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Signed: Shirley M. Lyster

Date: Sept 19, 2019
The Relationship between Crimps per Inch and Twists per Inch: How it Affects Yarn

This in-depth study is submitted by Shirley M. Lyster as a partial requirement for the Master Spinner Certificate at Olds College, Olds, Alberta, Canada.

Instructor: Birgit Rasmussen

Olds College Master Spinner Program

Olds College, Alberta, Canada

February 12, 2010
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Summary

In preparing for a project one must know how the required yarn needs to look and how it handles or feels. Is the yarn soft enough, strong enough or elastic enough for the job? These characteristics of the yarn are just some aspects needing consideration before beginning to spin. I have spun four samples of each fleece, each with a different amount of twist and grist to demonstrate these yarns. I have documented the spinning details and included samples that follow the discussion on this study.

The spinner must have control over the amount of fibre being drafted in order to be successful in spinning consistent yarns. Consistency will prevent knitted or woven fabric from weakening in thick or thin spots. I drew conclusions from the information I gathered and decided which yarn was most like the fleece. I mentioned my findings on other aspects of the yarns created.

If the spinner changes the spinning method to the opposite one used for the study and spins other fleeces as they become available, the new yarns become an extension of this research. The acquisition of more information through the addition of fleeces, will save time and effort and will increase the study’s worth.

I feel this in-depth study will serve me well for my future projects by giving me choices that I have already explored.
Table of Contents

BOOK ONE

Summary              ii
Introduction          iv
Discussion
  Gromark            6
  Unknown Breed      11
  Cheviot            16
  Romney            21

BOOK TWO

  Merino             26
  Shetland / Border Cheviot  31
  Jacob             36
  Romney Lamb       41

Conclusion          48
Recommendations     49
References          50
Appendices          51
  Appendix A        52
  Appendix B        53
  Appendix C        54
  Appendix D        55
Glossary            56
Introduction

My inspiration for this study was to have a better understanding of the relationship between grist and twist per inch. After studying books and many hours of practice spinning according to directions from many sources, I was still unable to spin the yarn I was expecting to produce.

When I found myself facing an in-depth study at the end of level six in the Master Spinner Program, it was not difficult to decide which direction I wanted to take. Once and for all, I would take the time to compare what I had learned in the Master Spinner Program, with other sources of information. My intent is to discover how the amount of twist in a yarn affects its handle and that of the fabric made with that yarn, and how to achieve it consistently.

In order to explore this idea, a spinner must be able to spin yarn with a very specific amount of twist per inch. Using the premise that a 2-ply yarn is best spun with the same number of twists (bumps) per inch as the number of crimps in the fleece (Field, 1995); I began with sample A to demonstrate this. Then two other samples contain more or less twist for comparison and one sample is spun according to Anne Field’s chart: See Appendix A. The report includes my documentation, conclusions and recommendations, as well as samples of the spun yarn and 4 inch knitted samples, in order to feel the fabric created using the spun yarn.
When I first started spinning I relied heavily on the information I read in books and magazines in order to learn how to spin my yarns more consistently. I read whatever I could get my hands on, but I always seemed to be missing something. In “The Woolcraft Book: Spinning, Weaving and Dyeing” (Jackson and Plowman, 1980) the authors suggest letting your fleece be the guide by studying the crimp pattern, then to experiment with the spinning and compare the plied samples with the crimp pattern in the fleece. Other books such as; “Hand Woolcombing and Spinning: A Guide to Worsted from the Spinning-wheel” (Teal, P. 1976); “The Alden Amos Big Book of Handspinning” (Amos, A. 2001) and “the essentials of Yarn Design for handspinners” (Ross, M. 1983) all discuss yarn diameter and the amount of twist that would be appropriate for that diameter. They often contain charts or tables that aim to help the spinner in achieving the exact yarn they require for a project. Often the information is quite technical, talking of tangents and co-tangents. When I started using Mabel Ross’ charts (112 - 113) and information from two articles in Spin. off magazine (XVII, 1993) by Rita Buchanan, I felt I was having some success. These articles describe methods of measuring yarn such as wraps per inch (wpi) and the angle of the yarn to keep track of the diameter. Both will demonstrate the amount of twist inserted. The lower the angle created through the twist, the softer the yarn.

Then I discovered Anne Field’s book, “Spinning Wool: Beyond the Basics” (1995). I thought I had found the final word on spinning yarn consistently. Here I learn about analysing fleece, and the idea of spinning yarn according to the crimp in the fleece, is once again introduced to me. Anne Field writes, “For instance, there should be a direct
relationship between the crimp number and fibre size of the wool to the twist number and
thickness of the spun yarn” (1995, 30). See Figure 1:

Fig. 1 shows how to count bumps or crimps per inch on one side of the fleece.

I began to spin according to Anne Field’s chart (Appendix A) to see if I could
improve further, but I was not successful. After several attempts, I began to think we
were not talking the same language. I emailed Anne Field (personal communication,
January 11, 2008) to ask her to explain and found that what I had begun to suspect was
true. Anne Field does not divide the bumps in a plied yarn by the number of plies, as I
learned, in order to count plied twists per inch (ptpi). Anne Field’s method just counts
the number of bumps (on one side) and calls that number the twists per inch (tpi), as
shown in Figure 2:

Fig. 2 counting bumps on one side of a 2-ply yarn, (8 bumps = my 4 ptpi)

I found that Anne Field’s email explanation for the example she gives contradicts
her chart. By the time I had reached level three in the Master Spinner Program, I was
slightly frustrated with the differences in the information that was available to me. In
level three I learned how to reproduce a specific yarn according to certain formulas.
Some of the formulas I had first encountered in Mabel Ross’ book (1983, 113). Whereas
Mabel teaches how to spin a singles yarn to a certain number of wraps per inch and to
follow the charts for the type of yarn you want to create, I was now learning to spin the singles with the required amount of twist, according to the amount of twist in the plied yarn. Finally, a method of spinning and plying that worked for me.

For example, if one wishes to create a 2-ply yarn with 4 plied tpi (8 bumps), one would begin with the 4 ptpi being divided by 2 (4 ptpi ÷ 2 plies = 2 tpi). When plying a balanced 2-ply yarn, two-thirds the amount of twist as the singles is used. This extra 2 tpi is the other 1/3, and you add it to the 4 ptpi to represent the full 3/3’s of the yarn. Now you are working with a singles yarn with 6 tpi and it is necessary to find the ratio on the wheel, which matches this closely. A ratio of 6:1 is perfect. The next step is to divide the ratio 6:1 by 6 tpi (6:1 ÷ 6 tpi = 1). This formula gives you the number of inches per treadle and for a short draw method of spinning, this is all that is required (Ross, 113).

For a longer draw (I use 12” in most cases), one needs to determine the number of treadles required in that draw length. Therefore you now divide the draw length (12”) by the number of inches per treadle. For this singles example it would be:

\[ 12” \text{ draw} \div 1”/T = 12 \text{ T (treadles).} \]

To create the 2-ply yarn from these singles, one can simply multiply the number of treadles (12) by 2/3 (balanced yarn) to get the number of treadles (8) that are required; or one can re-work the formula using ratio ÷ tpi = inches per treadle and again dividing the draw length by the inches/T to get the number of plying treadles.

For example:

\[ 12 \text{ T} \times 2/3 \text{ twist} = 8 \text{ T or} \]

\[ 6:1 \text{ ratio} \div 4 \text{ ptpi} = 1.5 \text{ T; then 12” draw} \div 1.5”/T = 8 \text{ T} \]

Learning this method gave me a better understanding of what actually takes place
during the spinning and plying process. The mathematics is very clear and it leaves the spinner with only the diameter to work out in order to create the correct number of twists. Through my spinning experience, I came to rely on the idea that the wpi were equal to approximately 4 times the tpi, and for spinning wool, this seems to work well for me. I used that figure as a guide throughout the samples A, B, and C.

I felt it necessary to include sample D (Anne Field’s spinning method) to compare with sample A yarns that were spun according to the Olds College’s method (“my” method), for achieving yarn which is spun according to the crimp. If one studies Anne Field’s chart, you would find that because her singles are spun with twice as much twist as in my method, her wpi are twice as much as the tpi. This number for wpi is actually the same as mine. I created a comparison chart, (Appendix B), to show the differences in sample A yarns and sample D yarns. Both these methods mean to produce a balanced 2-ply yarn with the same number of bumps per inch (bpi) as the number of crimps in the fleece.

After spinning sample D of the first four breeds and plying them on the same ratio as the singles, using 2/3 the number of treadles as in the singles (interpretation #1), I changed to plying the Merino sample with 1/3 of the singles treadles (interpretation #2). Neither of these methods produced the required results. Yet again I tried, this time changing the ratio for the plied yarn to one closest to the amount of twist required (interpretation #3). I used this interpretation for the last three breeds and a second sample of the Gromark. Anne Field’s spinning directions were clear to me, but I found it difficult to understand the procedure for plying (Field, 1995). The last four samples brought me a little closer to my goal.
Three of the fleeces that I had acquired were raw and needed washing. The rest of them were previously washed to some extent. The details of each fleece preparation are included with the samples. My fleece samples were prepared and spun to the most commonly accepted methods for long and short fleeces, with the exception of the Merino and the unknown breed. I noted my reasons with the individual spinning particulars that you will find on the pages accompanying each sample. For example, most short fleeces were spun woollen from rolags and long fleeces were spun worsted from roving. For each breed, I created a fleece analysis as a guide for spinning.

