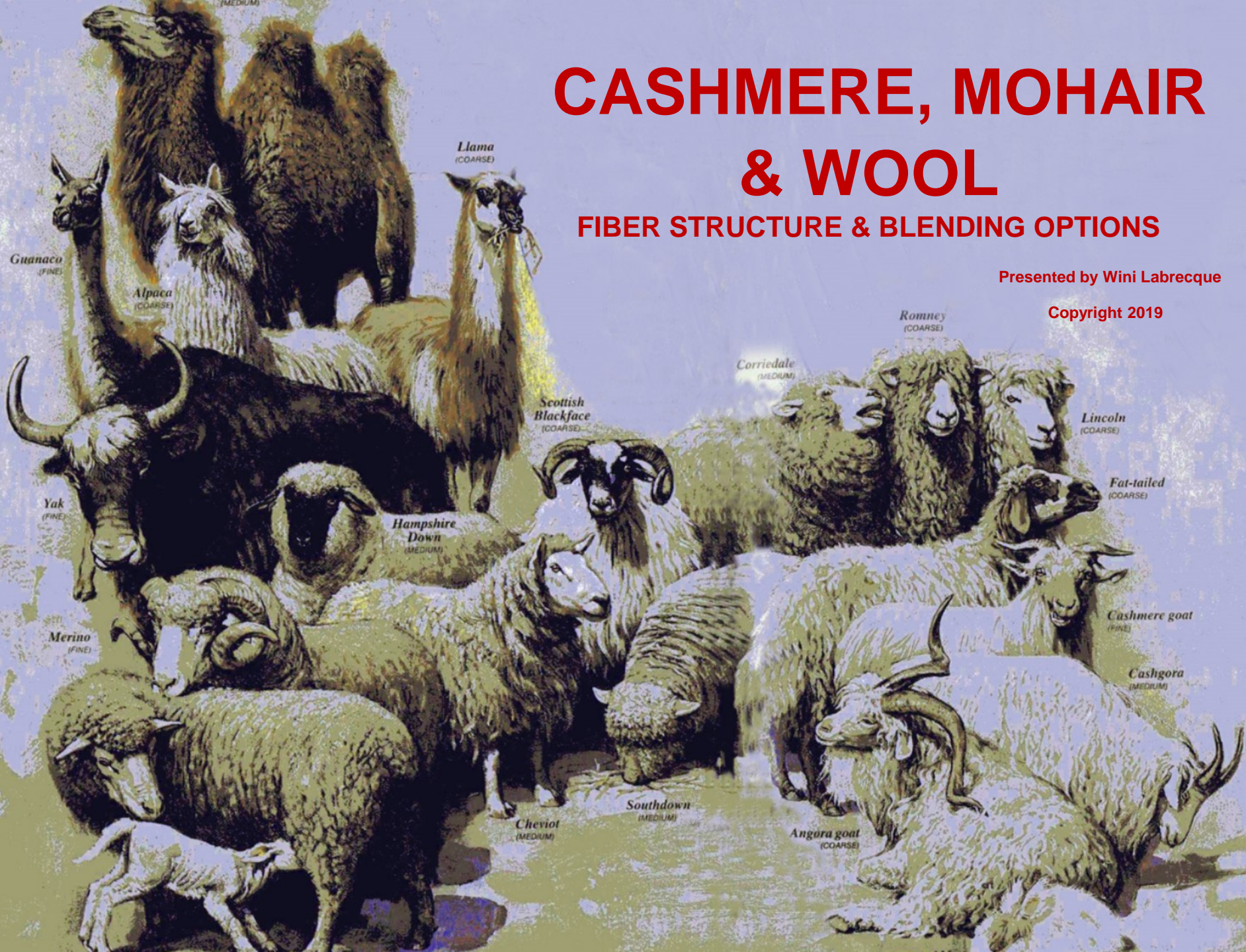


CASHMERE, MOHAIR & WOOL

FIBER STRUCTURE & BLENDING OPTIONS

Presented by Wini Labrecque

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CASHMERE

Photo courtesy June Cashmere



WOOL

Photo from Wikipedia



MOHAIR

Photo courtesy of Woolshed1

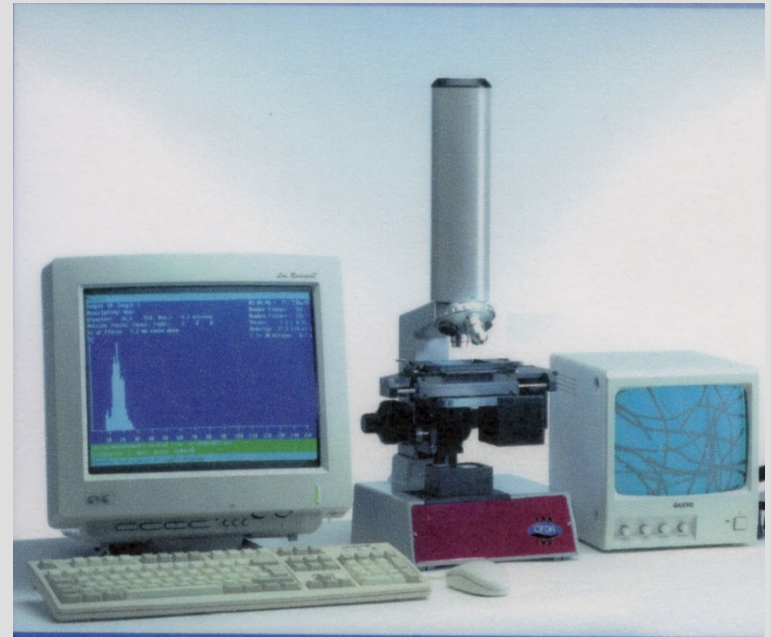
PROPERTIES OF FIBER

- **Fiber Diameter (micron)**
- **Scale Height/Frequency/Pattern**
- **Medullation/Kemp/Guard Hair**
- **Staple Length/Style**
- **Natural Impurities**
- **Yield**
- **Color**

FIBER DIAMETER

Micron or Micron Count (μm)

- A micron is 1/25,400 of an inch and human hair averages 30 μm
- Micron counts are used as a technical description of diameter for all fibers
- The lower the count, the finer the diameter of the fiber
- Average Fiber Diameter is documented as AFD



OFDA MICRON TESTING EQUIPMENT

CASHMERE FIBER DIAMETERS

- Down fibers should have AFD of less than 18 microns with no down fiber above 28 microns. Down fibers are typically non-medullated showing little to no hollow core in electron microscopy.
- Outer Guard Hair is coarser and longer. Typically has an AFD of greater than 50 microns. This lends itself to processing through a fiber separator effectively as these stronger micron fibers are heavier and drop out easier in processing. These primary fibers are medullated (having a hollow core) which leads to stiffness in the fiber.

MOHAIR FIBER DIAMETERS

- Fiber AFD is typically evaluated and labeled on fineness according to Mohair Council of America
 - Kid – Fine 20-30 micron
 - Yearling – medium 30-34 micron
 - Adult – Strong 34 – 39 micron
 - subgrades exist within each category (superfine, fine, good)
- Kemp and Heterotype Hair Fiber are coarser, primary fibers
 - Kemp is typically shorter in length with AFD of greater than 50 microns.
 - Heterotype hair can vary in micron but is stronger in micron than the finer existing secondaries

WOOL FIBER DIAMETERS

- Sheep are known by breed in part because of the wool they produce. Their wool should meet standards that have been documented over many years.
- Wool diameters range from fine wools in the low micron ranges of 12 – 18 all the way to coarse wools ranging in micron over 40-50.
- Some sheep are double coated with strong differences in micron in the 2 coats.

