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Photo by Joe Coca.

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An antique comb used to dehair *pashm*, the fine Kashmiri fiber used in precious shawls.

Equipment is generally the largest, most expensive, and most treasured investment a spinner makes. Fiber—even the most special fiber—comes and goes, slipping from stash to fingers to spinning tool to yarn and onward. But your spinning tools develop their own personalities. They conform to your body as you spin, like the worn patches on the treadles. They may change your body, too, wearing a callus on your hand where the spindle shaft rolls off to spin.

My first wheel was ill-fated. It had a small but persistent materials defect that several replacement parts couldn't quite eradicate. The kind dealer made an exception and took the wheel back, and I moved on to my current faithful wheel. A few years later, I met someone at a conference and discovered that she'd bought my old wheel; the dealer had asked her to bear with him while they got the part right, and she had been spinning problem-free. A wheel that hadn't worked out for me was perfect for someone else. In this issue, Linda Martin offers tips on separating the perfect-for-you pre-owned wheel from the buyer-beware wheel so that you can have as happy an experience.

"It's a poor workman who blames his tools," my father used to say—but there's also wisdom to investing in the best tools for the job. Whether you have a top-of-the-line dream wheel or spindle or you're working on a wobbly hand-me-down (or an improvised tool—see Dale Jackson's delightful piece on page 112), you can probably make a greater range of yarn with it than you ever dreamed possible. In this issue, Constance Hall surprises herself with the variety of yarns she could spin, from burly to dainty, on a single spindle. Amy Tyler's lively article explains how spinner and spinning wheel work together, bound by delightful forces of physics.

This issue of *Spin·Off* celebrates all tools from lofty to humble. I hope it inspires you to look at an old piece of spinning equipment in a new way.

Happy spinning,

Anne

Anne Merrow
amerrow@interweave.com

My new equipment crush: a blending board! On page 52, Constance Hall weighs the benefits of this new-again tool (and has me hankering for one of my own).

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Spin·along

Bountiful Bamboo

The Fall Spin-along Kit went out later than usual (I'll tell you why in a minute), so our members didn't have much time to play with the fibers, much less make anything out of them. So we're going to tease you with a few spinners' prodigious efforts and look forward to seeing the story develop in our forum.

First, let me describe the fibers. I confess, I have never spun with any of them in my life before now: two different forms of processed bamboo (bast and rayon), one of bamboo rayon blended with Merino, and one glitzy nylon. The inspiration was Patsy Zawistoski's new video, *Spinning the New Fibers*. I've been prejudiced against the synthetics, lumping them all together with the ones I came to hate in the 1960s. But these bamboos are spinnable, environment-friendly (mostly), and interesting.

Members were invited to share their projects on a special *Spinning Daily* forum (http://bit.ly/spinalong, or click on the Spin-along logo on the spinningdaily.com homepage). Just look at what Robin Armstrong has done with hers! The cream/white/ivory palette of the raw fibers has become deep and mysterious. Diana Blair created a bold and cheerful stocking, and Jennifer Wickstrom created a subtle blended scarf, knitted lengthwise to show off the color transitions.

But back to why the kits were so late. Along with the fiber, we included a little tin box with some spinning wheel first-aid items, like a spare drive-band cord, a bar of beeswax, and a tiny oil bottle. The oil bottle had to come on a slow boat from China. Hence the delay. As of press time, we still have some kits left—you'll find them in the *Spinning Daily* section of the Interweave Store.

For Winter, we've put together something a bit different, and more familiar: three blended shades of red Merino (plus some red bamboo—you've really got to try it). Very festive, very holiday, very subtle (if all-red can be subtle). We're also including a make-your-own orifice hook kit, complete with beads, wire, and instructions. Just add pliers. Watch for it.

Happy spinning,

Linda

As Robin Armstrong notes, it was interesting to see how the different fibers took up the Gaywool Dyes (daisy and bluegum, half and half). She threw in some handspun Merino/silk, too. Her next step is to knit the yarns up into a simple shawl or cover-up. Stay tuned.

Diana Blair took the challenge to a whole new level, using each type of fiber differently to create a festive and lovely Christmas stocking. Celebrating the playful aspect of the challenge, she even used her needlefelting machine to transform the bast bamboo into solid fabric. (The bow is solid Merino roving.)

Jennifer Wickstrom embraced the bamboos by blending three varieties with Merino in several colors, then knitting them into a striped scarf.

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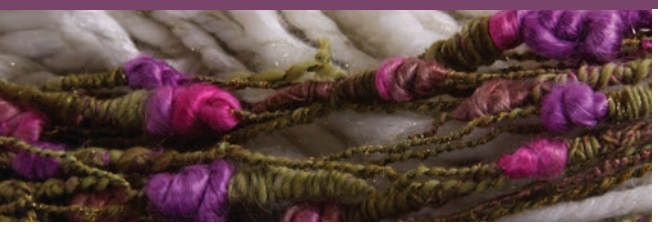

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Liz Good spun this yarn for Team *Spin·Off* last year despite a "whoops" with a kitchen knife.

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Whether you're an independent rogue spinner or a devoted team member, get out your fiber (as if you'd ever put it away!) and be part of the second annual event.

What do you need to do? Not much: join on the website and spin as much as you possibly can for one week in October. If you'd like to join one of the fifty teams (go Team *Spin·Off!*), you have until September 22; if you prefer to spin alone, you can sign up until October 3.

PHOTO COURTESY OF SCHACHT SPINDLE

Schacht Spindle's team is entirely made up of its employees. Maria Tejada and Lupe Lopez learned to spin as part of Schacht Spindle's 2013 Spinzilla team.

And why, you ask, would you do such a thing? Aside from the excuse to set aside chores and demands and just spin as though your life depended on it? Well, there are *prizes*. And trophies. (And it's also for a good cause.) Find out more at **www.spinzilla.org**.

Woolfest Features Herdwicks, Benefits Squirrels

Cumbria, a smallish district in western England, hosts one of the liveliest, most creatively programmed events in the world of sheep. Woolfest drew some five thousand people to this sparsely-populated region at the end of June 2014. Among the events, staged over three days, were a Rare Breeds Parade, a hand-shearing demonstration, and a robust celebration of the Herdwick breed—an "anarchic and watchfully intelligent" style of sheep. There were music, words by novelist Ann Lingard (author of *The Embalmer's Book of Recipes*), sale of a handsomely photographed book, and products made of Herdwick wool. And of course, lamb and mutton snacks.

But that is not all, by any means. The Fleecy Animal Auction this year benefited the Allerdale Red Squirrel Group, which, as you can imagine, is dedicated to preserving the genus *Sciurus vulgaris* which is not only adorable, but also on the decline. A spin-in capped off the event.

Next year's Woolfest is scheduled for Friday and Saturday, June 26–27 , 2015. Worth a trip, don't you think?

PHOTOS COURTESY OF SALLY SEED AND WOOLFEST.

This year's featured breed was the Herdwick, Cumbria's distinctive native sheep.

A hand-shearing demonstration (using traditional wool shears) features a Herdwick.