I began doing a timed sample from start to finish and found that it was taking time away from progressing with the study itself and it was using up fleece that in some cases was in short supply. For the Gromark fleece, this process took approximately 40 hrs., from carefully separating the locks for washing, to the finished sample. I changed from spinning a timed sample to spinning a small sample skein measuring yards per gram in order to estimate the amount of fibre from which to begin. I found that as I spun each yarn, it served as a guideline for following samples.

After spinning and finishing all the samples for each breed, I blocked the washed knitted squares on Styrofoam on which I drew a grid to create 4” squares. This held all my samples for each breed at one time and made comparing them easy.

I created the second chart, (Appendix C), with most of the information on each spun sample, in order to quickly compare information such as grist, count and even the yarn types. I used Anne Field’s information (1995, 11) and a chart from A Knitter’s Companion, an article in Spin off (Square, 1996) to decide what type of yarns I had produced.
Fleece Analysis

Breed --- GROMARK - a Border Leicester cross

Source --- Fran MacPherson, Merville, B.C.

Staple length --- avg. 4"

Staple shape --- slightly pointed, well defined

Crimp pattern --- avg. 5/inch

Fibre size --- medium

Colour --- washed; off-white, pale yellow tips

Lustre --- high

Bulk --- medium high

Cleanliness --- raw, little vegetation, some canary stain, easily opened tips

Soundness --- no breaks, some tippy ends and some areas had little crimp
Sample A

Breed --- GROMARK

Crimps/inch --- 5 = Bumps/inch --- 5

Required plied tpi --- 2.5

Ratio --- 4.9:1

Spinning method --- worsted from handcarded roving

Twist direction --- ZZS

Number of treadles/12” draw in singles (Z) --- 9

Number of treadles in 2-ply yarn (S) --- 6

<table>
<thead>
<tr>
<th>Singles tpi --- 3.75</th>
<th>Singles wpi --- 15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plied tpi --- 2</td>
<td>(after washing) --- 2 - 2.5</td>
</tr>
<tr>
<td>Plied bpi --- 4</td>
<td>(after washing) --- 5</td>
</tr>
<tr>
<td>Plied wpi --- 10</td>
<td>(after washing) --- 8</td>
</tr>
<tr>
<td>Yardage --- 68 yds</td>
<td>(after washing) --- 64.5 yds</td>
</tr>
<tr>
<td>Weigh --- not recorded</td>
<td>(after washing) --- 61 g</td>
</tr>
<tr>
<td>Count --- not recorded</td>
<td>(after washing) --- 1.7</td>
</tr>
</tbody>
</table>

Knitting instructions --- needle size = 5.5 mm, 4 sts. and 5 rows/inch

4-inch sampler used --- 9.5 yds and 5.3 g

Comments --- When the crimps per inch = the bumps per inch the sheen is maintained.

This is a chunky yarn with elasticity that knits up nicely. Because the yarn is spun worsted, it will wear well.

End-use suggestions --- This yarn is a nice weight for an outdoor sweater and would be good for weaving projects as well.
GROMARK - Sample A
Sample B

Breed --- GROMARK

Crimps/inch --- 5 > Bumps/inch --- 3

Required plied tpi --- 1.5

Ratio --- 4.9:1

Spinning method --- worsted from handcarded roving

Twist direction --- ZZS

Number of treadles/12" draw in singles (Z) --- 6

Number of treadles in 2-ply yarn (S) --- 4

Singles tpi --- 2.5

Plied tpi --- 1 - 1.5

Plied bpi --- 3

Plied wpi --- 5

Yardage --- 43.5 yds

Weight --- 68.5 g

Count --- 1.03

Singles wpi --- 9 - 10

Plies wpi --- (after washing) --- 1.25 - 1.5

Plies bpi --- (after washing) --- 2.5 - 3

Plies wpi --- (after washing) --- 5

Yardage --- (after washing) --- 41 yds

Weight --- (after washing) --- 70 g

Knitting instructions --- needle size = 7.5 mm, 3 sts. and 3.5 rows/inch

4-inch sampler used --- 5 yds and 11.5 g

Comments --- When the crimps per inch are more than the bumps per inch, there is less
sheen in the yarn. This is a bulky yarn with more loft than the other Gromark
samples that are spun with more twist per inch. It has a fuzzy surface and some
elasticity.

End-use suggestions --- This yarn would be suitable for outerwear. One might weave this
yarn into a decorative rug that is not subjected to a lot of wear.
GROMARK - Sample B
Sample C

Breed --- GROMARK

Crips/inch --- 5 < Bumps/inch --- 8  
Ratio --- 5.9:1  
Spinning method --- worsted from handcarded roving  
Twist direction --- ZZS

Number of treadles/12" draw in singles (Z) --- 12

Number of treadles in 2-ply yarn (S) --- 7

Singles tpi --- 6  
Plied tpi --- 3.5  
Plied bpi --- 7  
Plied wpi --- 16  
Yardage --- 200 yds

Singles wpi --- 26 - 28  
(after washing) --- 3 - 3.5  
(after washing) --- 7  
(after washing) --- 13  
(after washing) --- 185 yds

Weight --- 61.5 g  
Count --- 5.27  
(after washing) --- 63.2 g  
(after washing) --- 4.8

Knitting instructions --- needle size = 3 mm, 6.5 sts. and 8 rows/inch.

4-inch sampler used --- 11 yds and 8.8 g

Comments --- When the crimps per inch in the fleece are less than the bumps in the yarn, 
the sheen in the yarn is quite apparent with a pearly look. This yarn still has 
elasticity and the surface is fuzzy. This sport-weight yarn appeals to my eye.

End-use suggestions --- This yarn would be nice for an indoor cardigan, but it might be a 
bit prickly for some people to wear next to the skin.
GROMARK - Sample C
Sample D # 2

Breed --- GROMARK

Crimps/inch --- 5 = Bumps/inch --- 5  
Required plied tpi --- 2.5

Ratio --- 8.6:1 - Z and 4.9:1 - S

Spinning method --- worsted from handcarded roving

Twist direction --- ZZS

Number of treadles/12” draw in singles (Z) --- 10 on 8.6:1

Number of treadles in 2-ply yarn (S) --- 6 on 4.9:1, using a ratio closest to the twist

Singles tpi --- 7  
Singles wpi --- 15

Plied tpi --- 2.5  
(after washing) --- 2 - 2.5

Plied bpi --- 5  
(after washing) --- 4 - 5

Plied wpi --- 8  
(after washing) --- 8

Yardage --- 43.5 yds  
(after washing) --- 42.5 yds

Weight --- 51.8 g  
(after washing) --- 52.3 g

Count --- 1.4  
(after washing) --- 1.3

Knitting instructions --- needle size = 4.5 mm, 4 sts. and 5 rows/inch

4-inch sampler used --- 10.5 yds and 12.7 g

Comments --- The first sample was hard, kinky, and nearly impossible to ply, and I gave up. I went back after all the other samples were spun and tried again using 2 different ratios and this one turned out a little better using a lower plying ratio.

End-use suggestions --- A sturdy, worsted-weight yarn that may be suitable for outdoor garments. I would like to see how it dyes because the sheen is so high. This smooth, tightly spun yarn would be suitable to weave home decorating projects.
GROMARK - Sample D
Fleece Analysis

Breed --- UNKNOWN

Source --- Hope Slater, Powell River, B.C.

Staple length --- avg. 2.5 - 3"

Staple shape --- crimpy, pointed tips and broad butt ends

Crimp pattern --- 10/inch, uneven pattern

Fibre size --- medium fine

Colour --- creamy white

Lustre --- all-over low, shiny tips

Bulk --- medium

Cleanliness --- raw, very greasy; some vegetation; dirty, matted tips; lots of yolk and black kempy fibres

Soundness --- good
Sample A

Breed --- UNKNOWN

Crimps/inch --- 10 = Bumps/inch --- 10  Required plied tpi --- 5

Ratio --- 8.6:1

Spinning method --- semi-worsted from handcarded rolags

Twist direction --- ZZS

Number of treadles/12" draw in singles (Z) --- 11

Number of treadles in 2-ply yarn (S) --- 7

Singles tpi --- 7.8  Singles wpi --- 30
Plied tpi --- 4 - 5  (after washing) --- avg. 5
Plied bpi --- 7  (after washing) --- 10
Plied wpi --- 14  (after washing) --- 14
Yardage --- 110 yds  (after washing) --- 99.3 yds
Weight --- 24.2 g  (after washing) --- 24.6 g
Count --- 7.4  (after washing) --- 6.5

Knitting instructions --- needle size = 3.5 mm, 7 sts. and 10 rows/inch

4-inch sampler used --- 15.5 yds and 3.8 g

Comments --- I changed from drum carding to hand carding to decrease the noils. I spun worsted to better control the diameter. This yarn tends to be over-plied when skeined but it becomes balanced once washed.

End-use suggestions --- This soft, very elastic fingering yarn is nice enough to wear against the skin. It should wear well and using it for warp, knitting or crocheting would be an idea.
UNKNOWN BREED - Sample A
Sample B

Breed --- UNKNOWN

Crimps/inch --- 10 > Bumps/inch --- 7

Ratio --- 5.9:1

Spinning method --- semi-worsted from handcarded rolags

Twist direction --- ZZS

Number of treadles/12" draw in singles (Z) --- 11

Number of treadles in 2-ply yarn (S) --- 7

Singles tpi --- 5.25

Plied tpi --- 3 - 3.5

Plied bpi --- 6 - 7

Plied wpi --- 11

Yardage --- 60 yds

Weight --- 26 g

Count --- 3.74

Singles wpi --- 21

(after washing) --- 3.5 - 4

(after washing) --- 7 - 8

(after washing) --- 10

(after washing) --- 56.5 yds

(after washing) --- 26 g

(after washing) --- 3.52

Knitting instructions --- needle size = 4.5 mm, 5 sts. and 7 rows/inch

4-inch sampler used --- 14 yds and 13 g

Comments --- I found the same problem with noils in this yarn as in sample A. The noils seemed to develop in the drafting process as well as in the preparation.

