



CRC

for

Premium

Quality

Wool

Modified Wool Fibre Technology (OPTIM™ Fibres)

A Collaborative Project between
CSIRO Textile & Fibre Technology & The WoolMark Company.

Produced for the CRC for Premium Quality Wool undergraduate program by;
Gary O'Loughlin, CSIRO Textile & Fibre Technology.



Developments in Fibre Technology

- **Competing Fibres**

- linear density
 - microfibres
- profiles
 - Coolmax™
- surface effects
 - delustring
- latent effects
- new chemistry
 - PP
- re-launch old chemistry
 - Tencel™

- **Wool**

- finishing
 - shrink-resist fibres
 - insect-proof fibres
 - flame-proof fibres
 - enzyme treatment
- blending
 - new specs
 - fibre properties
- linear density
- profiles
- surface effects
- latent effects

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Consumer Preference

- Consumer Trend
 - lighter fabrics
 - softer fabrics
- Linear density of fibres needs to be reduced
- Now wool is able to meet the challenge better

OPTIM™ technology

- OPTIM™ fine
- OPTIM™ max

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OPTIMTMfine Technology

WOOL SLIVER

[e.g. 19 micron]

TWIST

DRAW/EXTEND

PERMANENTLY SET

BACKWASH

[15 micron]

OPTIMTMfine FIBRE

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OPTIMTMmax Technology

WOOL SLIVER

TWIST

DRAW/EXTEND

PARTIALLY SET

[25% latent contraction]

OPTIMTMmax FIBRE

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Chemical / Mechanical Process

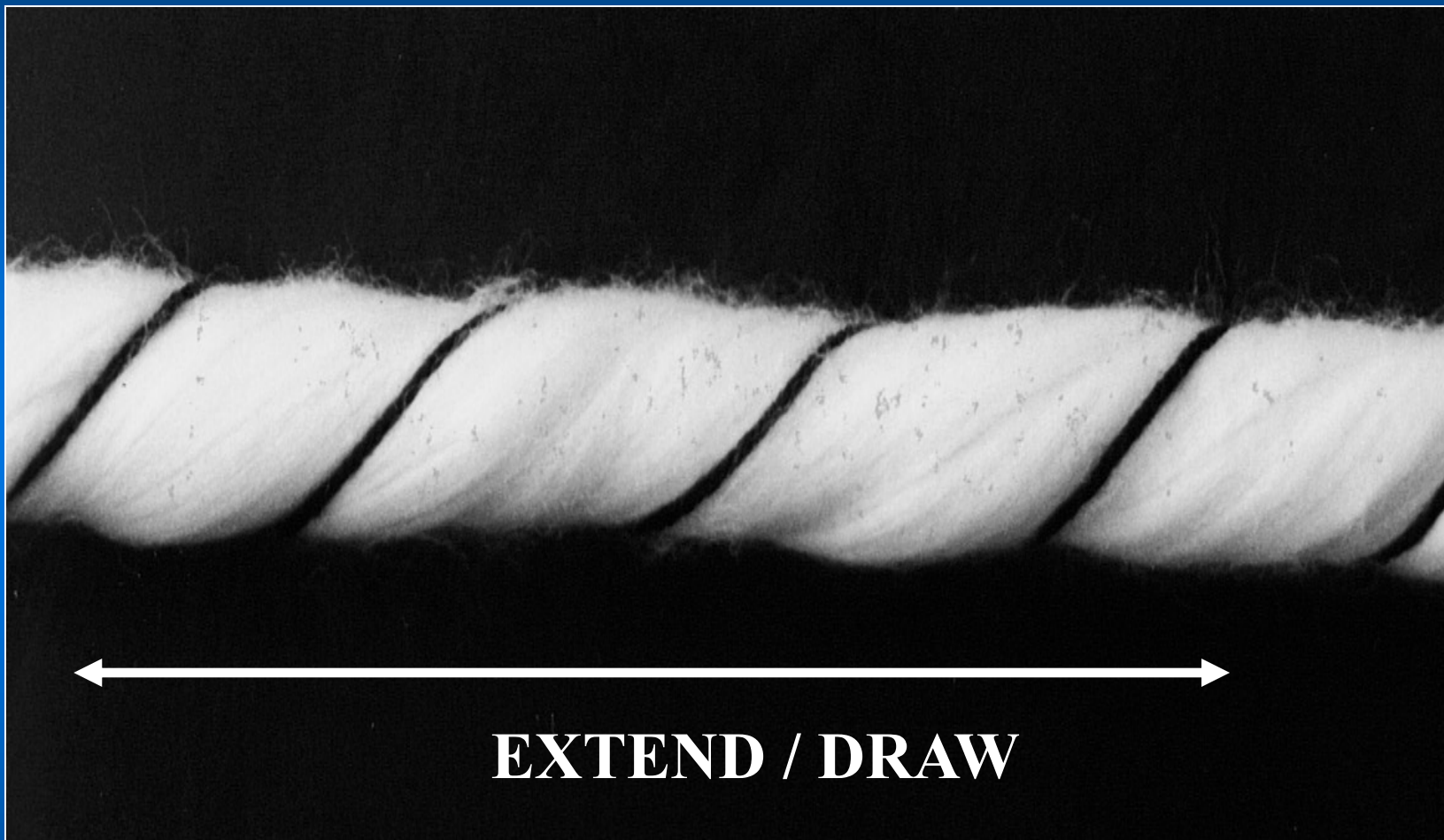
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EXTEND / DRAW