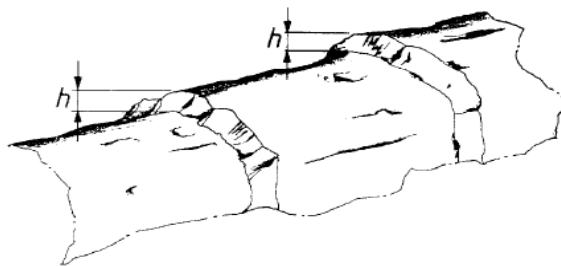
SCALE HEIGHT

Cashmere scale height rarely exceed 0.5 μm

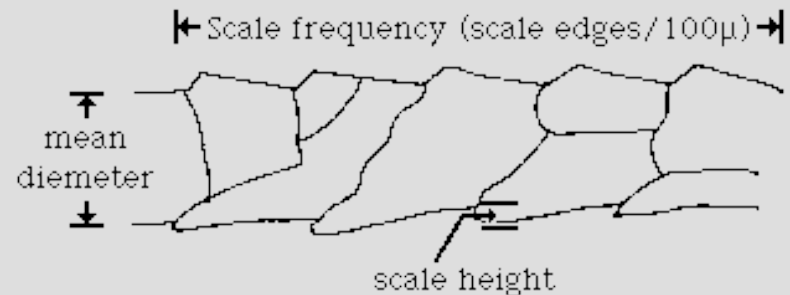
Mohair scale height averages around 0.4 μm

Wool scale height rarely falls below 0.5 μm
Usually height falls into the range of 0.6 to 1.1 μm

Scale height affects the reflectivity of light and contributes to the brightness or lustre of the fiber



2.10 Scale height (thickness), h , of a fibre.



SCALE FREQUENCY & PATTERN

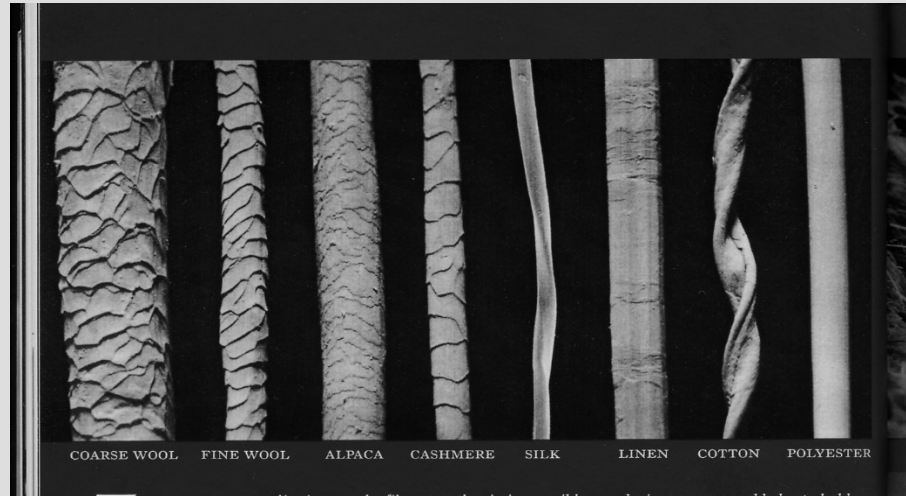
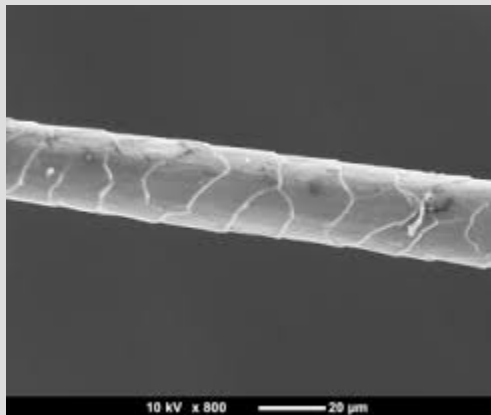
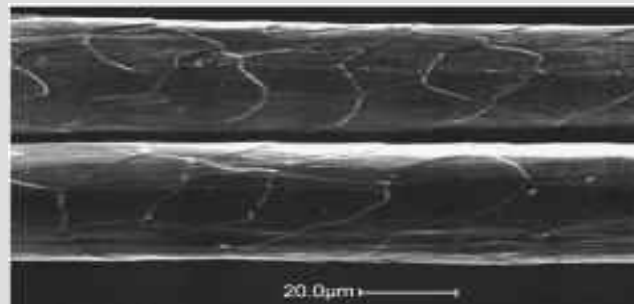


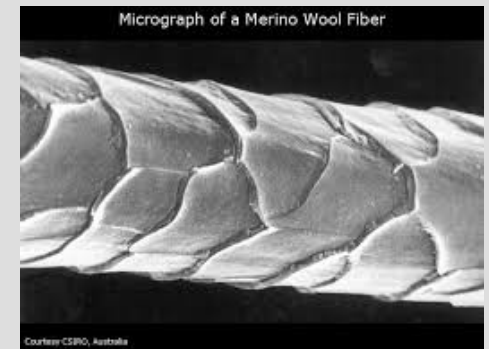
Photo courtesy of National Geographic May 1988