End-use suggestions --- This is a lofty, elastic, worsted-weight yarn that even though it may be soft enough to wear against the skin, would be best for a bulky, outdoor sweater or hat. It could also be used for warp threads in a weaving project.
UNKNOWN BREED - Sample B
Sample C

Breed --- UNKNOWN

Crimps/inch --- 10 < Bumps/inch --- 16  
Required plied tpi --- 8

Ratio --- 12.5:1

Spinning method --- semi-worsted from handcarded rolags

Twist direction --- ZZS

Number of treadles/12" draw in singles (Z) --- 12

Number of treadles in 2-ply yarn (S) --- 8

Singles tpi --- 12.5  
Plied tpi --- 7.5  
Plied bpi --- 15  
Plied wpi --- 26  
Yardage --- 62 yds  
Weight --- 9.3 g  
Count --- 10.8

Singles wpi --- 48  
(after washing) --- 7.5  
(after washing) --- 15  
(after washing) --- 22  
(after washing) --- 60 yds  
(after washing) --- 9.3 g  
(after washing) --- 9.9

Knitting instructions --- needle size = 2 mm, 9 sts. and 15 rows/inch

4-inch sampler used --- 25 yds and 3.7 g

Comments --- This yarn is harsh and pebbly feeling and one should not wear it next to the skin. It even hurt my hands to knit it up. It should wear well, however.

End-use suggestions --- I think this fingering yarn should be used for woven fabric and needle work.
UNKNOWN BREED - Sample C
Sample D

Breed --- UNKNOWN

Crimps/inch --- 10 = Bumps/inch --- 10

Required plied tpi --- 5

Ratio --- 15.8:1

Spinning method --- woollen, point of contact from handcarded rolags

Twist direction --- ZZS

Number of treadles/12" draw in singles (Z) --- 11

Number of treadles in 2-ply yarn (S) --- 7 (2/3 of singles treadles)

Singles tpi --- 15

Singles wpi --- 30

Plied tpi --- 7.5 - 8.5

(after washing) --- avg. 8 - 9

Plied bpi --- 15 - 17

(after washing) --- 16 - 18

Plied wpi --- 15 - 16

(after washing) --- 14

Yardage --- 28 yds

(after washing) --- 26.5 yds

Weight --- 13.5 g

(after washing) --- 13.5 g

Count --- 6.3

(after washing) --- 5.9

Knitting instructions --- needle size = 3.25 mm, 6 sts. and 7 rows/inch

4-inch sampler used --- 15 yds and 7.2 g

Comments --- This yarn is overspun, harsh and kinky and it took a lot of tension on the wheel and between my hands to ply it using 2/3 the singles treadles. I tried this yarn three times with little success. This yarn is not in keeping with the character of the fleece. It has no loft or elasticity.

End-use suggestions --- In my opinion this yarn would be good for cordage, warp for weaving and maybe for needlework. I labelled this yarn as double-knitting.
UNKNOWN BREED - Sample D
Fleece Analysis

Breed --- CHEVIOT

Source --- Anna Guthrie, Merville, B.C.

Staple length --- avg. 4.5"

Staple shape --- long, slender, pointed tips

Crimp pattern --- 11/inch, some of the shorter locks were 13/inch

Fibre size --- medium fine

Colour --- white with creamy tips

Lustre --- low

Bulk --- medium

Cleanliness --- raw, a few tags, some cotty areas, vegetation, dirty, brittle tips, black kempy fibres, second cuts and dye stain

Soundness --- good, no breaks
Sample A

Breed --- CHEVIOT

Crimps/inch --- 11 = Bumps/inch --- 11  
Required plied tpi --- 5.5

Ratio --- 8.6:1

Spinning method --- locks were flicked, then drumcarded into roving and spun worsted

Twist direction --- ZZS

Number of treadles/12" draw in singles (Z) --- 12

Number of treadles in 2-ply yarn (S) --- 8

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<tr>
<td>ppi</td>
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</tr>
<tr>
<td>wpi</td>
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<tr>
<td>Weight</td>
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<td>Count</td>
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<td>wpi</td>
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<td>10 - 11</td>
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<tr>
<td>(after washing)</td>
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<tr>
<td>Yardage</td>
<td>56.8 yds</td>
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<tr>
<td>Weight</td>
<td>13.2 g</td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>7</td>
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Knitting instructions --- needle size = 3 mm, 7.5 sts. and 10 rows/inch
4-inch sampler used --- 18.3 yds and 4.3 g

Comments --- This fingering yarn has sheen and elasticity and should wear well because of its smooth, worsted spin.

End-use suggestions --- This all-purpose yarn can be used for knitting, crocheting or weaving. An indoor sweater or light summer sweater knit from this yarn would be best, as it is a bit fine to use as an outdoor sweater for cooler weather. It could be used for knitting toques or mitts.
CHEVIOT - Sample A
Sample B

Breed --- CHEVIOT

Crimps/inch --- 11 > Bumps/inch --- 6  
Required plied tpi --- 3

Ratio --- 4.9:1

Spinning method --- locks were flicked, then drumcarded into roving and spun worsted

Twist direction --- ZZS

Number of treadles/12" draw in singles (Z) --- 11

Number of treadles in 2-ply yarn (S) --- 7

Singles tpi --- 4.5  
Singles wpi --- 18

Plied tpi --- 2.5  
(after washing) --- 3 - 3.5

Plied bpi --- 5 - 7  
(after washing) --- 6 - 7

Plied wpi --- 10  
(after washing) --- 8

Yardage --- 56 yds  
(after washing) --- 46.7 yds

Weight --- 25.5 g  
(after washing) --- 26 g

Count --- 3.6  
(after washing) --- 2.9

Knitting instructions --- needle size = 4.5 mm, 5 sts. and 7 rows/inch

4-inch sampler used --- 10 yds and 6 g

Comments --- This chunky yarn is smooth, soft and elastic.

End-use suggestions --- This heavier yarn would be appropriate for outdoor sweaters and hats. One may also crochet or weave this yarn into lap robes, afghans or throws.
CHEVIOT - Sample B
Sample C

Breed --- CHEVIOT

Crimps/inch --- 11 < Bumps/inch --- 14  
Required plied tpi --- 7

Ratio --- 10.8:1

Spinning method --- locks were flicked, then drumcarded into roving and spun worsted

Twist direction --- ZZS

Number of treadles/12” draw in singles (Z) --- 12

Number of treadles in 2-ply yarn (S) --- 8

Singles tpi --- 10.8  
Singles wpi --- 42

Plied tpi --- 6.5 - 7  
(after washing) --- 6.5 - 7.5

Plied bpi --- 13 - 14  
(after washing) --- 13 - 15

Plied wpi --- 28  
(after washing) --- 24

Yardage --- 86 yds  
(after washing) --- 74 yds

Weight --- 11 g  
(after washing) --- 11 g

Count --- 12.7  
(after washing) --- 10.9

Knitting instructions --- needle size = 2.75 mm, 8 sts. and 11 rows/inch

4-inch sampler used --- 19 yds and 2.5 g

Comments --- This fingering yarn has some sheen and feels comfortable enough to wear next to the skin. On smaller size needles, it would be a firmer fabric.

End-use suggestions --- I think this yarn would be nice for an indoor sweater or one could crochet or weave it into fine fabric for garments.
CHEVIOT - Sample C
Sample D

Breed --- CHEVIOT

Crimps/inch --- 11 = Bumps/inch --- 11

Ratio --- 15.8:1

Spinning method --- locks were flicked, then drumcarded into roving and spun worsted

Twist direction --- ZZS

Number of treadles/12" draw in singles (Z) --- 12

Number of treadles in 2-ply yarn (S) --- 8 (2/3 of singles treadles)

Singles tpi --- 16.5  
Plied tpi --- 9.5  
Plied bpi --- 19  
Plied wpi --- 22  
Yardage --- 62 yds  
Weight --- 17.5 g  
Count --- 5.7

Singles wpi --- 33  
(after washing) --- 9 - 10.5  
(after washing) --- 18 - 21  
(after washing) --- 20  
(after washing) --- 55 yds  
(after washing) --- 18 g  
(after washing) --- 5

Knitting instructions --- needle size = 2.75 mm, 7 sts. and 10 rows/inch

4-inch sampler used --- 16 yds and 5 g

Comments --- The knitted sample using this yarn skews badly from the extra twist. It is quite elastic however. It might be better to work with if it had been spun into a cabled yarn. This yarn has been labelled as double-knitting.

End-use suggestions --- I would not chose this yarn for any knitted project because it is so coarse, but it might be good for some needlework.
Fleece Analysis

Breed --- ROMNEY

Source --- Rondi Opko, Texada Island, B.C.

