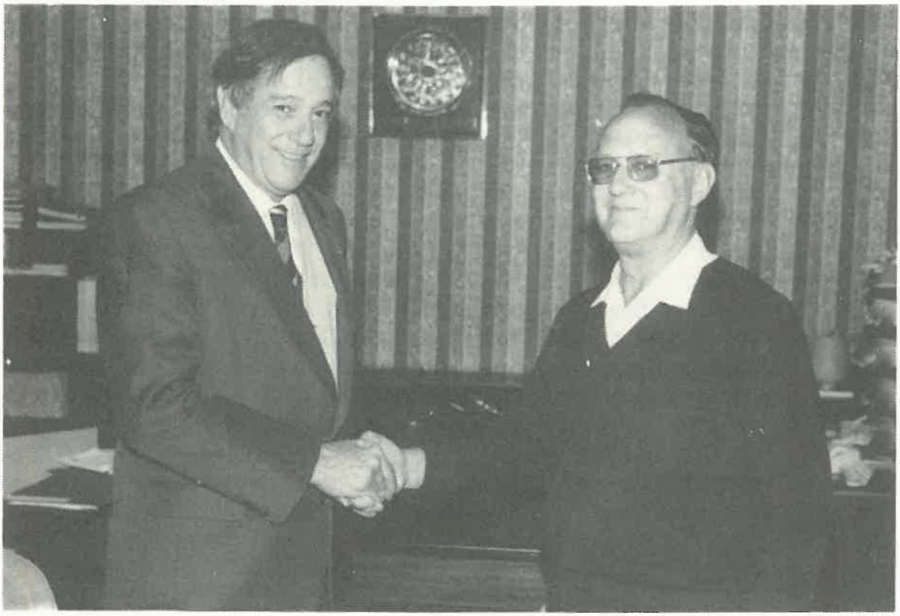
Visitors to SAWTRI

Some 20 third year domestic science students from the University of the Orange Free State were received at the Institute early in July. They were informed about the activities of SAWTRI through a slide show and a guided tour of the various processing departments. A group of 50 students from the Grootfontein Agricultural College, accompanied by 3 lecturers, visited the Institute in September to familiarize themselves with SAWTRI's research and processing facilities. Mr Hiroki Itoh, Manager of the Wool Sales Division of Toyobo Co. Ltd., Osaka, Japan, called at the Institute, accompanied by Mr S Kawashima, a supplier of mohair to Toyobo. They were briefed on some areas of research being conducted at SAWTRI and were shown around the Institute.

Staff News

Mr O C Oberem has been appointed as Chief Technical Assistant in the Scouring Department.

Mr A R Povey, appointed as Fitter and Turner in 1970, has retired recently. Dick, as he was affectionately known by all, will be remembered for the important role he has played as Workshop Superintendent in the maintenance of vehicles and equipment.



Mr A R Povey, Workshop Superintendent, taking leave from Dr D W F Turpie on the day of his retirement.