CASHMERE



MOHAIR



MERINO WOOL

MEDULLATION/KEMP/ GUARD HAIR

KEMP AND GUARD HAIR

- A medullated fiber is an animal fiber that in its original state includes a medulla. A medulla in mammalian hair fibers is the more or less continuous cellular marrow inside the cortical layer in most medium and coarse fibers.
- By definition (ASTM), a kemp fiber is a medullated fiber in which the diameter of the medulla is 60% or more of the diameter of the fiber.
- Kemp is a term used to describe coarser fibers present within the coat. They are usually straight and oval in cross section, have a relatively large medulla, are usually the most visible fibers in the fleece and don't accept dye well.
- Guard Hair is actually the protective coarse fiber covering a downy undercoat of a two coated animal. It is a term used across animal species when describing stronger micron fibers (usually over 30 micron) present originating from a primary follicle.

STAPLE LENGTH/STYLE

- Staple length is the measured length of a fiber from tip to base
- Fibers commonly referred to as down type fibers are usually very short and have very unstructured bundling – usually coming from a double coated animal
- Style refers to the crimp or curvature appearing in the downy undercoat

NATURAL IMPURITIES

Impurities lower the value the fleece -

- Tender fleece
- Lacking uniformity throughout fleece
- Color contaminations
- Staining from urine, soil or vegetable matter
- Grease, dirt, dust, sweat
- Felting

YIELD

The yield is usually expressed in grams, ounces, pounds or kilograms

Actual yield is the total clean, dehaired, dry uniform fiber free from all impurities produced annually

CASHMERE – 20 – 45% of actual harvested fiber 3.5 – 6 oz down

MOHAIR – 60 – 80% of actual harvest 2 – 25 lbs dependent on
kid/doe/buck

SHEEP WOOL – 50 – 100% of harvest, up to 25 lbs dependent on
cleanliness/breed

COLOR

Fiber color as a marketable characteristic can be an important criteria in placing value and price

White fiber is the most desirable color in all species of fiber producing animals due to its ability to be dyed any color

Cashmere – white, grays, browns

Mohair – white, tan, red, gray, black

Wool – dependent upon breed – all colors

CASHMERE



Photo – Wini Labrecque

- **Down Fiber Diameter – 12.5 - 19** micron
 - **Guard Hair Diameter - 20** micron and up
 - **Staple Length – 1.25 – 3** in
 - **Average Yield – 3.5 – 5.6** oz
 - **Scale Properties –**
 - Height 0.4um
 - Frequency 6-8/100um
- Regular waved mosaic, Smooth, distant margins