Bulk Generation in Yarn

**OPTIMTMmax
FIBRE**

NORMAL WOOL

BLEND

SPIN

**RELEASE YARN IN HOT WATER OR
DYE BATH**

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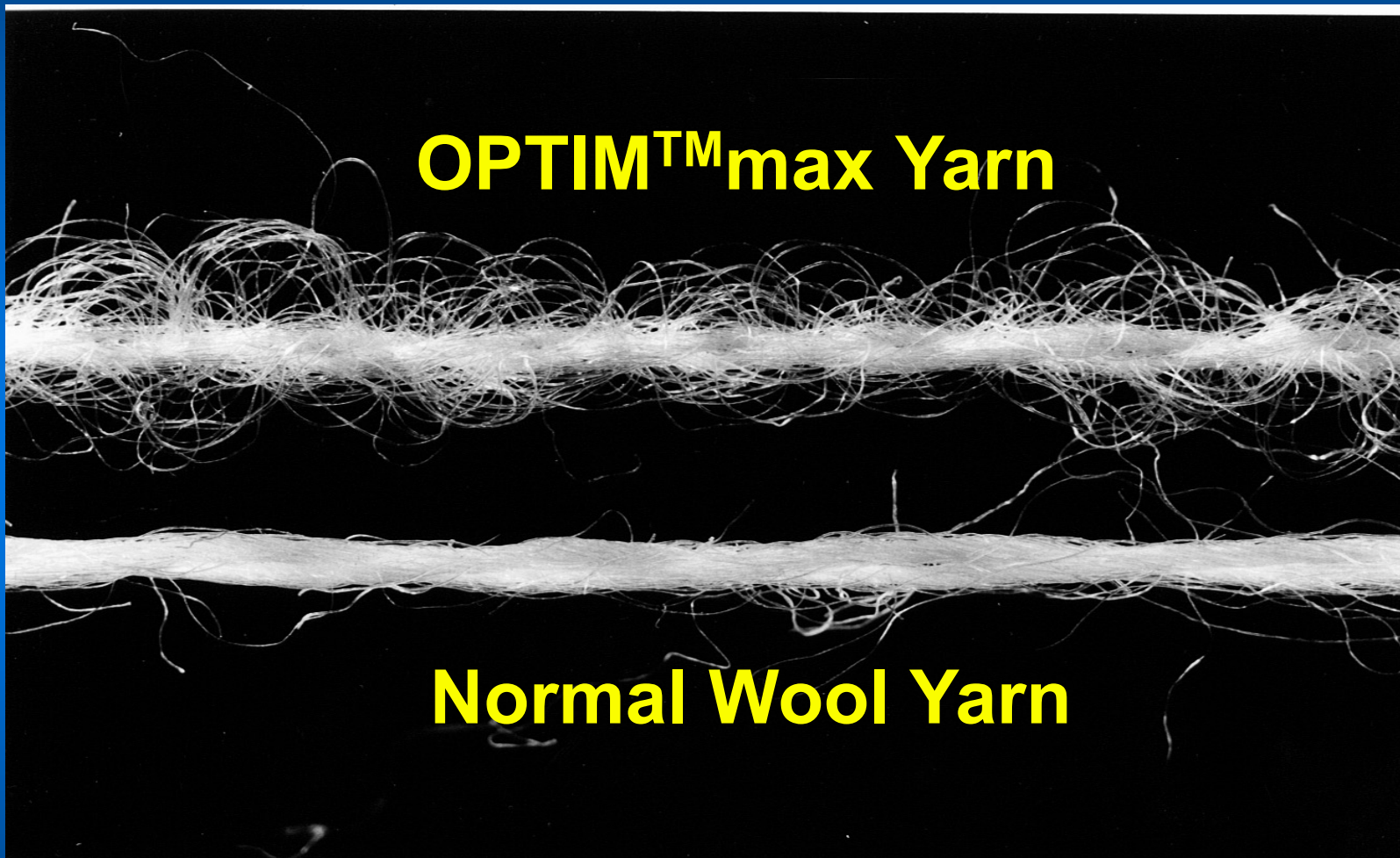
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Bulky Yarn Appearance