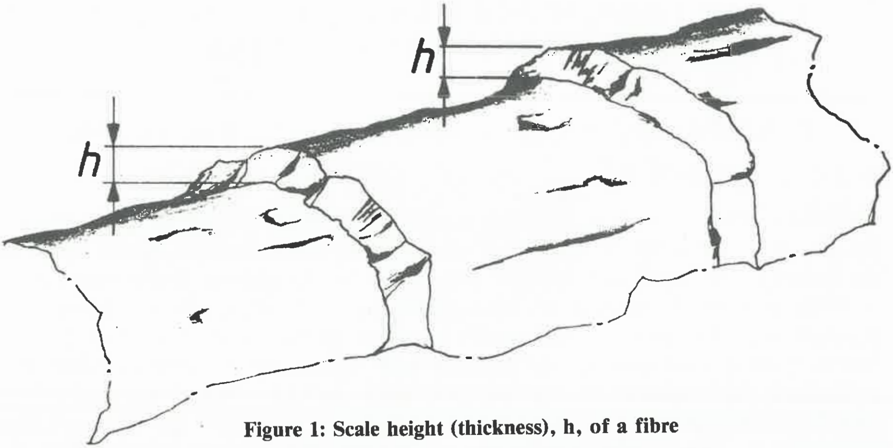


Figure 1: Scale height (thickness), h, of a fibre

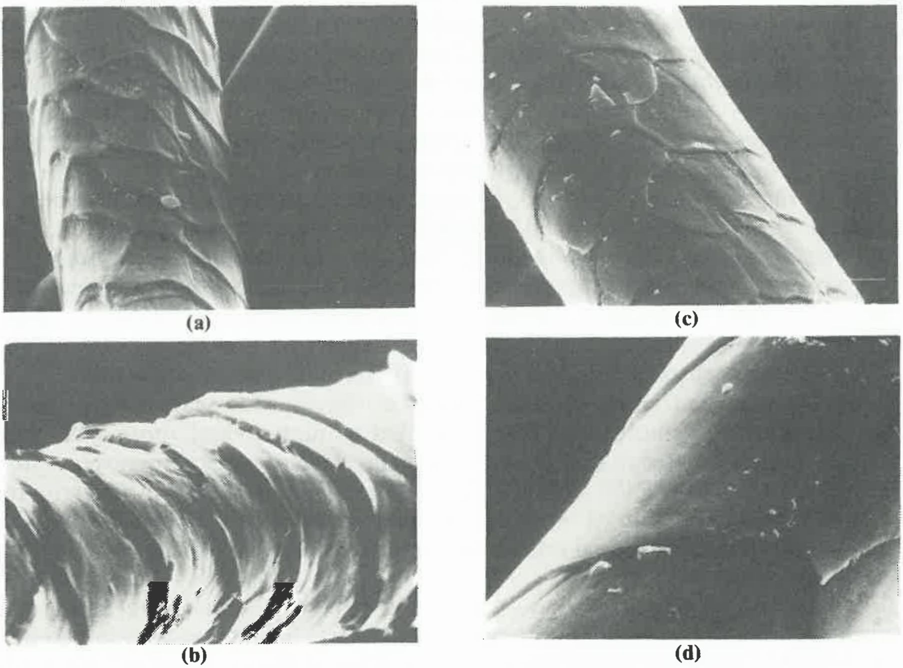


Figure 2: Scanning electron micrographs of fibres showing scale structures:
All magnification values mentioned in this article refer to the original magnifications.

Wool Fibres: (a) 1400x*
(b) 330x

Mohair fibres: (c) 1400x
(d) 3300x

*All magnification values mentioned in this article refer to the original magnifications.

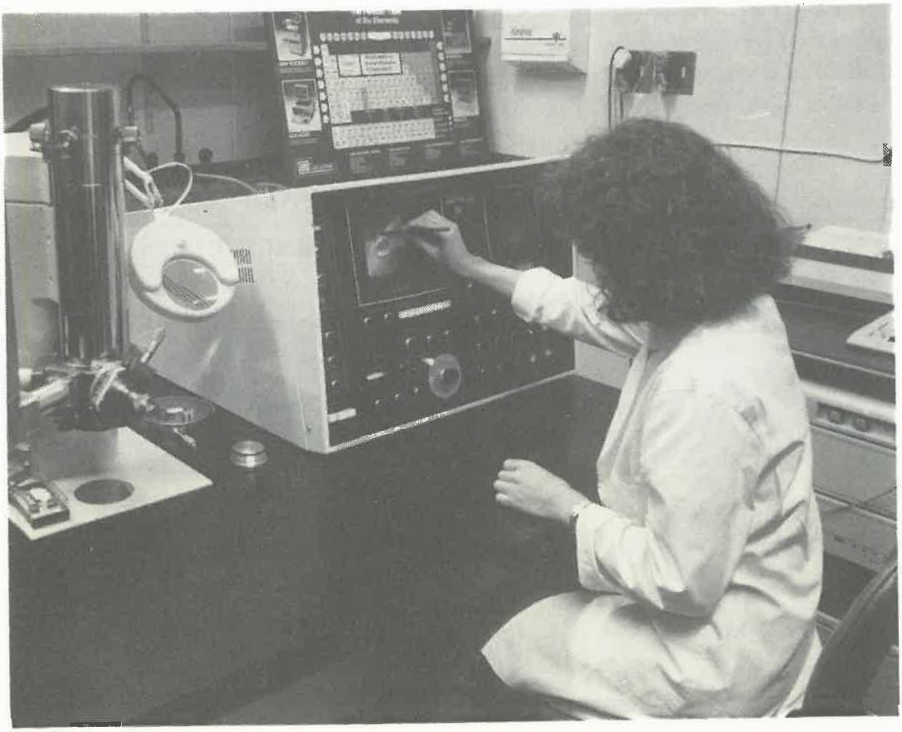
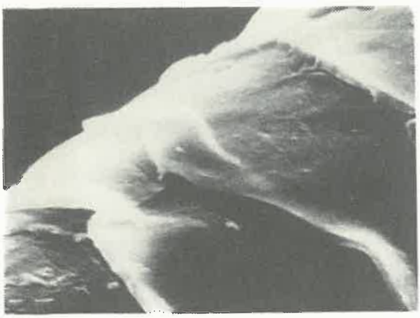
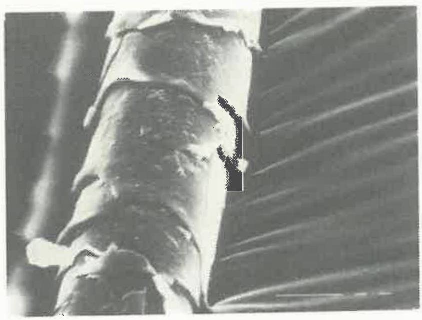