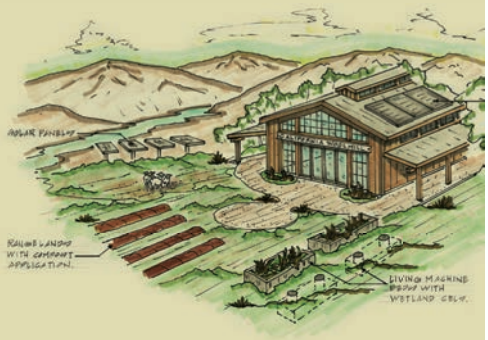
Think Globally, Dress Locally

The ambitious and creative Fibershed project has announced its third annual Wool & Fine Fiber Symposium, which will be held at the Dance Palace at Point Reyes Station, California, on November 15. The event, which centers around the theme of "Enhancing Diversity, Living with the Land," will include a panel on breeding for high-quality fiber and hands-on activities such as sheepshearing, skirting fleece, wool grading, Angora rabbit shearing, cashmere fiber processing, and natural dyes. There will also be a display of raw, handspun, and knitted fibers from around the region, and the Fibershed Marketplace will offer an array of local fibers and handmade goods.

PHOTO BY PAIGE GREEN

At the group's recent felted vest workshop, a small group of crafters began by meeting the sheep whose wool they would be using, then designed and created a vest with a naturally dyed embellishment. Felters carded the wool on the Cyclocarder (pictured above), a bicycle/drumcarder hybrid developed by felter Katharine Jolda.

Rebecca Burgess began the project as a local initiative, to create and wear a wardrobe whose fibers, colors, and labor were sourced from a region no larger than 150 miles from the project's headquarters. The Fibershed model has been adopted by groups in the United States, Canada, and Great Britain who share a set of core values. (For a list of Fibershed-affiliated groups in your area, visit www.fibershed.org/affiliates.)



The proposed California wool mill project would use renewable energy, water recycling, and composting systems. Only .03% of California's wool is currently processed within the state. Drawing by Bill O'Callaghan.

On a broader scale, Fibershed offers public education curricula on carbon and climate change for adults and a restoration dye garden for children. In another public education project, a group of volunteers gathered in 2013 to create felt panels that form the walls of a traditional-style wool yurt that now serves as a mobile classroom. The group also undertook a feasibility study for a California wool mill project for an entirely sustainable processing facility to support local farms and ranches.

For more information, email **fibershed@gmail.com** or visit the website at **www.fibershed.org**.

PHOTOS BY PAIGE GREEN

Fibershed's 2014 Wool & Fine Fiber Symposium highlights the group's dedication to local fibers, local natural dyes, and local labor.

The Spinner's Journey

Where to begin? With Prometheus, or Buddha, or Jason (of Greek mythology)? They exemplify Joseph Campbell's famous monomyth, a prototypical hero legend that appears in many cultures throughout history. But what do these iconic characters have to do with spinning? Their stories provide a pattern for inspiration, escape, and renewal in an online adventure titled Journey to the Golden Fleece Fiber Creativity Course, a yearlong odyssey guided by Arlene Thayer and Suzy Brown of **www.fiberygoodness.com**.

If this sounds too fanciful, just think of whether you have ever felt a little stuck in your craft. Maybe you keep spinning the same style of yarn, just because it's easy and familiar. Maybe you don't know how to push your skills, so you keep selecting the same kind of fiber, giving it the same preparation, drafting, plying, and finishing treatments. Maybe you are very, very good at this—but is that all there is?

PHOTO BY GRETE SPONGA

Participant Grete Sponga is spinning all her course yarns on a spindle, including this coiled and core spun yarn.

Journey to the Golden Fleece aims to inspire and challenge by presenting its members with eight different modules, one

delivered via PDF every six weeks. You read, you imagine, and you spin. You share what you've made via online galleries. You attend online spin-ins. You receive blog posts. You are gifted with coupons for lovely fibers. The final module challenges you to create a woven piece using the yarns you have spun, yarns you would never have dreamt of spinning before.

Enrollments for the Golden Fleece course will reopen in October 2014; two hundred students are currently participating. Thayer and Brown continue to develop content for the Fibery Goodness website and members-only resource library, and are also developing additional courses. Check the map of participants on the website, and you will see scores of spinners all over the globe (though mostly in English-speaking countries). Futuristic cyber-community meets ancient craft.

LETTERS

Editor's note: The following letter is in reply to Claudia M. Ward and Allison Porter, cochairs of the Monterey County Fair Wool Show, who wrote a letter in the Summer 2014 issue of Spin·Off, *which was in turn a response to the article "On Being Judgmental" in the Winter 2014 issue of* Spin·Off.

Your letter in the Summer issue of *Spin-Off* certainly points out many of the challenges faced by various fiber venues in different parts of the world. Our NwRSA Judges Training Program came about simply for the very reason you mentioned: the difficulty of finding good judges and the challenge with scorecards.

What is working for us in the Pacific Northwest may not be at all applicable for other venues but may at least provide a starting point. Yes, to become a certified judge with our program does require at least three years or more, but that is broken into two or three two-day classes, helping a certified judge at several regional fairs, and helping judge the gallery entries at our annual conference. Certainly it's not like taking a college course over a period of weeks or months.

One of the first instructions to judges in training as well as everyone else is: Read the Rules! Read the Rules! Read the Rules! As you pointed out, the Monterey County Fair Wool Show requires colored ties on the skeins while here in the Northwest, we prefer self-ties that do not detract from the appearance of the skeins. Some venues want skeins of a certain yardage while others want skeins of a specific weight. Whether someone is entering skeins and projects or is judging, reading the rules and following them is still an absolute must!

The various venue superintendents I've worked with typically follow some traditional guidelines but are also free to establish their own procedures including preferred scorecards. As their hired judge, I'm expected to use their scorecards. If that venue has no preference, then I'm free to use ours. Ideally, the judges work with venue superintendents in a partnership effort so entrants receive objective, positive comments and scores that will benefit future venues too.

Ann W. Klinect
NwRSA Certified Judges Committee Secretary
Everett, Washington

IF YOU HAVE COMMENTS TO SHARE WITH *SPIN·OFF*, PLEASE WRITE TO US AT *SPIN·OFF* LETTERS, 4868 INNOVATION DRIVE, FORT COLLINS, CO 80525-5576, OR EMAIL SPINOFF@INTERWEAVE.COM. BE SURE TO INCLUDE YOUR FULL NAME AND YOUR CITY AND STATE (AND COUNTRY IF OUTSIDE THE UNITED STATES). ALL LETTERS MAY BE CONSIDERED FOR PUBLICATION IN THE LETTERS DEPARTMENT OF FUTURE ISSUES. LETTERS WILL BE EDITED FOR SPACE AND CLARITY.

The Spinner's Book of Fleece: A Breed-by-Breed Guide to Choosing and Spinning the Perfect Fiber for Every Purpose

BY BETH SMITH

For spinners with questions about fleece, Beth Smith's new book has answers.

In *The Spinner's Book of Fleece*, Smith professes her love of all fleeces, from finewool to longwool, down breed to multicoated, and even the oddballs that resist the standard classifications. But this is at its core a practical book, and after a passionate introduction Smith gets down to the process of creating wool yarn.

Smith separates her examination into five categories. For each category, she discusses important facts about key breeds, from breed origin to fiber diameter. Common and noteworthy breeds such as Merino and Bluefaced Leicester (or less-known but noteworthy ones such as Suffolk and Scottish Blackface) are shown in even further depth. Accompanying each category are directions on how best to process and spin the fleece, from spinning from the lock for finewools to combing for longwools to carding for down breeds. Most instructions come with alternatives to fit different preferences and equipment, making them applicable to a variety of spinners.