Staple length --- varies, using 6" staple

Staple shape --- pointed tips

Crimp pattern --- 3/inch

Fibre size --- medium bulky

Colour --- creamy

Lustre --- high

Bulk --- high

Cleanliness --- previously washed, small bits of vegetation, some noils

Soundness --- some breaks
Sample A

Breed --- ROMNEY

Crimps/inch --- 3 = Bumps/inch --- 3
Ratio --- 4.9:1

Spinning method --- worsted from drumcarded roving

Twist direction --- ZZS

Number of treadles/12" draw in singles (Z) --- 6

Number of treadles in 2-ply yarn (S) --- 4

Singles tpi --- 2.25
Singles wpi --- 9
Plied tpi --- 1.5 - 2
(after washing) --- 1.25 - 1.75
Plied bpi --- 2.5 - 3.5
( after washing) --- 2.5 - 3.5
Plied wpi --- 5 - 6
( after washing) --- 5
Yardage --- 44 yds
( after washing) --- 42.5 yds
Weight --- 70 g
( after washing) --- 76 g
Count --- 1
( after washing) --- 1

Knitting instructions --- needle size = 7.5 mm, 2.5 sts. and 4 rows/inch

4-inch sampler used --- 5.5 yds and 11.5 g

Comments --- Although this bulky yarn lacks elasticity, it is soft and has a sheen that diminishes once one knits with it. Because it has been over-plied, it skews slightly when knitted. I could have used smaller size needles for a firmer fabric.

End-use suggestions --- It will make a nice heavy sweater for winter wear and will be a good weft yarn in a woven project.
ROMNEY - Sample A
Sample B

Breed --- ROMNEY

Crimps/inch --- 3 > Bumps/inch --- 2

Ratio --- 4.9:1

Spinning method --- worsted from drumcarded roving

Twist direction --- ZZS

Number of treadles/12" draw in singles (Z) --- 4

Number of treadles in 2-ply yarn (S) --- 2

Singles tpi --- 1.5

Plied tpi --- 0.75 - 1

Plied bpi --- 1.5 - 2

Plied wpi --- 4

Yardage --- 16 yds

Weight --- 59 g

Count --- 0.44

Singles wpi --- 6

(after washing) --- 0.75 - 1

(after washing) --- 1.5 - 2

(after washing) --- 3

(after washing) --- 15 yds

(after washing) --- 57 g

(after washing) --- 0.43

Knitting instructions --- needle size = 13 mm, 1.75 sts. and 2 rows/inch

4-inch sampler used --- 5 yds and 17 g

Comments --- It is a little difficult to knit with such a bulky yarn. Like sample A, it has
lost its sheen after knitting and may pill because there is much more soft surface
exposed that would be subject to abrasion.

End-use suggestions --- This would be best for a decorative rug not subjected to wear or
for a very heavy outdoor sweater.
Sample C

Breed --- ROMNEY

Crimps/inch --- 3 < Bumps/inch --- 6

Ratio --- 4.9:1

Spinning method --- worsted from drumcarded roving

Twist direction --- ZZS

Number of treadles/12" draw in singles (Z) --- 11

Number of treadles in 2-ply yarn (S) --- 7

Singles tpi --- 4.5

Plied tpi --- 3

Plied bpi --- 6

Plied wpi --- 9

Yardage --- 41 yds

Weight --- 26 g

Count --- 2.5

Singles wpi --- 18

(after washing) --- 2.5 - 3.5

(after washing) --- 6

(after washing) --- 9

(after washing) --- 38.7 yds

(after washing) --- 26.5 g

(after washing) --- 2.34

Knitting instructions --- needle size = 5 mm, 4 sts. and 5 rows/inch

4-inch sampler used --- 9 yds and 6.7 g

Comments --- This yarn has the most sheen of the Romney samples, but like the others, develops a fuzzy surface. If knit on smaller size needles the firmer fabric would likely wear better.

End-use suggestions --- I labelled this a chunky yarn. It is all-purpose and can be crocheted or woven. This yarn is a good weight for outdoor garments in spring and fall.
Sample D

Breed --- ROMNEY

Crimps/inch --- 3 = Bumps/inch --- 3

Required plied tpi --- 1.5

Ratio --- 4.9:1

Spinning method --- worsted from drumcarded roving

Twist direction --- ZZS

Number of treadles/12" draw in singles (Z) --- 11

Number of treadles in 2-ply yarn (S) --- 7 (2/3 of singles treadles)

Singles tpi --- 4.5

Singles wpi --- 9

Plied tpi --- 2.5 - 3

(after washing) --- 3

Plied bpi --- 5 - 6

(after washing) --- 6

Plied wpi --- 6

(after washing) --- 5

Yardage --- 17 yds

(after washing) --- 17 yds

Weight --- 48 g

(after washing) --- 48 g

Count --- 0.6

(after washing) --- 0.6

Knitting instructions --- needle size = 7.5 mm, 2.5 sts. and 3 rows/inch

4-inch sampler used --- 6.5 yds and 19.5 g

Comments --- This tightly spun yarn reflects light, has a pebbly feel and produces a firm fabric without changing to smaller size needles as in samples A and C.

End-use suggestions --- I would not choose this yarn for any knitted project as it is harsh, but it may be useful for warp in a woven item.
Fleece Analysis

Breed --- MERINO

Source --- Level One, Master Spinner Program, Olds College, AB

Staple length --- avg. 3.25"

Staple shape --- flat tips

Crimp pattern --- 12/inch

Fibre size --- fine

Colour --- dark brown, with some grey streaks, tips were sunburnt

Lustre --- low

Bulk --- medium

Cleanliness --- previously washed but retained a lot of grease. There was some vegetation, and a pale horizontal line through some staples.

Soundness --- no breaks
Sample A

Breed --- MERINO

Crimps/inch --- 12 = Bumps/inch --- 12  
Required plied tpi --- 6

Ratio --- 8.6:1

Spinning method --- semi-worsted from handcarded rolags

Twist direction --- ZZS

Number of treadles/12” draw in singles (Z) --- 13

Number of treadles in 2-ply yarn (S) --- 9

Singles tpi --- 9.3  
Singles wpi --- 36

Plied tpi --- 6  
(after washing) --- avg. 6

Plied bpi --- 12  
(after washing) --- avg. 12

Plied wpi --- 22  
(after washing) --- 16

Yardage --- 69 yds  
(after washing) --- 57.5 yds

Weight --- 10.5 g  
(after washing) --- 10.5 g

Count --- 10.7  
(after washing) --- 8.9

Knitting instructions --- needle size = 2.75 mm, 8 sts. and 12 rows/inch

4-inch sampler used --- 16 yds and 3 g

Comments --- This fibre was sticky to card and draft. This yarn bulks up and the grist is uneven. The large rate of shrinkage made it difficult to gauge how much fibre should be present in the drafting zone in order to produce the correct amount of twist per inch in the washed yarn. There was a lot of waste with this fibre.

End-use suggestions --- This yarn is soft enough for any garment worn next to the skin. Crochet, knit or weave this fingering size yarn.
Sample B

Breed --- MERINO

Crimps/inch --- 12 > Bumps/inch --- 8

Required plied tpi --- 4

Ratio --- 5.9:1

Spinning method --- worsted from handcarded rolags

Twist direction --- ZZS

Number of treadles/12" draw in singles (Z) --- 12

Number of treadles in 2-ply yarn (S) --- 8

Singles tpi --- 6

Singles wpi --- 24

Plied tpi --- 3.5 - 4.5

(after washing) --- 3.5 - 4.5

Plied bpi --- varied

(after washing) --- avg. 8

Plied wpi --- 13

(after washing) --- 11

Yardage --- 41 yds

(after washing) --- 34 yds

Weight --- 12.5 g

(after washing) --- 12.7 g

Count --- 5.3

(after washing) --- 4.3

Knitting instructions --- needle size = 3.25 mm, 6 sts. and 9 rows/inch

4-inch sampler used --- approx. 12 yds and 4.5 g

Comments --- This fibre is shrinking 6"/yd and drafting has not been smooth, creating uneven grist again. This yarn is heavy and dense. The sun-bleached tips show on the surface.

End-use suggestions --- This should make cozy garments or throws. It may be prone to pilling because more of the fibre surface is vulnerable to abrasion. Weaving, knitting and crocheting with this soft, double knitting yarn makes nice projects.
MERINO - Sample B
Sample C

Breed --- MERINO

Crimps/inch --- 12 < Bumps/inch --- 14  
Required plied tpi --- 7

Ratio --- 10.8:1

Spinning method --- worsted from handcarded roving (sliver pulled off the carder)

Twist direction --- ZZS

Number of treadles/12" draw in singles (Z) --- 12

Number of treadles in 2-ply yarn (S) --- 8

Singles tpi --- 10.5  
Singles wpi --- 42

Plied tpi --- 7  
(after washing) --- 6.5

Plied bpi --- 12  
(after washing) --- 11 - 14

Plied wpi --- 28  
(after washing) --- 22

Yardage --- 73.5 yds  
(after washing) --- 63.5 yds

Weight --- 10 g  
(after washing) --- 10 g

Count --- 11.9  
(after washing) --- 10.3

Knitting instructions --- needle size = 2 mm, 9.5 sts. and 12 rows/inch

4-inch sampler used --- 20 yds and 3.3 g

Comments --- I was still getting uneven grist from spinning with sliver.