Figure 3: Measurement of scale height on SAWTRI's Scanning Electron Microscope



(a)



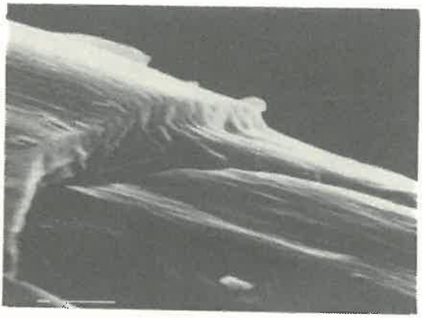
(b)

Figure 4: Examples to illustrate the variability of Mohair scales
(a) 3300x **(b) 1360x**

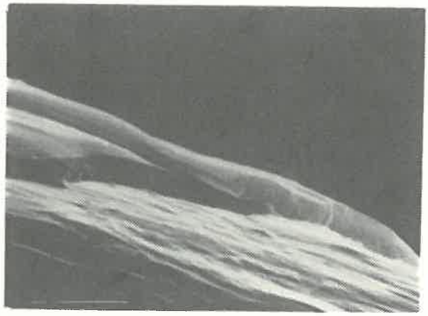
SAWTRI's research has shown that there are certain factors to be considered when using scale height as a sole criterion to distinguish between mohair and wool. Fig. 2 shows some typical scale structures of wool and mohair fibres, respectively. Fig. 4(a) is a photograph from a sample of mohair

TABLE I
LIST OF MOHAIR AND WOOL SAMPLES

ORIGIN	SAMPLE DESCRIPTION
MOHAIR:	
Argentine	Greasy White
	Greasy Grey
	Scoured White
	Scoured X- Bred Hair(Goat/Mohair)
	Scoured
Australia	Greasy
	Greasy (50/50 Adult/Young Goats)
South Africa	Greasy
	Scoured
	Scoured (Carbonised Kids)
	Top
New Mexico	Greasy (Kids)
	Greasy (Young Goats)
	Greasy (Adult)
	Greasy (Grey)
Turkey	Greasy Grey
	Scoured Grey
	Top
Texas	Greasy
Lesotho	Greasy Basuto
	Greasy (possibly Basuto)
WOOLS:	
Britain	Greasy (Blue Face Leicester)
	Greasy Massam Hogs/Teeswater
	Greasy Massam Lustre
	Greasy Ripon Hogs
Buenos Aires	Scoured Lincoln
Iceland	Top A
	Top B
	Top C
New Zealand	Top A
	Top B
Scandinavian	Greasy



(a)



(b)