With photographs and instructions of every process and type of fleece discussed, this guide serves as the basis for the reader's own breed study. In addition to showing how to spin well, this book is a reference for when things don't go exactly as you plan or expect.

North Adams, Massachusetts: Storey, 2014. Hardcover, 246 pages, $29.95. ISBN 978-1-61212-039-3. www.storey.com.

Hand Spinning Cotton

BY OLIVE AND HARRY LINDER, UPDATED BY JOAN S. RUANE

In 1977, Olive and Harry Linder shared the results of their investigations on cotton, achieved painstakingly (with the aid of a 480-pound bale purchased from a local cotton gin) at a time when few handspinners would have considered cotton. Their book fell out of print after several decades, but that classic text has now been updated and re-released by Joan S. Ruane. In addition to advice on methods to clean and prepare cotton, the book includes a discussion of tools from a variety of spindles to spinning wheels. Interspersed with the Linders' original text are additions and revisions, set off typographically to indicate new material.

Cotton Clouds, Inc. & Southwest Corner, 2013. Paperback, 61 pages, $24.50. ISBN 9870-0-9899490-0-2. www.handspinningcotton.wordpress.com.

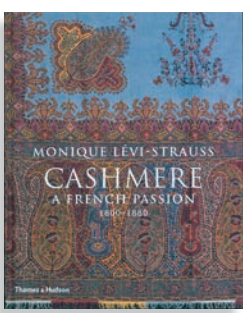
Cashmere: A French Passion, 1800–1880

BY MONIQUE LÉVI-STRAUSS

This exquisite book follows the migration of cashmere shawls from the Kashmir region of India to high-society Europe. In addition to close examinations of individual shawls, Lévi-Strauss's book explores the role of the shawl in social matters grave and frivolous: A hilarious excerpt from Balzac describes the tricks needed to sell a shawl to a recalcitrant Englishwoman, and in one of a series of caricatures, the artist suggests that the only way to be sure of having a real cashmere is to carry the goat on your back.

(For more on the cashmere shawl phenomenon, see "The Butterfly Effect," page 44.)

New York and London: Thames and Hudson, 2013. Hardcover, 320 pages, $80.00. ISBN 978-0-500-51712-3. www.thamesandhudsonusa.com.



In Search of the Perfect Green—and Orange, Too!: A Natural Dye Book

BY STEFANIA ISAACSON

In this slim but rich volume, Isaacson (known as the dyer behind Handspun by Stefania) offers guidance on extracting dyes and mordanting fiber before delving into the details of specific dyestuffs. The plants range from chamomile to zinnia, onion skin to peppermint, with each described in detail accompanied by images of the dye in action. The book focuses mostly on plants that are fairly easy to grow or gather, with exceptions for dyes such as Osage orange and fustic. Each dyestuff is shown on its own as well as overdyed with indigo and madder, and the book finishes with in-depth sections on those famous dyes.

Elgin, Illinois: Hagg 2013. Paperback, 100 pages, $19.95. ISBN 978-0-615-82301-0. www.stefania-spins.com.

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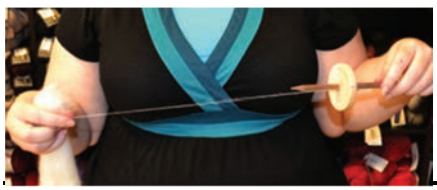

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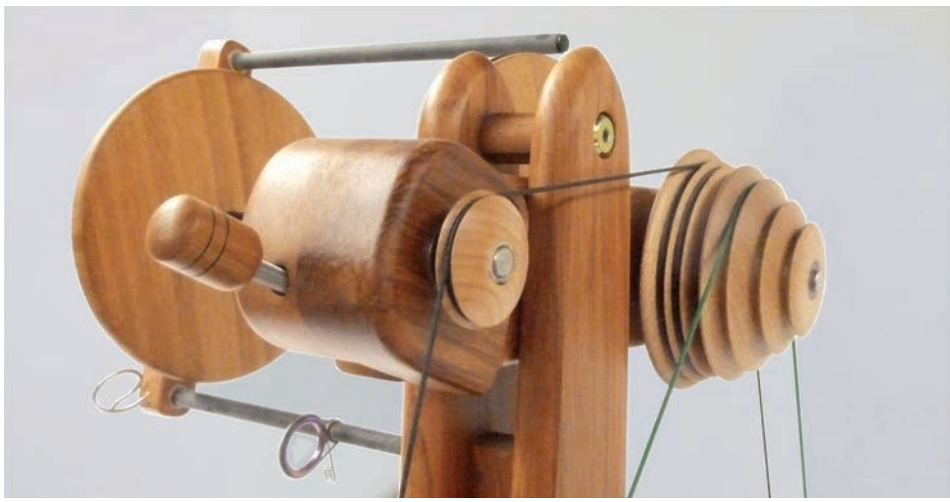

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Schacht Spindle Company, 6101 Ben Place, Boulder, CO 80301; (303) 442-3212; info@schachtspindle.com; www.schachtspindle.com.

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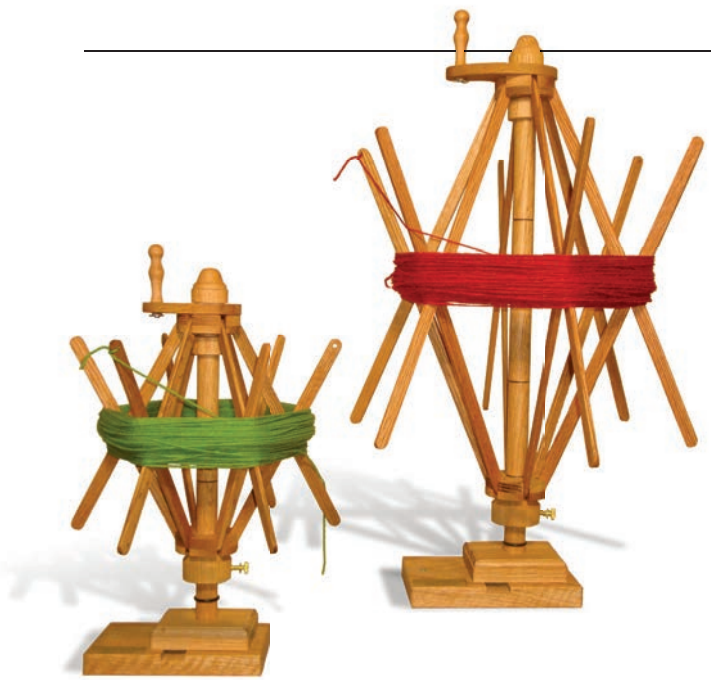
Lucky Cat Craft offers a wide variety of fleeces and luxury fiber blends including cashmere, angora, silk, camel down, and more. This dreamy 50/50 blend of **ultra-fine Merino and muga silk** has a delicate halo and rich golden sheen. $16/2 oz.

Lucky Cat Craft; luckycatcraft@gmail.com; www.luckycatcraft.com.



The new **Mini Swift/Skeinwinder** from Strauch (above left) is compact and perfect for traveling but still has all of the great features of the standard model (above right). Standing at 19 inches tall, the mini table model is collapsible and will hold a skein of yarn up to 1 yard in circumference (note that most commercial skeins are 1½ yards in circumference). Available in oak, cherry, maple, and walnut. $156 (oak), $162 (maple), $173 (cherry), $196 (walnut).