End-use suggestions --- With a lighter coloured fleece, a pattern would show nicely. I think this would be nice knitted into baby garments, evening shawls, sweaters and lacy scarves. Both crocheted and woven garments would be nice too.
Sample D

Breed --- MERINO

Crimps/inch --- 12 = Bumps/inch --- 12  Required plied tpi --- 6

Ratio --- 15.8:1

Spinning method --- worsted from handcarded roving (sliver pulled off the carder)

Twist direction --- ZZS

Number of treadles/12" draw in singles (Z) --- 13

Number of treadles in 2-ply yarn (S) --- 4 (I changed to 1/3 Z treadles hoping for better results)

Singles tpi --- 18  Singles wpi --- 36

Plied tpi --- 6 (4 - 4.5)  (after washing) --- 5.5 (6.5 - 8.5)

Plied bpi --- 12 (8 - 9)  (after washing) --- avg. 11 (15)

Plied wpi --- 24 (20)  (after washing) --- 18 (21)

Yardage --- 14.5 yds (22 yds)  (after washing) --- 13 yds (20 yds)

Weight --- 3.2 g (4.5 g)  (after washing) --- 3.2 g (4.5 g)

Count --- 7.4 (7.9)  (after washing) --- 6.6 (7.5)

Knitting instructions --- needle size = 2 mm, 9 sts. and 13 rows/inch

4-inch sampler used --- Information was not recorded, samplers were smaller than 4" as so much was wasted and I lacked the fibre.

Comments --- The numbers in brackets represent a second sample of yarn. I had difficulty producing a reasonably even grist with this sample. The shrinkage made the finished grist and tpi difficult to predict.

End-use suggestions --- This pebbly feeling yarn would be okay for hats and mittens.
MERINO - Sample D
Fleece Analysis

Breed --- SHETLAND / BORDER CHEVIOT cross

Source --- Jery Lowe, Laughing Crow Farm, Black Creek, B.C.

Staple length --- 5.5"

Staple shape --- pointed tips

Crimp pattern --- avg. 9/inch

Fibre size --- medium

Colour --- white

Lustre --- medium

Bulk --- medium

Cleanliness --- previously washed, still lots of vegetation, second cuts

Soundness --- no breaks
Sample A

Breed --- SHETLAND / BORDER CHEVIOT cross

Crimps/inch --- 9 = Bumps/inch --- 9

Required plied tpi --- 4.5

Ratio --- 5.9:1

Spinning method --- worsted from drumcarded roving, pre-drafted

Twist direction --- ZZS

Number of treadles/12" draw in singles (Z) --- 13

Number of treadles in 2-ply yarn (S) --- 9

Singles tpi --- 6.75

Singles wpi --- 27

Plied tpi --- 4.5

(after washing) --- 4 - 4.5

Plied bpi --- 8

(after washing) --- 8 - 9

Plied wpi --- 18

(after washing) --- 14

Yardage --- 90 yds

(after washing) --- 77.5 yds

Weight --- 20 g

(after washing) --- 20.5 g

Count --- 7.3

(after washing) --- 6.1

Knitting instructions --- needle size = 3.25 mm, 6.5 sts. and 9 rows/inch

4-inch sampler used --- 14.25 yds and 3.8 g

Comments --- After sampling spinning methods, I chose to spin the yarn worsted, for harder wearing yarn. Like Merino, this fibre shrinks a lot and becomes very elastic. It does retain some sheen. Noils formed in the drafting process and this yarn may pill. It was time consuming to prepare and there was a lot of waste.

End-use suggestions --- This seems like a nice soft all-purpose yarn, good for knitting, weaving and crocheting. I labelled this sport-weight.
SHETLAND/BORDER CHEVIOT - Sample A
Sample B

Breed --- SHETLAND / BORDER CHEVIOT cross

Crimps/inch --- 9 > Bumps/inch --- 6

Ratio --- 4.9:1

Spinning method --- worsted from drumcarded roving

Twist direction --- ZZS

Number of treadles/12" draw in singles (Z) --- 11

Number of treadles in 2-ply yarn (S) --- 7

Singles tpi --- 4.25

Singles wpi --- 18

Plied tpi --- 3

(after washing) --- 2.5 - 3

Plied bpi --- 5 - 6

(after washing) --- 5 - 6

Plied wpi --- 9.5

(after washing) --- 9

Yardage --- 64 yds

(after washing) --- 55 yds

Weight --- 30 g

(after washing) --- 30.5 g

Count --- 3.5

(after washing) --- 2.9

Knitting instructions --- needle size = 3.75 mm, 4 sts. and 6 rows/inch

4-inch sampler used --- 11 yds and 6.25 g

Comments --- I think this yarn is likely to pill. It is soft and elastic, with a little sheen. I called this yarn chunky.

End-use suggestions --- I think one can create many novelty woven or knitted items from this yarn, as well as heavy sweaters, hats, blankets or throws.
SHETLAND/BORDER CHEVIOT - Sample B
Sample C

Breed --- SHETLAND / BORDER CHEVIOT cross

Crimps/inch --- 9 < Bumps/inch --- 11  
Required plied tpi --- 5.5

Ratio --- 8.6:1

Spinning method --- worsted from drumcarded roving (pre-drafted)

Twist direction --- ZZS

Number of treadles/12" draw in singles (Z) --- 12

Number of treadles in 2-ply yarn (S) --- 8

Singles tpi --- 8.25  
Singles wpi --- 33

Plied tpi --- 5.5  
(after washing) --- 5.5 - 6

Plied bpi --- 10  
(after washing) --- 11 - 12

Plied wpi --- 21 - 22  
(after washing) --- 19

Yardage --- 106 yds  
(after washing) --- 93 yds

Weight --- 18.5 g  
(after washing) --- 18.7 g

Count --- 9.3  
(after washing) --- 8

Knitting instructions --- needle size = 3 mm, 7.25 sts. and 10 rows/inch

4-inch sampler used --- 19 yds and 4 g

Comments --- This finer yarn is not as soft as samples A and B and would not be as comfortable as a sweater worn next to the skin. Size 2.75 mm needles would produce a firmer fabric.

End-use suggestions --- It would make a nice cozy wrap, poncho or decorative throw with a definite pattern; such as lace, cable etc., as the tighter twist would show off the pattern. This is a sport-weight yarn.
SHETLAND/BORDER CHEVIOT - Sample C
Sample D

Breed --- SHETLAND / BORDER CHEVIOT cross

Crimps/inch --- 9 = Bumps/inch --- 9  
Required plied tpi --- 4.5

Ratio --- 13.1:1 (Z) and 4.9:1 (S)

Spinning method --- worsted from drumcarded roving

Twist direction --- ZZS

Number of treadles/12” draw in singles (Z) --- 12 on 13.1:1

Number of treadles in 2-ply yarn (S) --- 10 on 4.9:1, using a ratio closest to the twist

Singles tpi --- 13.5  
Singles wpi --- 27

Plied tpi --- 4  
(after washing) --- avg. 4.5

Plied bpi --- varied  
(after washing) --- avg. 9

Plied wpi --- 16  
(after washing) --- 11

Yardage --- 42 yds  
(after washing) --- 36 yds

Weight --- 22 g  
(after washing) --- 22 g

Count --- 3.1  
(after washing) --- 2.7

Knitting instructions --- needle size = 3 mm, 5.5 sts. and 8 rows/inch

4-inch sampler used --- 12 yds and 15.5 g

Comments --- This is not a soft, elastic yarn. I am not sure if this yarn will felt or full well.

End-use suggestions --- I suggest weaving this yarn tightly to make fabric for clothing or home décor. It may be useful for accessories such as handbags or hats.
SHETLAND/BORDER CHEVIOT - Sample D
Fleece Analysis

Breed --- JACOB

Source --- Fibre Works Studio, Pender Harbour, B.C.

Staple length --- 5"
Staple shape --- blunt tips
Crimp pattern --- 4/inch
Fibre size --- medium bulky
Colour --- multi; white, with small amounts of grey and black
Lustre --- high
Bulk --- high
Cleanliness --- pre-washed, still a bit greasy, very little vegetation, easy to hand tease
Soundness --- no breaks
Sample A

Breed --- JACOB

Crimps/inch --- 4 = Bumps/inch --- 4
Required plied tpi --- 2

Ratio --- 4.9:1

Spinning method --- worsted from drumcarded roving

Twist direction --- ZZS

Number of treadles/12" draw in singles (Z) --- 8

Number of treadles in 2-ply yarn (S) --- 5

Singles tpi --- 3
Singles wpi --- 12

Plied tpi --- 2
(after washing) --- 2

Plied bpi --- 4
(after washing) --- 4

Plied wpi --- 5 - 6
(after washing) --- 6

Yardage --- 39.5 yds
(after washing) --- 38 yds

Weight --- 63 g
(after washing) --- 63.2 g

Count --- 1.01
(after washing) --- 1

Knitting instructions --- needle size = 7.5 mm, 2.5 sts. and 4 rows/inch

4-inch sampler used --- 8.25 yds and 13 g

Comments --- This is an easy fibre to prepare and spin. Even though the butt end is still sticky, the fibres draft easily and I could have spun straight from the locks. For uniformity, I drumcarded the fleece and pulled it into roving. The subtle changes in colour are interesting.

End-use suggestions --- It is best to knit outdoor garments from this chunky yarn. It is not very soft for next-to-the-skin garments.
Sample B

Breed --- JACOB

Crimps/inch --- 4 > Bumps/inch --- 2

Required plied tpi --- 1

Ratio --- 4.9:1

Spinning method --- worsted from drumcarded roving

Twist direction --- ZZS

Number of treadles/12" draw in singles (Z) --- 4

Number of treadles in 2-ply yarn (S) --- 2.5

Singles tpi --- 1.5

Singles wpi --- 7

Plied tpi --- 1

(after washing) --- avg. 1

Plied bpi --- 2 - 3

(after washing) --- 1.5 - 2.25

Plied wpi --- 3

(after washing) --- 3

Yardage --- 20.5 yds

(after washing) --- 20 yds

Weight --- 80.3 g

(after washing) --- 80 g

Count --- 0.4

(after washing) --- 0.4

Knitting instructions --- needle size = 13 mm, 1.5 sts. and 2 rows/inch

4-inch sampler used --- 5 yds and 20 g

Comments --- I liked spinning this fleece because the drafting flowed so easily.