Photo – Wini Labrecque



Csiro photo



Microscopic photo – Wini L

MOHAIR



Wikipedia photo



Photo courtesy Singingfalls.com

Fiber Diameter –

kid - 20 - 30 micron

yearling - 30 – 34 micron

adult - 34 - 39 micron

Kemp Diameter - >50 micron

• **Staple Length – 6 – 12 in**

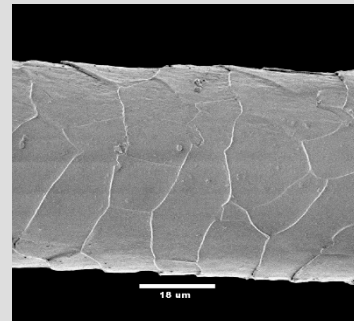
• **Average Yield – 1.5 – 5 lbs**

• **Scale Properties –**

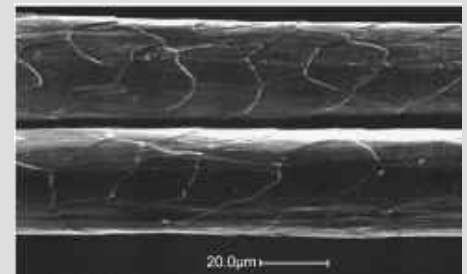
high frequency – 6-10um

Low height 0.4 or less

Kemp and Heterotype hairs are medullated



Csiro photo



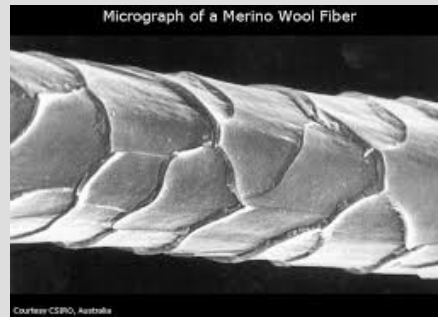
Csiro photo

SHEEP WOOL

- **Fiber Diameter –**
 - 12.5 - 22 micron fine breeds
 - all the way to 40+ breed dependent
- **Staple Length – 2.5 – 8 in**
- **Average Yield – 2 - 20 lb**
- **Scale Properties –**
 - height 1 – 1.1
 - frequency $>9/100\mu\text{m}$



Milligans Gander Hill Farm photo



Csiro photo



BLENDING POSSIBILITIES

Natural Fibers For Blending

- Angora Rabbit
- Bison
- Yak
- Silk
- Quiviut
- Camel
- Paco-Vicuna
- Alpaca (both huacaya and suri)

BLENDING POSSIBILITIES

Man Manufactured & Synthetic Fibers For Blending

- Lyocell/Tencel
- Bamboo/Rayon Bamboo
- Soy Silk
- Ingeo (Corn Protein)
- Milk
- SeaCell
- Rose Fiber
- Nylon
- Mylar (Angelina)
- Firestar

Compiled By Wini Labrecque - copyright 2019

BREED	FIBER DIAMETER (micron)	STAPLE LENGTH (inches)	AVERAGE YIELD	SCALE HEIGHT (microns)	SCALE FREQUENCY (microns)
YAK	12 – 14	18 - 20	3.5 oz	0.4 or less	>9/100
QIVIUT (MUSK OX)	12.5 - 22	3/4 - 2	2 lb	0.4	>9/100
BISON	12 - 29	1/2 - 3	under study	under study	under study
CAMEL	16 - 20	0.5 - 2.5	7.7 – 15.4 lb	0.4	6-8/100
CASHMERE	12.5-18.5	1.25-3	3.5 – 5.6 oz	0.4	6-8/100
GUANACO	14 - 16	20 - 25	10.5 – 28 oz	0.4	>9/100
LLAMA	19 - 38	4 - 8	4.4 - 11 lb	0.4	<9/100
VICUNA	12 - 14	1	1.5 lb	unavailable	unavailable
MOHAIR	17 - 40	6 - 12	1.5 – 5 lb	0.6	6-8/100
MERINO SHEEP	13-22	2 - 5	14 - 25 lb	1-1.1	9-11/100
OPOSSUM	18 - 22	1/2 - 1	Unknown	very deep	unavailable
HUACAYA	18-28	4 - 8	3 – 12 lb	0.4	> 9/100
SURI	18 - 36	6 - 10	3 – 4 lb	0.4	6.5/100
ANGORA RABBIT	10 - 16	3 - 7	1.8 – 2.6	rounded, smooth	10.6/100

REFERENCES

- Silk, Mohair, Cashmere and other Luxury Fibres, Woodhead Publishing, 2001, Edited by Franck, Robert R
- Cashmere Goat Association, cashmeregoatassociation.org website 2019
- A286 Goats – Cashmere (Down) Production, Infovets.com
- Handbook of Textile Fibres, Vol. I – Natural Fibres, Woodhead Publishing, 2006, J. Gordon Cook
- Mohair Biology and Characteristics, Texas A&M University, October 13, 2019, Christopher John Lupton
- Raising Angora Goats for Beautiful Mohair, 2016, Sharon Chestnut
- Fleece & Fiber Source Book, Storey Publishing 2011, Deborah Robson & Carol Ekarius
- Breed Standard For Angora Goat Fleece, 2019, The American Goat Breeders Association
- American Sheep Industry Association, sheepusa.org website 2019
- Wool, online publication, 2000, New Mexico State University & US Department of Agriculture
- Wool: Science and Technology, The Textile Institute with Woodhead Publishing, 2002, Edited by W S Simpson and G H Crawshaw
- Sort, Grade, Class – SGG, sortgradeandclass.com, sorting/grading training program, Wini Labrecque

THANK YOU!!!!