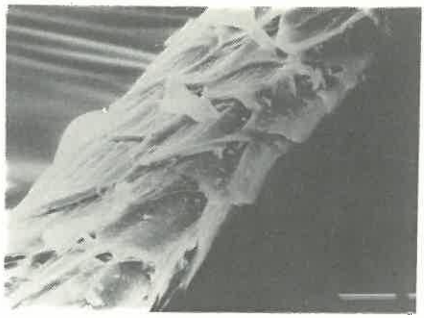
(c)

(d)

Figure 5: Examples of "Double" scales

(a) Mohair (10300x)
(b) Mohair (10300x)
(c) Iceland wool (7000x)
(d) New Zealand wool (7000x)

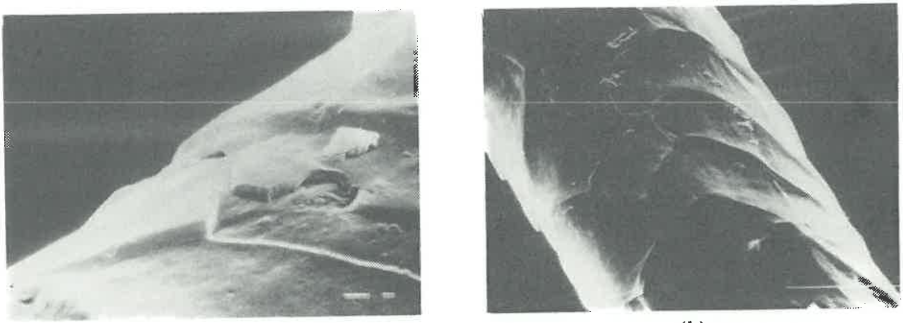
(a)



(b)

Figure 6: Examples of scales which are difficult to measure

(a) Iceland wool (1000x)
(b) Iceland wool (1500x)



(a) (b)

Figure 7: Examples of scales which vary in thickness (height)

(a) Massam Hog wool (7000x) **(b) New Zealand wool (1400x)**

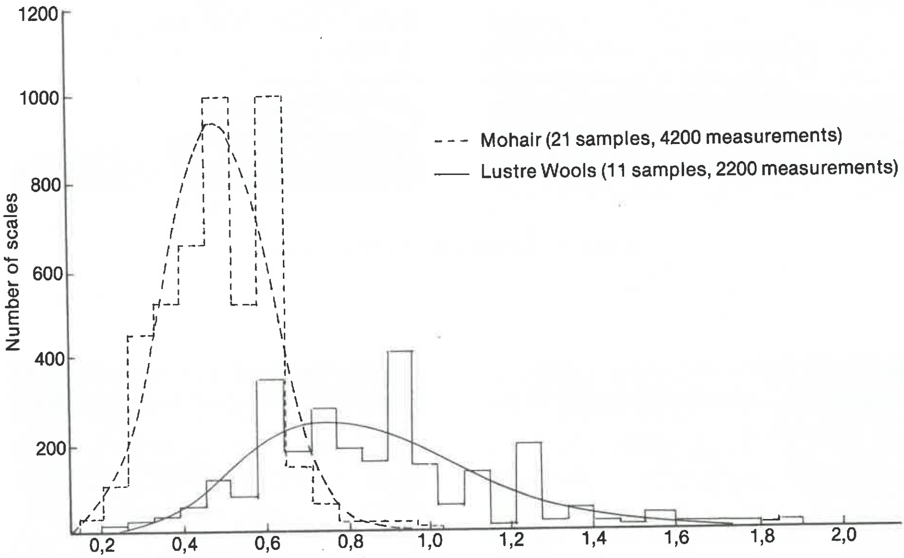


Figure 8: Scale Height distributions of wool and mohair.

and illustrates the great differences in appearance and heights which can be found between the scales from a single fibre. Fig. 4(b) illustrates a Kid mohair sample.

It was found in some cases that the edge of one scale lies directly above the edge of another scale, thereby forming a double scale with a height about twice the normal. The operator must be very careful to avoid such scales, which can be found in both wool and mohair as illustrated in Fig. 5.

In other cases, the scales on some snippets are so ill-defined or distorted that their heights are almost impossible to measure. This is illustrated for the Iceland wool (Fig. 6). In other instances the thickness of a particular scale varies, making it difficult to decide where to measure the scale height. This is illustrated in Fig. 7.