OPTIMTMmax Yarn



Normal Wool Yarn

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Cross-section of OPTIMTMfine Wool



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Fibre Appearance



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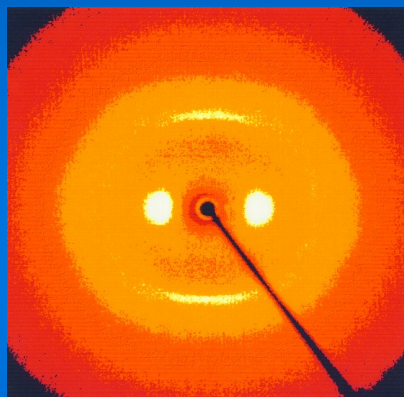
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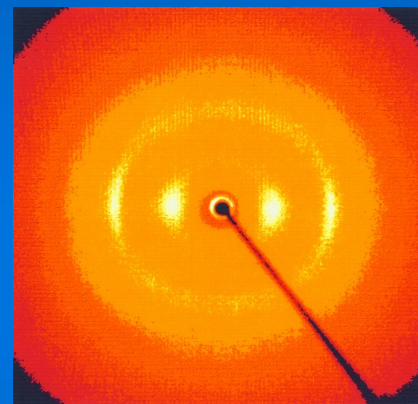
Fibre Structure