Strauch Fiber Equipment Co., 10319 Johns Creek Road, New Castle, VA 24127; (540) 864-8869; ors@strauchfiber.com; www.strauchfiber.com.

To celebrate its fortieth birthday, Louet has transformed its very first wheel, the classic S10, into your dream wheel—whatever your dream may be. Starting with a brand-new scotch-tension option in addition to the original Irish tension, the **S10 Concept spinning wheel** takes a modular approach. Choose the flyer style, bobbin, lazy kate, drive wheel, number of treadles, and more for a customized spinning experience. Starts around $600; price depends on options selected.

Louet North America, 3425 Hands Road, Prescott, ON, Canada K0E 1T0; (613) 925-4502; info@louet.com; www.louet.com.

Hemp fiber is strong like linen, with great drape and a silky luster. Similar to spinning flax, this durable **100% hemp top** from FiberLady's Fine Fibers can be spun wet for a fine, smooth yarn or dry for a fuzzier texture. Available in a number of handpainted colorways, such as Black Gold shown here. $4.99/2 oz.

FiberLady's Fine Fibers, 438 South Fork Drive, Suite 200, Lewisville, TX 75057; (214) 803-1243; www.fiberlady.com.

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A Conversation with

Chris & Nancy Miller, the Woolery

ALL PHOTOS COURTESY OF CHRIS AND NANCY MILLER, THE WOOLERY

Nancy and Chris Miller stand in the store they have operated for five years.

From a small storefront in Kentucky, the family-owned business the Woolery has a big presence. With more than three decades' worth of business acumen and three different states under its belt, the Woolery has proved an enduring source for fiber and equipment alike.

SPIN·OFF: *How long have you had your fiber business?*
WOOLERY: The business was started in 1981 in Genoa, New York, by the Horchlers. We started as a small farm offering wool (from sheep on the Horchlers' farm), basic supplies, and spinning lessons. It was called Woolery Farm. A few years after starting, we opened the Fingerlakes Woolen Mill but the mill was sold when, in 2001, the Woolery expanded and moved to Murfreesboro, North Carolina. In 2009, we purchased it, expanded again, and moved to historic Frankfort, Kentucky.

SO: *Could you tell us a little about what you do?*
WOOLERY: The Woolery is a family-owned business, and we've been serving our customers for over thirty years. We ship spinning wheels, looms, and other fiber arts supplies all over the world every day, and we have tens of thousands of satisfied customers. We strive to be a part of the fiber arts community, and it is part of our mission to strongly support guilds, festivals, and the fiber arts people who work so hard to keep the crafts alive for future generations. We offer classes and private instruction in our shop as well as help on the phone.

The Woolery ships fiber and equipment all over the world through its robust mail-order service.

SO: *How did you come to it?*
WOOLERY: Everything that has happened with the Woolery has been serendipitous! While visiting some friends in North Carolina, we happened upon the Woolery. We both have a background in small business and love the fiber arts, especially the wonderful people we interact with.

SO: *What did you do before?*
WOOLERY: We owned and operated our own small businesses. Nancy owned a nutritional and weight-loss business as well as an interior design business. Chris was in the automotive industry.

SO: *When you were little, what did you want to be when you grew up?*
WOOLERY: Nancy: Veterinarian. Chris: Trash man (cool trucks!).

SO: *Where are you located?*
WOOLERY: Our shop is located in Frankfort, Kentucky. Historic downtown Frankfort is a wonderful place to visit, small enough to be small-town friendly yet big enough to offer travelers the amenities that they expect. Frankfort is a special place to visit. Frankfort is very accessible to travelers and next door to a national UPS hub in Louisville, Kentucky. The Woolery is one or two days standard shipping to 48 percent of the United States.

SO: *How many employees do you have?*
WOOLERY: There are thirteen people (including Nancy and Chris) who come into the shop every day plus several other people who help out as needed when we go to shows and to teach.

SO: *What are three things about your business you find surprising?*
WOOLERY: 1. How excited and passionate our customers are about fiber arts. They are such friendly and knowledgeable people. We have learned so much from our customers about fiber arts.
2. How interesting and diverse all of the different tools are and the many techniques that exist. We had a request today (via Facebook) for Mongolian yak combs.
3. How many new people we talk to who are beginning the journey to learn various fiber-related crafts.

SO: *What type of equipment do you use in your business?*
WOOLERY: Spindles, spinning wheels, weaving looms, carders, combs, and more.

SO: *What is the trickiest part of what you do?*
WOOLERY: We are very grateful to be involved in something that we know and love. We take much care in selecting and recommending products and fiber to our customers. Making sure that we exceed our customers' expectations takes a genuine and sincere commitment from the entire staff.

SO: *Outside of work, what are you excited about?*
WOOLERY: We are excited about our faith and the opportunities to serve that God brings our way. Our kids keep us busy, and we love to travel. Later this year, in coordination with Loom Dancer Weaving Odysseys, we will be offering a Woolery-sponsored fiber-related trip (with a chance to win a free trip!) to an exciting location. Stay tuned . . .

Woolery
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The storefront of the shop in Frankfort, Kentucky.

The Woolery, caught here in a quiet moment, keeps more than thirteen staff members busy.


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Singles!

In our Spring 2014 issue, we asked readers to send us their singles. Here we invite you to meet four delightful examples. See all the yarns on our website, spinningdaily.com.

PICTURE FRAME ©ISTOCKPHOTO.COM/KAMISOKA

Diana Blair of Kalispell, Montana

Corriedale wool and ceramic beads, singles, 14 wpi, 1,400 ypp

"This singles yarn is called 'Navajo Tears' and is dedicated to my friend master weaver Roy Kady and his mother, who has passed. The rust yarn is a Corriedale wool and is embellished with handmade ceramic beads in a soft turquoise color."

Linda Cronquist of Moscow, Idaho

Wool, singles, 30 wpi, 4,800 ypp

"I love my high-whorl; it goes where I go and I figure that I've spun about 2 miles of yarn. Most of it seems to be about this weight. As my friend says, 'Linda couldn't spin a fat yarn if she tried!'"

PICTURE FRAME ©ISTOCKPHOTO.COM/MILOSLUZ

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Vivian Dills of Bow, Washington

Wool blend, singles, 23 wpi, 950 ypp

"This wool blend singles is a result of the 'All the Little Bits' class with Judith MacKenzie I attended at Madrona in February. We took small samples of different colors and fiber content and spun them at random, then plied. I love the randomness of the yarn and colors, as well as the changes in texture and grist."

Jessica Hupp of Hendersonville, Tennessee

VHS tape, singles, 15 wpi, 1475 ypp

"I recently came across a large stash of unusable old VHS tapes. They seemed to be an ideal option for an outdoor-suitable yarn . . . so this recycled 'fiber' is the result. While crunchy and crackly, it works up nicely for patio placemats and such!"

Next Challenge

Stash! Spin the fiber you've had in your stash for the longest time. Can't remember when you bought it and what for? Make room in your stash for more goodies and spin up your long-held treasures. Choose any fiber, tool, technique you wish, just make sure to send a finished yarn. The deadline to submit is October 31. Please send a minimum five-yard length of yarn labeled with your name, mailing address, phone number, email address, and fiber content. Mail your comments and your yarn to *Spin·Off* Your Yarn, 4868 Innovation Drive, Fort Collins, CO 80525-5576. Email spinoff@interweave.com with any questions. The yarn won't be returned, but it will be used to raise money for a worthy charity. Please contact us at the above address if you'd like to volunteer to make a charity item using the yarns from previous Your Yarn entries.