SAWTRI's work has shown that scale heights vary a great deal on every mohair and wool sample tested, with that of wool having a wider variation than mohair. For wool, the scale heights vary from about 0,25 micron to about 1,8 micron while for mohair they vary from about 0,12 micron to about 1 micron (Fig. 8). The wool lots, however, were characterised by the presence of some relatively large scale heights, particularly beyond about one micron, while the mohair lots were characterised by the presence of a large number of scales of relatively low scale height, particularly below 0,7 micron.

A very interesting point to emerge from SAWTRI's work relates to establishing whether a sample is pure mohair or not. If one selects a scale height threshold of one micron, and it is found for a specific sample that no scale height exceeds this value, then, according to the results obtained, it can be said that the sample is pure mohair. Conversely should a sample contain fibres with scales exceeding one micron then it *cannot be pure mohair.*

Where blends of mohair and wool are involved, however, it clearly has emerged from SAWTRI's work that a single scale height on a fibre snippet cannot be used as a sole criterion for accurately determining the composition of such blends. In such a case an experienced operator will use additional criteria e.g. mean scale height of a fibre[3] to improve the accuracy of the blend determination.

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RECENT STUDIES AT SAWTRI ON MEDULLATED FIBRES IN MOHAIR

By L Hunter

Medullated fibres in mohair can be a source of problems in many end uses when they differ in appearance from the rest of the fibres which are not medullated. They are characterised by having a central canal (medulla) containing cell residues running in either a continuous or fragmented form along their length (Fig 1). The term "kemp" is probably more familiar, but this refers to an extreme form of medullated fibre which is clearly visible to the naked eye.

The main problems associated with the presence of kemp are their chalky white appearance and apparent inability to dye to the same shade as the normal solid fibres and also to a lesser extent their effect on handle, stiffness and prickliness. Because they tend to lie predominantly on the surface of the yarn, and therefore also on the surface of the fabric, the visual and other effects produced by kemp tend to be out of proportion to their numbers. Generally, the presence of even a small amount of kemp in a high quality mohair may have a pronounced adverse effect on

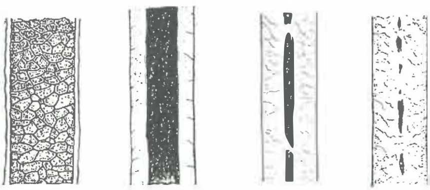

Fig. 1 — Classification of Medullae*
(a) Unbroken lattice (wide)
(b) Simple unbroken
(c) Interrupted
(d) Fragmented
***Wildman**

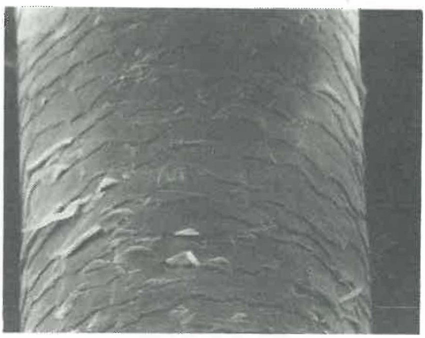

Fig. 3 — Kemp

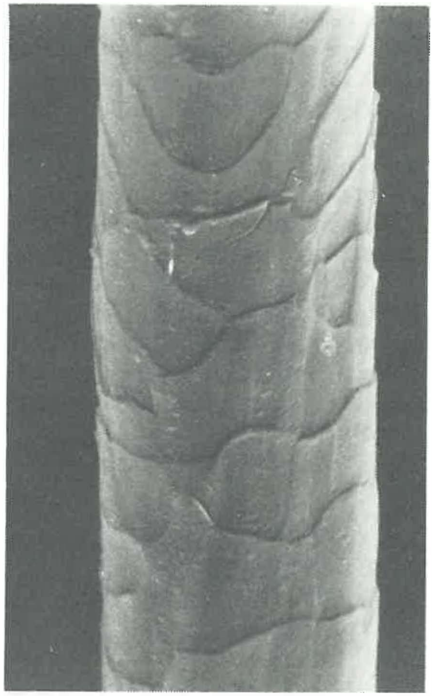

Fig. 2 — Mohair

*This article originally appeared in The Angora Goat and Mohair Journal of September 1987.

its value. Higher grades of mohair are largely free from kemp and medullated fibres, the kemp content being well below 1 % in well-bred South African mohair. Figs 2 and 3 illustrate the surface scale structure of mohair and kemp, respectively.