End-use suggestions --- This heavy yarn would make nice weft for a rug, or one could weave novelty baskets. It might even be suitable for a “Cowichan” style sweater.
JACOB - Sample B
Sample C

Breed --- JACOB

Crimps/inch -- 4 < Bumps/inch -- 8
Ratio --- 5.9:1

Required plied tpi --- 4

Spinning method --- worsted from drumcarded roving

Twist direction --- ZZS

Number of treadles/12” draw in singles (Z) --- 12

Number of treadles in 2-ply yarn (S) --- 8

Singles tpi --- 6
Singles wpi --- 24

Plied tpi --- 4
(after washing) --- 3.5

Plied bpi --- 8
(after washing) --- 7

Plied wpi --- 14
(after washing) --- 14

Yardage --- 50 yds
(after washing) --- 48 yds

Weight --- 18.2 g
(after washing) --- 17.8 g

Count --- 4.5
(after washing) --- 4.4

Knitting instructions --- needle size = 3.25 mm, 6.5 sts. and 8 rows/inch
4-inch sampler used --- 16 yds and 6.5 g

Comments --- This double knitting yarn is coarse and scratchy. The bumps per inch (8)
seemed correct during the spinning process, when plied back on itself. However,

once I plied and washed it, the twist relaxed to 6 bumps per inch in some areas.
This made it difficult to predict the outcome.

End-use suggestions --- I would dye this yarn and use for home décor projects. Bargello
and flame point patterns would be nice in woven tapestry or needlework.
JACOB - Sample C
Sample D

Breed --- JACOB

Crimps/inch --- 4 = Bumps/inch --- 4

Ratio --- 5.9:1 (Z) and 4.9:1 (S)

Spinning method --- worsted from drumcarded roving

Twist direction --- ZZS

Number of treadles/12" draw in singles (Z) --- 12 on 5.9:1

Number of treadles in 2-ply yarn (S) --- 5 on 4.9:1, using a ratio closest to the twist

Singles tpi --- 6

Singles wpi --- 12

Plied tpi --- 2

(after washing) --- 2 - 2.25

Plied bpi --- 4

(after washing) --- 4 - 4.5

Plied wpi --- 8

(after washing) --- 5

Yardage --- 40 yds

(after washing) --- 38.5 yds

Weight --- 76.5 g

(after washing) --- 76.7 g

Count --- 0.85

(after washing) --- 0.81

Knitting instructions --- needle size = 7.5 mm, 2.75 sts. and 3.5 rows/inch

4-inch sampler used --- 8 yds and 16 g

Comments --- This yarn is the closest I have spun to compare to sample A. It seems a bit thinner, but it is heavier. The extra Z twist still makes plying difficult. Knitting with this is harsh on the hands.

End-use suggestions --- This bulky yarn may be suitable for a tightly (to keep the air out) knit outdoor sweater and would be good for rug weft. I envision a Krogbrag pattern from brightly dyed yarn.
JACOB - Sample D
Fleece Analysis

Breed --- ROMNEY LAMB

Source --- Rondi Opko, Texada Island, B.C.

Staple length --- 3"

Staple shape --- pointy tips

Crimp pattern --- 6/inch (these staples tend to twist, making it difficult to count the tpi)

Fibre size --- medium bulky

Colour --- creamy-white

Lustre --- medium

Bulk --- medium

Cleanliness --- pre-washed, dirty tips and second cuts, very little vegetation, some kemp

Soundness --- some breaks and tippy ends
Sample A

Breed --- ROMNEY LAMB

Crimps/inch --- 6 = Bumps/inch --- 6

Required plied tpi --- 3

Ratio --- 4.9:1

Spinning method --- woollen, point of contact from handcarded rolags

Twist direction --- ZZS

Number of treadles/13" draw in singles (Z) --- 11

Number of treadles in 2-ply yarn (S) --- 7

Singles tpi --- 4.5

Singles wpi --- 20

Plied tpi --- avg. 2.5 - 3

(after washing) --- 2.5 - 3

Plied bpi --- 4 - 7

(after washing) --- 5 - 6

Plied wpi --- 12

(after washing) --- 12

Yardage --- 71 yds

(after washing) --- 67 yds

Weight --- 26 g

(after washing) --- 26 g

Count --- 8.3

(after washing) --- 7.8

Knitting instructions --- needle size = 3.25 mm, 5.5 sts. and 7 - 7.5 rows/inch

4-inch sampler used --- 13 yds and 5.2 g

Comments --- This fibre was easier to spin from a fluffy rolag rather than a tightly rolled one. The fleece had been disturbed and the crimp varied from one spot to the other. It was difficult to keep the tpi and diameter even. The yarn kept the sheen.

End-use suggestions --- This worsted-weight yarn is soft enough for a child’s sweater yet heavy enough for an outdoor sweater for spring or fall. It is useful for craft projects too.
ROMNEY LAMB - Sample A
Sample B

Breed --- ROMNEY LAMB

Crimps/inch --- 6 > Bumps/inch --- 4

Required plied tpi --- 2

Ratio --- 4.9:1

Spinning method --- woollen, point of contact from handcarded rolags

Twist direction --- ZZS

Number of treadles/13" draw in singles (Z) --- 8

Number of treadles in 2-ply yarn (S) --- 4

Singles tpi --- 3

Singles wpi --- 12

Plied tpi --- 1.5 - 2

(after washing) --- 1.75 - 2

Plied bpi --- 3 - 4

(after washing) --- 3.5 - 4

Plied wpi --- 6

(after washing) --- 6.5

Yardage --- 56 yds

(after washing) --- 51.5 yds

Weight --- 56.2 g

(after washing) --- 56.5 g

Count --- 0.3

(after washing) --- 2.8

Knitting instructions --- needle size = 4.5 mm, 3.5 - 4 sts. and 5 rows/inch

4-inch sampler used --- 8 yds and 10 g

Comments --- Five treadles (2/3 the Z treadles) was inserting too much twist and the yarn was clearly not balanced.

End-use suggestions --- This chunky yarn will knit into a very heavy outdoor sweater coat or hat. As well, it would be good for weft in a tightly woven rug.
ROMNEY LAMB - Sample B
Sample C

Breed --- ROMNEY LAMB

Crimps/inch --- 6 < Bumps/inch --- 8
Required plied tpi --- 4

Ratio --- 5.9:1

Spinning method --- woollen, point of contact from handcarded rolags

Twist direction --- ZZS

Number of treadles/12" draw in singles (Z) --- 12

Number of treadles in 2-ply yarn (S) --- 8

Singles tpi --- 6
Singles wpi --- 24

Plied tpi --- 3 - 4
(after washing) --- 3.5 - 4

Plied bpi --- 6 - 8
(after washing) --- 7 - 8

Plied wpi --- 16
(after washing) --- 15

Yardage --- 82.5 yds
(after washing) --- 77 yds

Weight --- 19.5 g
(after washing) --- 19.7 g

Count --- 12.8
(after washing) --- 11.8

Knitting instructions --- needle size = 2.75 mm, 7 sts. and 9 rows/inch

4 inch sampler used --- 17 yds and 4.3 g

Comments --- This yarn has a little sheen and I like how it knits up, but I do not like the handle. It is quite pebbly on the purl side and may be uncomfortable against the skin.

End-use suggestions --- Because the yarn is fine (fingering) it might make a nice vest to wear over a shirt or blouse. Something with a pattern would be appropriate here.
Sample D

Breed --- ROMNEY LAMB

Crimps/inch --- 6 = Bumps/inch --- 6  
Required plied tpi --- 3

Ratio --- 8.6:1 (Z) and 5.9:1 (S)

Spinning method --- woollen, point of contact from handcarded rolags

Twist direction --- ZZS

Number of treadles/12" draw in singles (Z) --- 12 on 8.6:1

Number of treadles in 2-ply yarn (S) --- 4 on 5.9:1, using a ratio closest to the twist

Singles tpi --- 9  
Singles wpi --- 18

Plied tpi --- avg. 3  
(after washing) --- 2.5 - 3

Plied bpi --- varied  
(after washing) --- varied

Plied wpi --- 12  
(after washing) --- 8

Yardage --- 46.5 yds  
(after washing) --- 45 yds

Weight --- 52.3 g  
(after washing) --- 52.3 g

Count --- 2.6  
(after washing) --- 2.6

Knitting instructions --- needle size = 6 mm, 3.5 sts. and 4.5 rows/inch

4 inch sampler used --- 10 yds and 11 g

Comments --- This yarn has a lot of sheen, but it is so tightly spun that it was difficult to

ply. The diameter and twist per inch are uneven. It was not easy to keep the twist

out of the fibre mass when spinning singles, and I tended to separate the mass

from the yarn. I tried twice for a better yarn and could not achieve it. Like sample

C of the Jacob fleece, it relaxed to a loose twist.