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History and Innovation

Alvin Ramer brings spinning tools to life

BY LESLIE ORDAL

PHOTOS BY SHIREEN NADIR

Alvin Ramer stands in the spinning wheel museum that he curated with his wife, Barbara-Anne.

Twenty years ago, southern Ontario spinner Barbara-Anne Ramer began attracting some unexpected attention at her local guild. The tools she brought with her to meetings didn't look like any that belonged to her fellow guild members, and they often worked better than the well-known brands available at the time. When asked, Barbara-Anne replied that her tools were made by her husband, Alvin, then a utilities worker. When Alvin had seen the items Barbara-Anne was using, he put his inventive mind to work on improving them, making new equipment that she could use as she developed her spinning skills. What started as a hobby and a way to indulge his own interests in woodworking and engineering became a successful business run out of the Ramers' home in Colborne, Ontario.

When he retired from his utilities job, Alvin started creating high-quality tools and equipment for spinners. His products have gained popularity mostly due to word of mouth, starting with the enthusiastic members of Barbara-Anne's guild and continuing today with frequent mentions on Ravelry. Although he has had to recently scale back his work due to health issues, his consistently high-quality and innovative products have earned him a devoted following in Ontario and beyond.

Alvin's most popular product, his wool combs, is the result of a Goldilocks-style trial-and-error process among local spinners. Initially inspired by the work of Peter Teal, Alvin produced his first set of combs, which were well liked but deemed too large for many people to use comfortably. His next product, a scaled-down version called Mini Combs, was again well received but thought to be "too small." Alvin finally settled on a design called the Super Minis, which proved "just right." A medium-sized tool, the Super Mini combs are practical yet elegant. They are a comfortable size to hold but are also capable of processing large amounts of fiber. The base that holds the comb handles while processing fiber doubles as a storage container, keeping the sharp steel tines safely covered when not in use. As with all of Alvin's products, the Super Minis are sturdy, long-lasting, and available in the customer's choice of several hardwoods grown in local Northumberland County, Ontario. Small extra touches, such as the inclusion of a tine straightener (although the tines are meant to hold up to aggressive combing) and a diz made from a seashell, have helped make his combs stand out.

Once used only by a select few in Ontario, the Super Minis and other tools eventually found their way to other parts of the world. Customers as far away as Germany and Australia have contacted Alvin for orders, and he's sold 650 sets of Super Minis. Overhauling his workshop to better suit the production of spinning equipment led to a decrease in production time to less than a day for a single set of combs, an improvement over the two to three days it used to take.

Left: Alvin demonstrating the use of the pendulum spinning wheel. **Right:** Alvin assessing an antique wheel.

He also designed perfectly balanced drop spindles, spinning chairs, and other items, often working with customers to create the right tool for their needs, whether it's a hackle of a certain length or a kick spindle with sealed ball bearings to run more smoothly.

HISTORIC WHEELS

The Ramers have also contributed to the knowledge and history of Canadian spinning wheels through the creation of a spinning wheel museum in their home. The collection, now dispersed, ranged from flax wheels to large walking wheels to several examples of the Quebec production wheel. Sometimes referred to as Canadian production wheels, they were made in a few locations in Quebec during the late nineteenth and early twentieth centuries and feature a distinctive tilt-tension and often surprisingly bright paint jobs. Alvin and Barbara-Anne regularly wrote articles for the *Spinning Wheel Sleuth* newsletter while building their collection, adding to the body of available knowledge about antique Canadian wheels.

The crown jewels of the Ramers' collection were the two pendulum wheels dating back to 1866 to 1867. The cleverly designed pendulum wheel functions in much the same way as a walking wheel, using a giant drive wheel for making large quantities of yarn as quickly as possible. With a cannonball as a counterweight, the pendulum wheel's main innovation was that it allowed the spinner to recline in a sitting position rather than walk back and forth. It is an example of an ingenious invention that had the misfortune to appear at precisely the wrong time. On the brink of the industrial revolution in 1860s Canada, the spinning industry was being moved from the hearthside to the factory floor. Many pendulum wheels were scrapped for parts or burned before they were even fully assembled. Needless to say, these wheels are vanishingly rare, but the Ramers' persistence (and Barbara-Anne's eagle eye for spotting wheels in antique store windows) paid off in the acquisition of two pendulum wheels that Alvin restored. They didn't sit around collecting dust, either; for years, Alvin and Barbara-Anne regularly took the wheels out for demonstrations at guilds and as part of the local primary schools' unit on pioneer crafts.

Alvin's skills in wheel repair are also in demand. There are a good number of spinning wheels (especially Quebec wheels) that inhabit the attics, antique shops, and yard sales of southern Ontario in various states of (dis)repair. It's not uncommon for enthusiastic spinners to acquire an antique wheel, only to discover broken or missing pieces, warped drive wheels, or any number of other issues that limit its use to a decorative living room accent rather than a working tool for making yarn. Alvin has restored many antique wheels back to a state of functioning, fixing or replacing parts as needed and also being honest when a wheel is beyond hope.

Now more than twenty years since his first foray into the world of spinning, Alvin is starting a well-deserved retirement while spinners around the world continue to use his Super Mini combs and other tools. He and Barbara-Anne have closed the museum and sold the collection to active spinners who expressed interest in using the wheels for their intended purpose rather than as purely decorative pieces. Even in retirement, however, he is still involved in wheel restoration. Interested in getting in touch with Alvin? Contact him and Barbara-Anne at aerbar@outlook.com to inquire about price and availability of wheel repair and restoration services.

Leslie Ordal writes and works in health care research in Toronto, Ontario, Canada. Her blog can be found at www.leslieordal.com.

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Spindle Hook Alignment

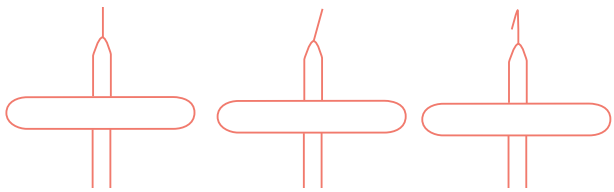
Simple Steps for Wobble-Free Spinning

BY TOM GOLDING

Spinning on a drop spindle that wobbles can be annoying. The wobble, and resulting imbalance, may well be due to the spindle hook not being aligned properly. What follows is a quick two-step method for checking and aligning your spindle hook. Each step represents a plane of alignment. Round-nose pliers are the preferred tool for adjusting the hook, but you can also use needle-nose pliers with a soft cloth to protect the metal.

1

Look at the rear of your spindle hook. If the hook is properly aligned, you should see only a straight line continuous with the shaft. If the line is not straight, adjust the hook by pushing it sideways to the left or right with your fingers. If needed, use needle-nose pliers with a soft cloth to avoid marring the metal. Although not as critical, you may at this point check to see if the "beak" is tilted and needs straightening.



Aligned | Not aligned | Aligned but with tilted beak

2

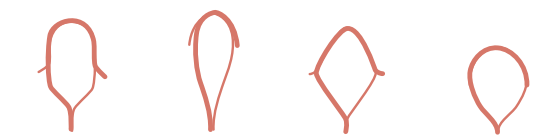
Stationary

Look at the side view of your spindle. Here are profile views of four common hook shapes.