Measurement of total medullation [1, 2]

An instrument (the SAWTRI Medullameter) for measuring medullation was built along similar lines to the WRONZ design, but with certain changes in electronics and design. It works on an optical principle in which a small representative mohair sample, cut into little pieces called snippets, is immersed in a liquid (benzyl alcohol or anethol) having the same refractive index as mohair, after which the sample is illuminated. The unmedullated fibres become "invisible" since light is not scattered by these fibres. If medullated fibres are present, however, an amount of light is scattered which can be measured and used as an indication of the overall medullation of the sample.

The relationship between various measures of medullation and kemp [1, 2]

Various measures of kempiness and medullation, most of them being subjective and very time consuming, are in use and these have been shown to be fairly highly

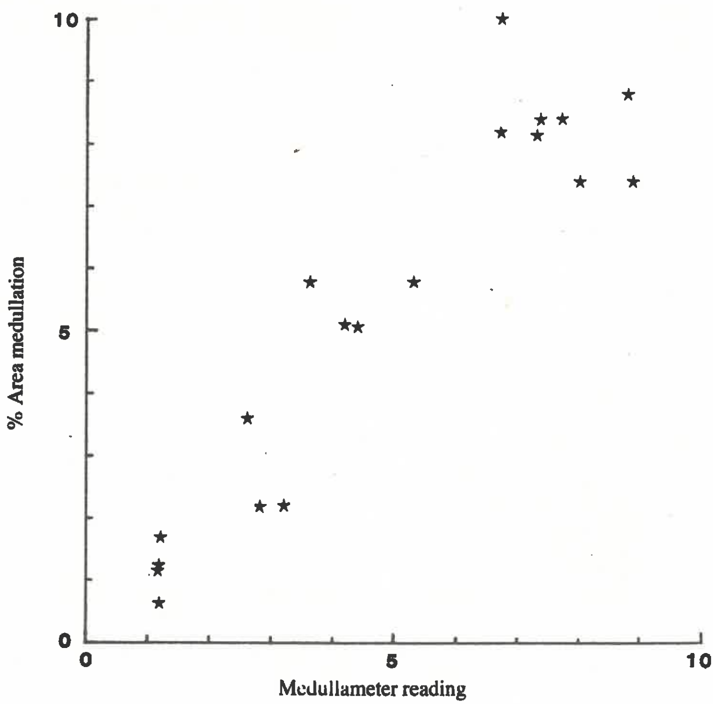

Fig. 4 — Area medullation measured by microscope vs medullameter reading.

correlated with each other (Fig 4.) Of interest in the context of this discussion is that readings on SAWTRI's Medullameter provided an estimate of the degree of kemp. Nevertheless, the actual contribution of kemp fibres to the Medullameter reading varied widely.

A numerical classification for the degree of medullation in mohair could be as in Fig 5 ranging from 1 (virtually free of kemp) to 6 which represents very heavily medullated (kempy) mohair. Category 1 should generally be acceptable for even the most critical end-uses, category 2 would be acceptable in certain cases, while category 3 and higher will rarely be acceptable for high-quality critical end-uses where the appearance of kemp is undesirable. It can be seen that around the accept-reject level for certain critical end-uses (i.e. at Medullameter readings of about 0,8 to 1 %) there is a relatively large scatter in the results and the Medullameter does not always distinguish between acceptable and non-acceptable samples as assessed subjectively.

Geometrical differences (2)

In further work it was attempted to establish what actually distinguishes (characterises) kemp from other medullated fibres.