End-use suggestions --- Maybe this could be rug warp or weft. It is quite cord-like.
What I found was the finest yarns shrunk so much after washing that the plied twist per inch was no longer the amount required for the sample. Some of the yarns weighed heavier after washing which doesn’t seem logical. The only explanation I have is that they were not as dry as they felt when I weighed them after washing. I found that the finest and densest yarns were darker in colour, while most of the softest yarns were the lightest. Most of the finest yarns that were spun with more bumps per inch than the crimp in the fleece were the least elastic and the hardest. Sample D, while being the densest yarns, have the most sheen. The softest yarns were sample B, those spun with less twist per inch than the fleece crimp. These yarns were also most likely to pill from abrasion. Finally, the yarns I found most like the fleece itself were sample A yarns, spun with bumps equal to the crimp in the fleece.

Sample A yarns look nice and neat when knit and most of them are soft and elastic. Most sample B yarns are soft, lofty and light in colour, but the samplers look untidy. The samplers from C yarns are the neatest looking; however, they feel harsh or pebbly. I found some of the D samplers show the uneven twist. One-half of the stitch seems to stand out more and some of those spun according to the first interpretation (plying twist = 2/3 the spinning twist) tend to skew.

I tried three different methods of plying when doing sample D, Anne Field’s method, and in all cases found the yarns to be harsh. The extra twist that she requires in the singles produces an over-twisted yarn that is difficult to ply without a great deal of tension on the whorl and on the yarn as it comes off the bobbins. These yarns were also unpleasant to knit with, so much so, that they irritated my hands while working with them.
An extension of this study would include spinning the same fibres with the opposite method to that which I have used. For example, those fibres that were spun worsted could now be spun woollen to see if the figures and results are different.
Conclusions

In order to spin a yarn with a specific number of twists per inch, the spinner must have great control over the drafting zone of the fibre. It takes very little difference in the amount of fibre entering the twist to change the wraps per inch or the diameter of the yarn. This in turn affects the number of twists per inch that are present in the yarn produced. For example, if too much fibre is present in the drafting zone the yarn will have too few twists compared to the number of twists needed to create the required twist per inch. Yet if there is too little fibre present, there will be too many twists per inch than are required. The results show the yarns spun with the same number of bumps per inch as crimps per inch are most like the fleece characteristics.

When the spinner chooses to spin with a lot less twist than crimps per inch in the fleece, the yarn becomes vulnerable and susceptible to pilling. Perhaps it is even in danger of drifting apart. With too much twist, the yarns become harsh and wiry, more like cord. Too much twist can stretch the fibres in the yarn causing them to rupture and weaken.
Recommendations

I cannot say definitively that it is best to spin a 2-ply yarn with the same number of bumps per inch in the plied yarn as the number of crimps per inch in the fleece (sample A), but I recommend staying close to that figure according to the results of this study.

Sample B methods do produce a nice soft yarn when the number of twists per inch is less than the crimp, but they may be vulnerable. I caution against varying the twist per inch too much. I recommend sampling the finer fibres and carefully monitoring the shrinkage that will change the grist you require. I think this aspect could become a study of its own.

This study was limited to eight fleeces, but I would like to see it extended with any additional fleeces that I might acquire. There are many other aspects of the yarns that I feel can be explored. For example, one might look at the relationship between wraps per inch and the number of stitches per inch. The size of the needles and the tension would also have an effect on the knitted fabric. A study of these areas would greatly increase one's knowledge of handspun yarns.
References


Appendices
Appendix A

A chart comparing crimp numbers with spun and plied tpi and wpi

<table>
<thead>
<tr>
<th>A Crimp per 2.5cm (in) in fleece wool</th>
<th>B Twists per 2.5cm (in) in singles</th>
<th>C Wraps per 2.5cm (in) in singles</th>
<th>D Twists per 2.5cm (in) in two-ply yarn</th>
<th>E Wraps per 2.5cm (in) in two-ply yarn</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>3</td>
<td>6</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>4.5</td>
<td>9</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>12</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>6</td>
<td>7.5</td>
<td>15</td>
<td>5</td>
<td>10</td>
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<td>7</td>
<td>9</td>
<td>18</td>
<td>6</td>
<td>12</td>
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<tr>
<td>8</td>
<td>10.5</td>
<td>21</td>
<td>7</td>
<td>14</td>
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<tr>
<td>9</td>
<td>12</td>
<td>24</td>
<td>8</td>
<td>16</td>
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<tr>
<td>10</td>
<td>13.5</td>
<td>27</td>
<td>9</td>
<td>18</td>
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<tr>
<td>11</td>
<td>15</td>
<td>30</td>
<td>10</td>
<td>20</td>
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<tr>
<td>12</td>
<td>16.5</td>
<td>33</td>
<td>11</td>
<td>22</td>
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<td>13</td>
<td>18</td>
<td>36</td>
<td>12</td>
<td>24</td>
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<td>14</td>
<td>19.5</td>
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<td>16</td>
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<td>17</td>
<td>24</td>
<td>48</td>
<td>16</td>
<td>32</td>
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<td>18</td>
<td>25.5</td>
<td>51</td>
<td>17</td>
<td>34</td>
</tr>
<tr>
<td>19</td>
<td>27</td>
<td>54</td>
<td>18</td>
<td>36</td>
</tr>
<tr>
<td>20</td>
<td>28.5</td>
<td>57</td>
<td>19</td>
<td>38</td>
</tr>
</tbody>
</table>

from Anne Field, Spinning Wool: Beyond the Basics. Permission was granted in an email: A. Field (personal communication, June 28, 2009)
### appendix B: Comparing A and D yarns

<table>
<thead>
<tr>
<th>Breed</th>
<th>Sample</th>
<th>Fleece crimp</th>
<th>singles tpi</th>
<th>Singles wpi</th>
<th>2-ply tpi</th>
<th>2-ply bpi</th>
<th>2-ply wpi</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gromark</td>
<td>A</td>
<td>5</td>
<td>3.75</td>
<td>15</td>
<td>2.5</td>
<td>10</td>
<td></td>
<td>shiny, soft balanced and nice handle</td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>5</td>
<td>7.5</td>
<td>15</td>
<td>5</td>
<td>10</td>
<td></td>
<td>unbalanced, under-plied, yet still feels harsh and very firm</td>
</tr>
<tr>
<td>Unknown</td>
<td>A</td>
<td>10</td>
<td>7.8</td>
<td>30</td>
<td>5</td>
<td>20</td>
<td></td>
<td>elastic, soft, nice to knit. May be softer if WLN spun</td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>10</td>
<td>15</td>
<td>30</td>
<td>10</td>
<td>20</td>
<td></td>
<td>over-plied, heavy, harsh and cord-like</td>
</tr>
<tr>
<td>Cheviot</td>
<td>A</td>
<td>11</td>
<td>8.25</td>
<td>33</td>
<td>5.5</td>
<td>22</td>
<td></td>
<td>a firm, smooth, elastic yarn. Has some sheen.</td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>11</td>
<td>16.5</td>
<td>33</td>
<td>11</td>
<td>22</td>
<td></td>
<td>very elastic, highly twisted, cord-like, skews badly when knit</td>
</tr>
<tr>
<td>Romney</td>
<td>A</td>
<td>3</td>
<td>2.25</td>
<td>9</td>
<td>1.5</td>
<td>6</td>
<td></td>
<td>soft, shiny, lofty, somewhat elastic, and over-plied causing it to skew.</td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>3</td>
<td>4.5</td>
<td>9</td>
<td>3</td>
<td>6</td>
<td></td>
<td>softness and loftiness are lost with too much Z twist</td>
</tr>
<tr>
<td>Merino</td>
<td>A</td>
<td>12</td>
<td>9.3</td>
<td>36</td>
<td>6</td>
<td>24</td>
<td></td>
<td>very soft, delicate and elastic, somewhat under-plied.</td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>12</td>
<td>18</td>
<td>36</td>
<td>12</td>
<td>24</td>
<td></td>
<td>softness is lost with the extra Z twist required</td>
</tr>
<tr>
<td>Shetland/Border Cheviot</td>
<td>A</td>
<td>9</td>
<td>6.75</td>
<td>27</td>
<td>4.5</td>
<td>18</td>
<td></td>
<td>shiny and elastic, nice soft, balanced yarn</td>
</tr>
<tr>
<td>Shetland/Border Cheviot</td>
<td>D</td>
<td>9</td>
<td>13.5</td>
<td>27</td>
<td>9</td>
<td>18</td>
<td></td>
<td>balanced, elastic, too much Z twist , cord-like</td>
</tr>
<tr>
<td>Jacob</td>
<td>A</td>
<td>4</td>
<td>3</td>
<td>12</td>
<td>2</td>
<td>8</td>
<td></td>
<td>soft, smooth, shiny with some loft and elasticity</td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>4</td>
<td>6</td>
<td>12</td>
<td>4</td>
<td>8</td>
<td></td>
<td>darker, heavier, with a pebbly handle and little elasticity</td>
</tr>
<tr>
<td>Romney Lamb</td>
<td>A</td>
<td>6</td>
<td>4.5</td>
<td>18</td>
<td>3</td>
<td>12</td>
<td></td>
<td>nice soft yarn with some sheen, but little elasticity</td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>6</td>
<td>9</td>
<td>18</td>
<td>6</td>
<td>12</td>
<td></td>
<td>high sheen, pebbly, with little elasticity and a hard handle</td>
</tr>
</tbody>
</table>