Swan's Neck | Shepherd's Crook | Dinner Bell | Cup Hook

Spinning

To complete the process of alignment, you must observe the hook while it is spinning. Attach some fiber to the spindle, and spin it as swiftly as you can. Gaze at the hook while it is spinning. If properly aligned, the hook should look like one of these.



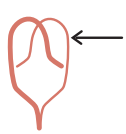
Swan's Neck | Shepherd's Crook | Dinner Bell | Cup Hook

a

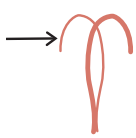
Adjustment

If you see "doubles," the hook is improperly aligned and needs further adjustment. Hold the spindle so you see the hook profile (at left). Using your fingers or needle-nose pliers with a soft cloth, push the hook forward or back as shown. Spin the spindle again, gaze at the hook, and recheck to see that the hook peak is uniform in appearance. The hook peak should not show doubles while spinning.

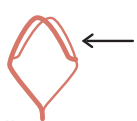
b



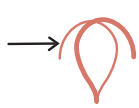
Swan's Neck
Too much space in the center. Push hook forward (pushing from the rear and moving it forward).



Shepherd's Crook
Too little space in the center. Push hook back (pushing from the front beak and moving it back).



Dinner Bell
Too much space in the center. Push hook forward.



Cup Hook
Too little space in the center. Push hook back.

c

Tom Golding is known for his creative and precision-balanced spindles, spinning wheels, and accessories. He is founder of Golding Fiber Tools along with his wife, Diane, and sons Seth and Obe. He lives and works on a fifty-nine-acre Icelandic sheep farm in Saxtons River, Vermont. Learn more at www.goldingfibertools.com.

Spindle Survival Kit

A Spinner's Kit for Spinning on the Go

BY JEANNINE GLAVES

I sometimes spin to lower my stress level, so being able to spin anytime, anywhere is great. My spinning kit is an 8-inch-long, 2½-inch-diameter leather pencil case I bought at a back-to-school sale. In it is a bundle of a dozen punis I made using child-size cotton handcards; a 9½-inch by 6-inch piece of soft leather with a small 1½-inch-diameter shallow bowl glued in the center on the slick side of the leather; and an Indian tahkli spindle with knitting needle point protectors on the ends to keep from poking holes in everything.

To spin, I drape the leather, rough side down, bowl side up, on my right thigh and use the bowl to support the spindle. For everyday spinning, I use a metal tahkli so I don't worry when the kit is in my purse. (If I am flying, I switch to a nonthreatening-looking wood spindle. Our airport is very fussy.)

Jeannine Glaves seems to be traveling to teach a lot of classes lately, and between the airlines and a MINI Cooper, space is at a premium. It's amazing how much cotton can be spun during one trip.

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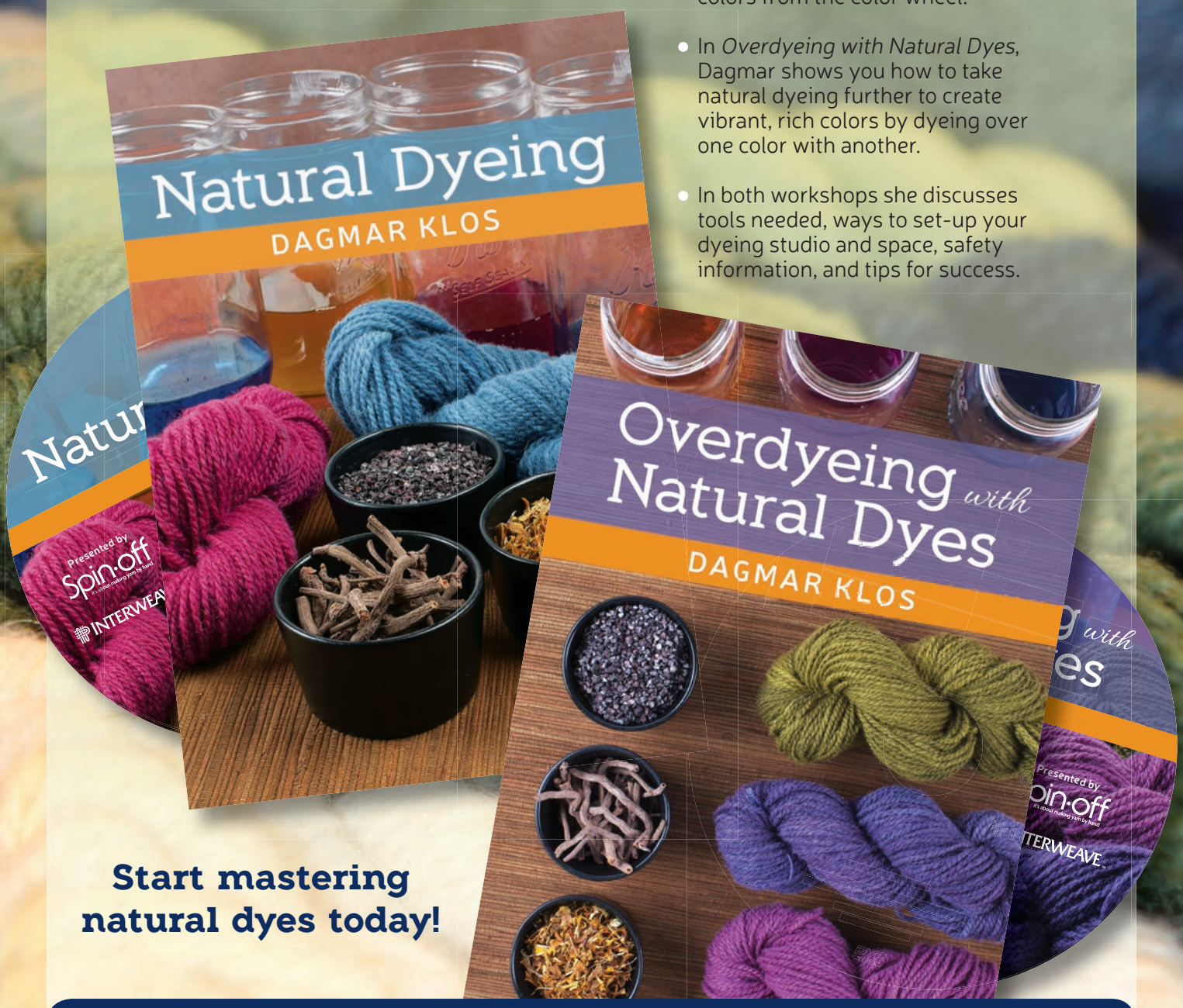
- In *Overdyeing with Natural Dyes*, Dagmar shows you how to take natural dyeing further to create vibrant, rich colors by dyeing over one color with another.
- In both workshops she discusses tools needed, ways to set-up your dyeing studio and space, safety information, and tips for success.



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The Weighty Matter of Spindles

From top-whorl to Turkish, size matters.

BY CONSTANCE HALL

Spindle spinning is a very simple concept. Initially there are few things involved: spinner, fiber, twist, and the spindle. With more experience, it can become more complex: What kind of fiber? How much twist? What is the twist angle and how many plies?