To this end, the medullated fibres from 54 undyed mohair samples, including the most common South African types, were visually sorted into the following three groups:

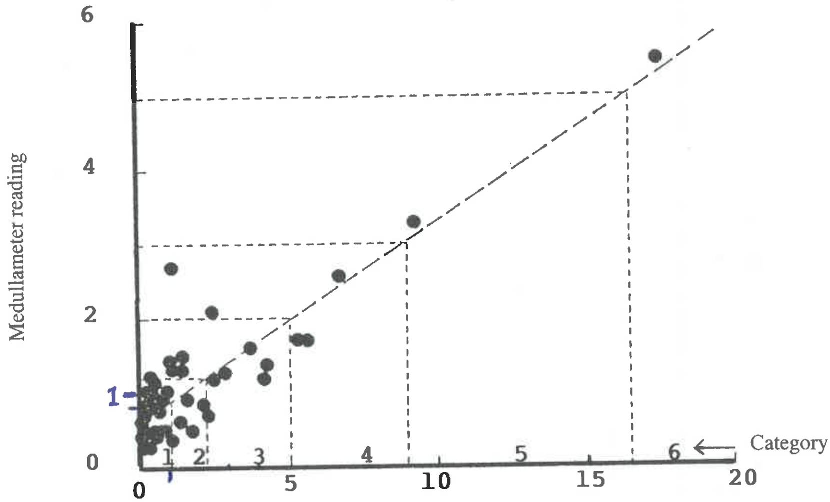

Fig. 5 — Medullameter readings vs percentage visible kemp (by mass).

* Chalky white fibres which were easily distinguishable in air and therefore objectionable in certain end-uses (termed Kemp A).
* Chalky white fibres which were less easily distinguishable in air and consequently less objectionable (borderline and termed Kemp B).
* Fibres which were only distinguishable in benzyl alcohol after removal of the chalky white fibre (termed MED or medullated fibres). These fibres would generally not be considered objectionable in practice.

The above fibres were examined individually on a projection microscope and the diameter of the fibre as well as that of the medulla recorded. These dimensions, as well as the ratio of medulla diameter to fibre diameter, were then examined to determine whether they explained the observed difference in the appearances of the different types of medullated fibres.

It was found that the medulla diameter to fibre diameter ratio appeared to hold some promise for discriminating between the various groups of medullated fibres over the entire range of mohair diameters but did not consistently distinguish between the various categories of medullation, especially between the Kemp A and Kemp B categories. The more obvious objectionable kemp fibres (Kemp A), however, generally had ratios above 0,5 (above 0,55 for dyed fibres) while medullated fibres which did not appear different in air, mostly had ratios below 0,5. A mean ratio of about 0,5 or 0,55 could therefore be used as a *very approximate* criterion for discriminating between medullated fibres which differ in appearance from other less apparent medullated fibres.

Nature of medulla (2, 3)

Because of the failure to distinguish reliably between objectionable medullated (i.e. kemp) and other medullated fibres on the basis of dimensional differences, it was decided to investigate whether or not the nature (type) of the medulla was perhaps different for these two types of medullated fibres.

First of all, the different types of medullated fibres were examined on a projection microscope and classified according to whether the medulla appeared "normal", latticed or a mixture of the two (Fig 1). It was found, however, that the medulla type so assessed (i.e. lattice or non-lattice) did not help to distinguish more reliably between kemp and other medullated fibres.

The question then arose as to whether or not differences in some other fibre characteristics (e.g. fibre surface and substance and medulla structure and content) were responsible for differences in appearance of medullated fibres having the same ratios. To investigate this, longitudinal and cross-sections of the different types of medullated fibres were examined under high magnification on a scanning electron microscope. (3)

No feature of the fibre surface or medulla, which could explain why the different types of medullated fibres (Kemp A, Kemp B and MED) differed so markedly in their visual appearance, could be identified by means of the scanning electron microscope. Some examples of scanning electron microscope photographs are shown in Fig 6. These clearly illustrate the cellular appearance of the medulla. In