Note: D samples are spun according to the figures on Anne Field's chart. See Appendix A
<table>
<thead>
<tr>
<th>Breed</th>
<th>lock</th>
<th>cpi</th>
<th>req. bpi</th>
<th>req. ptpi</th>
<th>ratio</th>
<th>spin</th>
<th>tpi</th>
<th>wpi</th>
<th>ptpi</th>
<th>pwpi</th>
<th>yds</th>
<th>g</th>
<th>count</th>
<th>yrs/sample</th>
<th>g/sample</th>
<th>yrs left</th>
<th>gm left</th>
<th>needles</th>
<th>yarn type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grossmark A</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>2.5</td>
<td>4.9:1</td>
<td>wts</td>
<td>3.75</td>
<td>15</td>
<td>2 - 2.5</td>
<td>8</td>
<td>64.5</td>
<td>61</td>
<td>1.7</td>
<td>9.5</td>
<td>5.3</td>
<td>46</td>
<td>44.5</td>
<td>5.5mm</td>
<td>bulky</td>
</tr>
<tr>
<td>B</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td>1.5</td>
<td>4.9:1</td>
<td>wts</td>
<td>2.5</td>
<td>9 - 10</td>
<td>1.25 - 1.5</td>
<td>5</td>
<td>41</td>
<td>70</td>
<td>1</td>
<td>5</td>
<td>11.5</td>
<td>30</td>
<td>53.2</td>
<td>7.5mm</td>
<td>bulky</td>
</tr>
<tr>
<td>Romney A</td>
<td>2</td>
<td>10</td>
<td>5</td>
<td>6.8:1</td>
<td>s-wrs</td>
<td>3.6</td>
<td>30</td>
<td>8 - 9</td>
<td>14</td>
<td>26.3</td>
<td>13.5</td>
<td>5.9</td>
<td>15</td>
<td>7.5</td>
<td>11.5 / 26.5</td>
<td>19.2</td>
<td>3.25mm</td>
<td>DK</td>
<td>2mm</td>
</tr>
<tr>
<td>B</td>
<td>2</td>
<td>10</td>
<td>3.5</td>
<td>5.9:1</td>
<td>s-wrs</td>
<td>2.5</td>
<td>16.5</td>
<td>5.5</td>
<td>9 - 10.5</td>
<td>20</td>
<td>56</td>
<td>26</td>
<td>3.5</td>
<td>14</td>
<td>16.5</td>
<td>28</td>
<td>13</td>
<td>4.5mm</td>
<td>wts wgt</td>
</tr>
<tr>
<td>Unknown A</td>
<td>2</td>
<td>10</td>
<td>8</td>
<td>12.5:1</td>
<td>s-wrs</td>
<td>12.5</td>
<td>48</td>
<td>4 - 5</td>
<td>14</td>
<td>99.3</td>
<td>24.6</td>
<td>6.5</td>
<td>15.5</td>
<td>3.8</td>
<td>68</td>
<td>16.5</td>
<td>3.5mm</td>
<td>fingering</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>2</td>
<td>10</td>
<td>8</td>
<td>5.9:1</td>
<td>s-wrs</td>
<td>5.9:1</td>
<td>20</td>
<td>15</td>
<td>7.5</td>
<td>11.5</td>
<td>36</td>
<td>9.5</td>
<td>1.5</td>
<td>2mm</td>
<td>4</td>
<td>9.5</td>
<td>1.5</td>
<td>2mm</td>
<td>fingering</td>
</tr>
</tbody>
</table>

Note: plied tpi (ptpi), plied wpi (pwpi), yds, g, and count refer to a washed measurement

<table>
<thead>
<tr>
<th>32 - yarn Comparison chart</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breed: RomneyLamb A:</td>
</tr>
<tr>
<td>Count: 36</td>
</tr>
<tr>
<td>Lock: 10</td>
</tr>
<tr>
<td>Yarn Type: Bulky</td>
</tr>
<tr>
<td>Sport Weight: Lyster 54</td>
</tr>
</tbody>
</table>

**Note:** Yarn type, sport weight, lock, and count are provided for reference. The yarn is identified as Lyster 54, indicating its specific characteristics and usability for crafting projects.
Look in windows explorer
Shirley,
I think I can see where we look at twists differently. If I want the finished plied yarn to have say 9 twists to the inch, I spin the singles with 6. This means I would choose a drive ratio of 6 (or as near as possible), and draft 2 inches of fibre for two treadles. Then I would ply this yarn with 6 twists (2/3 rds). This is similar to what you do. I do not bother to measure the plying draft length and treadles as I do with the singles. I just ply the two threads together for a yard or two, then count the twists. I count the bumps on one side. Then if there are too many twists I thin out the amount of the two singles I am feeding into the bobbin. too few twists I shorten the amount. I am not sure why you would need to count the tpi in the plied yarn by dividing the yard bumps by two. The twist in the plied yarn depends on the singles twist and should be 2/3s of that. I have never heard of anyone dividing the bumps by 2. 8 bumps in the plied yarn (counting only one side) makes that there are 8 twists in the plied yarn. That is the theoretical way I spin. In practice I make allowances for shrinkage and bulk which changes with each type of fleece. I explain that on page 149-152 in the 2002 edition. Let me know if this explanation helps.
Anne Field

Dear Anne,
I am also a spinner and weaver, for about 20 yrs. Right now I am studying to get my Master Spinner's Certificate from Olds College in Alberta B.C., Canada. I have both the Ashford book of Spinning and Spinning Wool: Beyond the Basics. I have poured over these books several times and I am still unclear on one thing. When I count twist per inch in the singles, it's pretty much through calculating using ratio, draft distance and number of treadles and plying. I calculate using 2/3 of the spinning treadles (basically). I count the tpi in my plied yarn by counting the bumps and dividing by 2 (2 ply) as I have been taught. For example if I have 8 bumps in the yarn my twists would be 4. I'm not sure that you are doing it the same way and the charts you provide don't seem to work for me! I can't find in the books anywhere that you say to divide the yard bumps by 2 to get the tpi in 2-plied yarn. I'm finding this quite confusing and wonder if you are able to straighten me out on this?
Sincerely, Shirley Lyster

Sent to Anne on June 28, 2009
Dear Anne,
I am about to write a research paper which is the last step towards receiving my Master Spinner's Certificate. I have chosen to write on the subject of spinning yarn according to the crimps per inch versus spinning it with more or less twist than the crimp. I am asking permission to use material from your book, Spinning Wool: Beyond the Basics; that may be relevant to my study. I would greatly appreciate this support.
Sincerely,
Shirley Lyster shirl_ml@shaw.ca

Rec'd from Anne June 28th 2009
NOTE new email address

Dear Shirley,
I am happy to give you permission to use material from my book. Good luck with your studies.
Anne Field
Anne Field - Arts Centre - Christchurch - New Zealand
See http://www.annesfield.co.nz
Glossary

balanced  yarn that has no twist in one direction or the other, hangs straight.

batt  carded fibres that are removed from the carder without being rolled into a rolag or being drawn off as roving through a diz.

bpi  the number of bumps per inch counted only on one side of a plied yarn.

break  a weakness in the length of the fibre caused by illness, poor nutrition or harsh weather.

carding  the process of preparing fleece using hand cards, a drumcarder or an electric carder.

cotted  matted fleece.

count  the number of hanks per pound that can be spun according to the spinning method used and the yardage amount assigned to that method. There are different values assigned to different fibres such as linen, cotton and silk.

crimp  the wavy bumps in the length of the lock, counted on only one side.

diameter  the thickness of the yarn, a good measure of consistency.

diz  a tool made of various materials such as wood, clay, metal, bone or plastic etc. that has a hole in it for pulling yarn through it to draw a rope-like preparation off the carder.

fleece  the whole amount of fibre sheared from one sheep rolled in a manner to keep it tidy so that it may be rolled out flat for inspection.

flick card  to use a small narrow carder in a tapping motion rather than a pulling motion in order to open the locks.

grist  is a length to weight measure, usually expressed as yards per pound.
handle  the actual feel of the yarn or fabric, refers to the softness, fineness, resilience.

kemp  coarse, wiry fibres, short in length and usually white, that are present in some breeds.

lock  separate clumps of fleece. Use these for fleece analysis.

loft  springiness, elasticity and bulkiness of the fleece compared to the weight.

noils  short tangled fibres that are best removed in the preparation process in order to make drafting flow more smoothly, thus creating a more consistent yarn.

plying  the act of spinning two or more singles together in the opposite direction (usually counter-clockwise) to create a stronger, balanced yarn, with a slant resembling an S.

ptpi  refers to plied twist per inch.

ratio  the difference in diameter of the drive wheel to the diameter of the spindle or bobbin whorl. This number represents the amount of twist per inch inserted into the yarn.

raw wool  dirty, greasy wool, as is shorn from the sheep.

rolags  a rolled batt, creating a tumble of fibres which retain air in the fibres, making the yarn lighter and warmer.

roving  fibres that are pulled off the carders in a parallel formation allowing smoother, denser spinning.

second cuts are formed when a second pass with the clippers is necessary during shearing.

singles  yarn spun in one direction only, usually turning the wheel clockwise that creates a slant in the yarn resembling a Z.

skirting  the act of removing debris and inferior fibres from a fleece (usually at the
edges) prior to having it washed.

**staple** the same as lock.

**tpi** refers to twist per inch (I used this to refer to twist in singles yarn).

**woollen** yarn spun from rolags, a batt that has been rolled off the carder.

**worsted** yarn spun from a parallel preparation, such as roving or top.

**wpi** refers to wraps per inch (I used this to refer to wraps in singles yarn).

**yarn type** different sources provide numbers that give an idea how handspun yarn compares to commercial yarn.