Wool



alpha- Keratin
X-Ray Pattern

OPTIMTMfine



beta-Keratin
X-Ray Pattern

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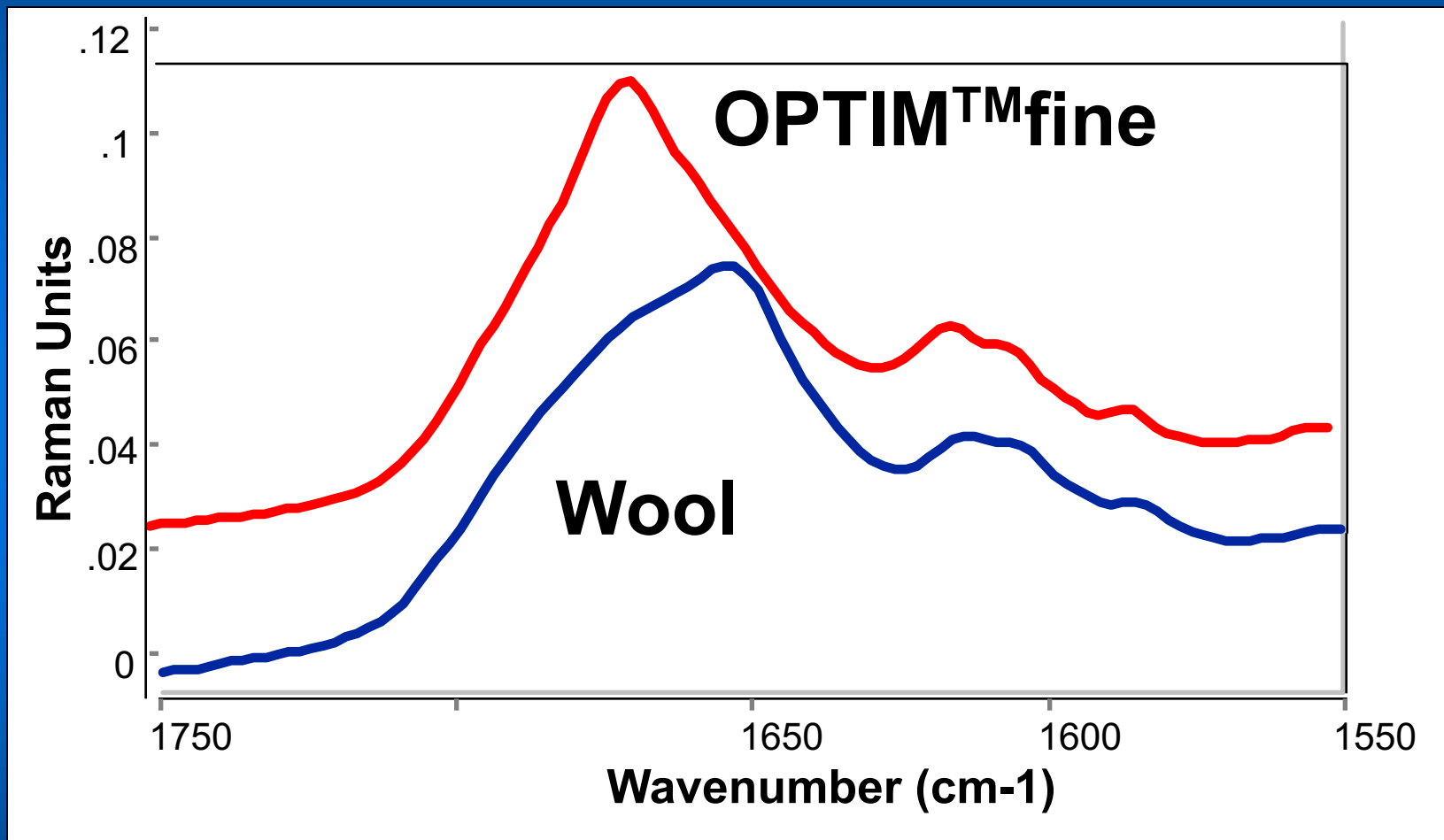
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Alpha $\rightarrow$ Beta Transformation



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Fineness of OPTIMTMfine Fibre

Parent Fibre		Reduced Micron Wool
Diameter [micron]	Linear Density [decitex]	Linear Density [decitex]
19	3.7	2.3
23	5.4	3.3

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OPTIMTMfine Fibre Properties

	OPTIM TM fine	Wool	Viscose	Silk
Linear Density [decitex]	2.3	3.7	1.7	1.2
Tenacity [cN/tex]	14.5	11.5	22-26	39
Extensibility [%]	19	38	20-25	18

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Fabric Properties

	WOOL	RM 1	RM 2	RM 3	WOOL	“COOL WOOL” SPECIFICATION
Fibres in X-Section	38	61	51	61	38	
Weight [g/m ²]	100	100	129	170	170	MAX. 220
Strength [N]	135	176	252	341	240	>147
Abrasion Resistance [1000 rubs]	12	8.7	26	18	22	>15

* RM=OPTIMTMfine



Yarn and Fabric Bulk

	Yarn Count [tex]	Yarn Bulk [cm ³ /g]	Fabric Bulk [cm ³ /g]	Fabric Weight [g/m ²]
Untreated Wool	R 75/ 2	12	3.5	287
Relaxed OPTIM™max Blend	R 74/ 2	17	6.3	225
Untreated Wool	R 478 /3/3	6	7.8	
Relaxed OPTIM™max Blend	R 435 /3	12	10.5	

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Thermal Properties of OPTIM™max

Machine Knitting Yarn	Thermal Insulation [Tog]	Fabric Weight [g/m ²]	Warmth to Weight Ratio [Tog.m ² /kg]	Tex	Twist Alpha	Fabric Bulk [cc/g]
Untreated Wool	0.3	286	1.3	R70/2	α 84/71	3.6
Bulky Wool [Relaxed]	0.5	224	2.3	R78/2	α 85/72	6.6

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New Product Opportunities

- **OPTIMTMfine Fibre**
 - Light-weight “silk-like” trans-seasonal wear
- **OPTIMTMmax Fibre**
 - 20 to 30% lighter garments
 - “warmth without weight” knitwear

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Current Status

- Test marketing of products taking place
- Australian topmaker licensed to:
 - produce fibre
 - distribute globally
- Second Generation OPTIM Fibres

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