But the first question is always, "Which spindle do I want?" Often this question comes from a new spinner at a fiber show standing before a display of spindles, a look of longing on her face and a spindle (or two or three) in her hand. Usually she is holding a fragile, lovely, lightweight beauty. And it's true—picking a spindle is often based as much on beauty and admiration of the craftsmanship as it is on the suitability of the spindle to spin the yarn desired.

Although it may not be the first factor that comes to mind, the weight of a spindle does matter. The reason yarn keeps breaking may be that the spindle is too heavy for the amount of twist going into the fiber. On the other hand, the delicate beauty that keeps backspinning may be too light for the amount of fiber being drafted.

A more experienced spinner can make almost any spindle do the job, but for a new spinner, picking the wrong spindle can lead to discouragement. The question of what yarn a given weight of spindle can

easily create is a key consideration for all spinners but especially critical for new spinners. There are many spindle options available to spinners today, and most styles are produced in a wide range of weights. Two spindles of the same size and style can vary quite a bit in weight because some woods are much denser and heavier than others with more open grain.

THE JOURNEY TO TURKISH SPINDLES

Spindle spinning is not my native language—wheel spinning came more naturally—but after seeing a number of spinners using Jenkins Turkish spindles and actually enjoying it, I reluctantly decided to give it a try. That was the beginning of a new love. I have since learned to love all spindles, but the Turkish style will always be my favorite.

Winding onto a Turkish Spindle

To get started winding one of those lovely center-pull balls, make a half hitch in the leader yarn. Slide the arms of the spindle up the shaft and place the half hitch on the bottom of the shaft. Slide the arms back down so that a bit of the yarn is caught under the arms. To start the wind-on, bring the yarn over two arms and under one arm, over two arms and under one arm again. Bring the yarn up the shaft and make a half hitch on the top of the shaft under the groove on the tip of the shaft (if there is one). It is ready to go.

There are a couple of ways to wind spun yarn onto the spindle: quick and dirty or slow and fancy.

Quick and dirty:
Flip the half hitch off the top, make a butterfly on your fingers with the spun yarn (see page 41 for more on prewinding yarn), and wind on over two arms, under one arm, over two arms, and under one arm until there is no more yarn; don't worry about lining up the yarn. Place a half hitch back on top and off you go.

Slow and fancy:
When you have enough yarn spun up to wind on, flip the half hitch off the top of the shaft. Make a butterfly and begin to wind on close to the shaft, over two arms and under one, over two arms and under one. Carefully line up each new row of spun yarn next to the last. When the yarn will not easily go down the arms any farther, it is time to begin the next layer. Bring the yarn right up to the shaft again for the second layer and repeat the over two, under one sequence, making careful rows. This layer will extend farther down the arms before it is time to make the next layer; always go back up to the shaft to start each layer. The fancy cop is built up layer after layer, and with such a lovely result, it might be worth the extra time it takes.

Carefully winding over two arms and under one while placing each layer of yarn creates an exquisite effect.

Removing the arms of the spindle leaves a ready-made center-pull ball.

SPINDLES, TAKE YOUR MARKS

The samples below were spun on four Turkish spindles weighing 6, 25, 45, and 65 grams. Each sample shows three weights of yarn spun on a single spindle: from left, the thinnest weight, the easiest to spin, and the thickest yarn I could coax out of each spindle. The range of yarn that could be spun was surprising. It was easier to spin a thin Merino/bamboo blend yarn on the heavy spindle than it was to spin it bulky on the tiny one. Although the patience required to wait for enough twist to build up in the thin yarn on the heavy spindle was more than I possess, it just took more time. By contrast, the lightweight spindle simply didn't have the weight to pull down on the fiber being drafted for the worsted to bulky yarn; it spun back very quickly. The center sample was where the speed of twist combined perfectly with the weight of the spindle to produce effortless spinning.

The Turkish spindle is a very old style of spindle. The first examples, found in the Middle East, include a shaft and one arm across the bottom. The version we see today has two crossed arms with a shaft going up through the center. It is bottom weighted, and the low center of gravity keeps it stable when spinning. The weight extends out from four points, making for a very stable and even spin right from the beginning. It consists of three pieces, making it easily packable. It can accommodate a large cop, and—the most-loved feature of the Turkish spindle—the three pieces can come apart, leaving an instant center-pull ball and making the spindle easily packable.

Turkish spindles come in a variety of woods, but besides the differences in wood, Turkish spindles behave differently for structural reasons. Even on spindles of the same weight, there is variation of where the crossed arms fall on the tapered shaft. If the arms are mounted higher on the shaft, they allow more room to wind on a bigger cop of spun yarn, but the spin time will be slightly decreased because the weight of the yarn is balanced higher. On the other hand, as the cop builds, any spindle will spin longer and longer.

If the weight of an empty spindle is at the upper limit of your chosen fiber and yarn, as the spindle fills with yarn, it may quickly become too heavy. A 25-gram empty spindle can easily end up weighing 60 grams. Your hands will make adjustments to keep the yarn consistent, but eventually the weight may become too much for the yarn you want to spin, and it will be time to remove the cop and start over.

THE VERDICT

Spindle weight does matter; there is no doubt about it. The newer the spinner you are, the more it matters. But after spinning on these different weight spindles, I see that it matters less than I thought. Pick any three beauties, one very light, one medium-weight and one heavy, and you will be able to spin all the yarns you can dream up. And while you're at it, give a Turkish spindle a try.

Constance Hall began her fiber explorations with crochet, followed by knitting, sewing, spinning, weaving, and felting—all the while being a full-time glassblower. Pattern design for Schacht Spindle Company and teaching fiber arts fill her time.

Each sample shows the thinnest, easiest, and thickest yarn to spin on each spindle from 65 g (top) to 6 g (bottom).

Winding Well

Five Tips for Building Your Cop

BY ANDREA MIELKE SCHROER

I love my spindles. I can't praise them enough. Whenever I meet someone who seems less enthusiastic about them, I can't help but wonder if I could convert them to spindle fanaticism by sharing a few helpful tips that can make spindle spinning even more enjoyable. Here are some of those tips for winding yarn onto the spindle.

1 PROPER WINDING-ON

You always want to turn the *spindle* to wind on yarn. If you wrap the yarn around the spindle by moving the hand holding the yarn, you are adding or subtracting twist to the yarn. When your cat or toddler unwinds a roll of toilet paper across the bathroom floor and down the hall, how do you wind it back up? Do you grab a section of the paper and begin wrapping it around the cardboard core? If you haven't done this before (lucky you!), give it a try. The toilet paper will begin to twist up. Instead you probably turn the cardboard core, rolling it, to wind up the toilet paper without inserting twist. This same principle applies to handspun yarn.

Want to avoid changing the twist in your yarn? Turn the spindle to wind on.

2 DIRECTION OF WIND-ON

The direction in which you wind on is important to ensure that the yarn will not loosen and start to unwind itself as you are spinning. Wind on yarn by turning the spindle in the same direction you are spinning. Centrifugal force encourages the yarn to remain snug. Think of it as spinning *into* the cop, as opposed to spinning *out* of the cop (unwinding). Spinning clockwise? Turn the spindle clockwise to wind on. Technically, the yarn is moving counterclockwise around the spindle, but by focusing on the direction the spindle moves, you eliminate confusion for yourself. You just need to make sure your spindle is always moving in the same direction in which you are spinning (or plying).