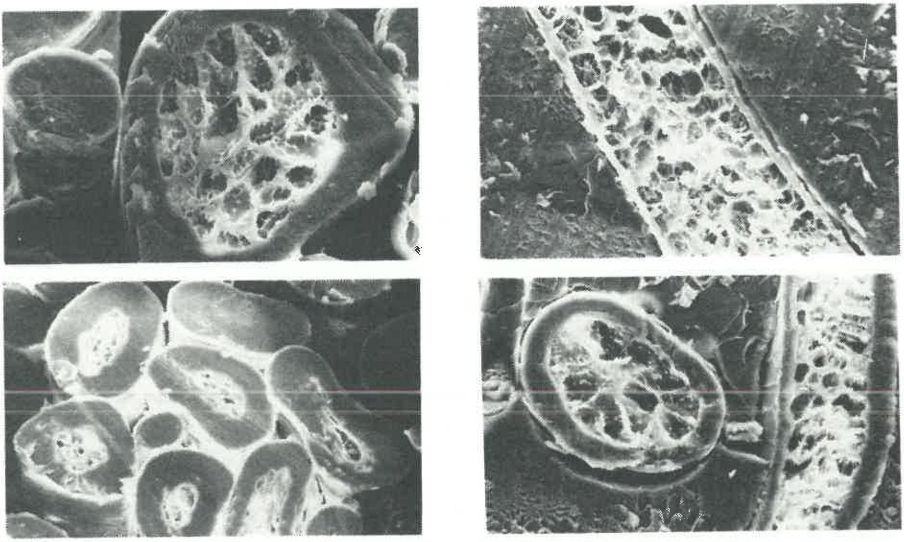

Fig. 6 — Some cross and longitudinal sections of medullated mohair illustrating the cellular structure of the medullae[3].

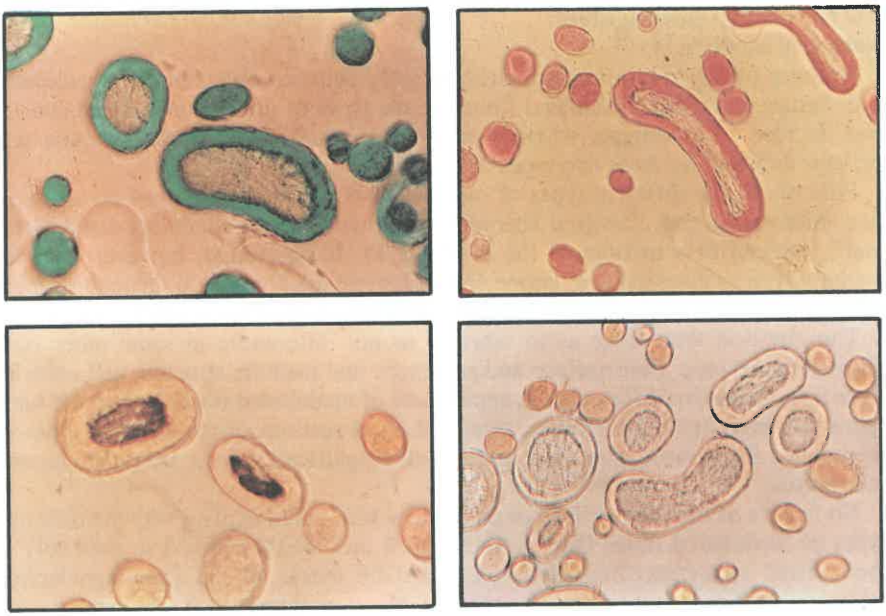

Fig. 7 — Examples of dyed mohair, unmedullated and medullated[3].

no case was a medulla found which was totally hollow or void of cell residues (i.e. empty or only filled with air), the medulla always showing a cellular type of structure. Certain thin-walled medullated fibres have a flattened (bean-shaped or ribbon like) appearance but this could have happened during processing or in the handling of the fibres.

Dyeing behaviour (3)

Some dyeing studies have been undertaken to establish the dyeing behaviour of medullated fibres, more particularly kemp, and unmedullated (i.e. normal mohair) fibres. Although this work is by no means complete yet, the results obtained thus far suggest that, for the particular dyes and dyeing conditions studied, kemp and normal mohair fibres behaved similarly during dyeing, and dyed to approximately the same depth of shade (except for the medulla). From Fig 7 it can be seen that the solid material of both the kemp (i.e. their walls) and the normal mohair fibres are approximately the same colour (shade). The different (lighter) appearance of kemp in a dyed sample therefore seems to be an optical effect due to the reduced light path through the dye in the fibre wall and refraction and reflection of the light at and within the medulla. What also emerged was that kemp can be more or less apparent (i.e. visually different), depending upon the colour and depth of shade to which the material was dyed. Further work is in progress to confirm these findings.

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