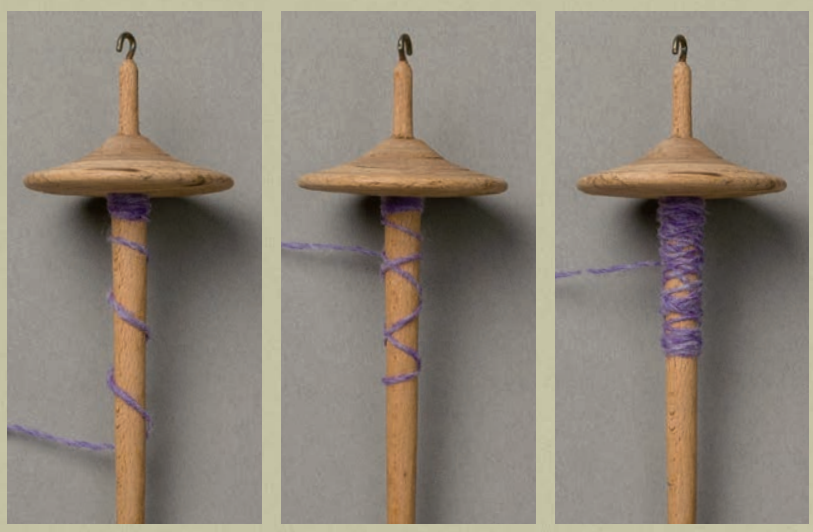
In this photo, the arrow on the spindle whorl shows the direction the spindle is turning to wind on the yarn.

3 X WIND-ON

The X wind-on can serve several purposes: It keeps the cop neat and tidy. It allows for faster winding on. And on some spindles, it is the only way to control where the cop stays on the spindle shaft. I have Lady Ann and Victorian Lady spindles in mind in particular—what Bette Hochberg calls a "carved one-piece spindle."

To start an X wind-on, turn the spindle in the correct direction to wind on, but angle the yarn between 25 and 55 degrees toward the whorl so that the yarn begins to spiral around the shaft or cop. (The angle varies as the cop grows.) When you reach the whorl, change the direction of the angle and spiral back to the other end of the cop. Continue to wind up and down the cop in this manner. (If you fish, this may remind you of the way your fishing reel winds on.)

The yarn winds on more quickly in this way because it travels over a longer distance with the same turn of the spindle than if the wraps were stacked vertically. One turn of the spindle using the X wind-on can take up as much yarn as four turns of the spindle stacked vertically. This technique gets the name "X wind-on" from the fact that the two paths of the yarn will cross each other at some point on the cop, creating an X.



To make an X wind-on, spiral the yarn down the shaft, then back up to the top of the cop. The crosses in the cop give this wind-on its name.

4 FIGURE-EIGHT WIND-ON PREPARATION

Because of the active twist in newly spun singles, winding on anything more than a foot of yarn can get tricky. If you don't keep the yarn taut, it starts to twist and kink and tangle. Soon you find yourself doing bizarre calisthenics in an attempt to grab the spindle to wind on without letting the yarn tangle on itself. One way to manage this nicely and still be kind to your body is to use a preliminary figure-eight wind-on, which controls the yarn while bringing the spindle back to your hand so you can then wind the yarn onto the spindle.

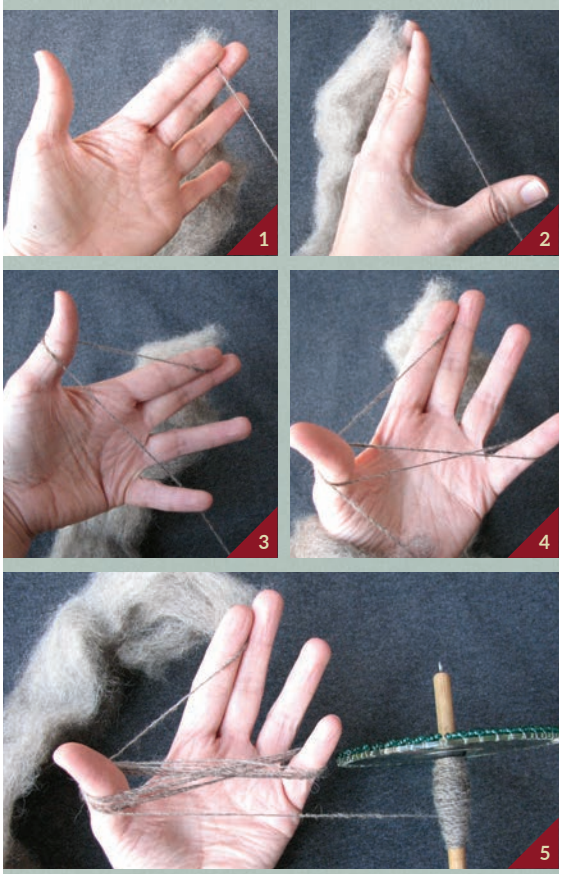
I've seen many variations on this technique. I'll show the method I use, but feel free to use any combination of fingers or movements that give you the same end result of tensioned yarn.

Let's say I have spun 3 feet of singles, and the spindle is now down near my feet. I pull the yarn and spindle in toward my body so that the spindle rests against me and stops moving. This prevents the spindle from adding or subtracting twist. Next, I pinch

Continued on page 42

... continued from page 41

off my drafting triangle between the index and middle fingers of the hand that holds the fiber. I twist my wrist so that I can catch the yarn behind my thumb. Then I twist my wrist in the opposite direction and catch the yarn behind my pinkie. I continue to alternate catching the yarn behind my thumb and pinkie, creating a figure eight around my fingers until I am within a foot or less of the spindle. At this point, I can pick up the spindle by the shaft with my free hand and wind the yarn off my fingers and onto the spindle.



PHOTOS BY ANDREA MIELKE SCHROER

1) Pinch off the drafting triangle. **2)** Twist your wrist to catch the yarn behind your thumb. **3)** Twist your wrist to catch the yarn behind your pinkie. **4)** Alternate catching the yarn behind your thumb and pinkie, creating a figure eight around your fingers, until you are within a foot of the spindle. **5)** Pick up the spindle by the shaft with your free hand, and wind the yarn off your fingers onto the spindle.

5 CANDY-CANE SPIRAL FOR LOW-WHORL SPINDLES

When I was first learning to spin, on a low- or bottom-whorl spindle, I was told to take the yarn under the whorl and once around the shaft before coming up to the tip of the shaft to put on a half hitch. This seems like a quick and efficient way to get to the top of the shaft . . . until you see someone spinning with a top-whorl spindle and using a thigh-roll to get lots of twist quickly. Adding lots of twist quickly equals less time spinning, which means I get to my knitting or weaving faster. It is very appealing. But when I tried it, I couldn't roll the low-whorl spindle against my thigh because that yarn coming from the bottom of the spindle up to the half hitch was in the way.

Left: Spiral the yarn up the shaft at a 35° to 45° angle. **Right:** Wrapping the yarn directly from the whorl to the tip of the shaft prevents a good thigh-roll.

Enter the candy-cane spiral. If I spiral my leader up the shaft of the spindle, much like the stripes on a candy cane, they hug the shaft well, preventing slippage or unwinding while spinning, yet are out of the way, allowing me to do a thigh-roll with a low-whorl spindle. A 35- to 45- degree angle on the spiraling yarn works best. A steeper angle doesn't grip as well and allows for slippage of the yarn; less of an angle just takes longer to do and doesn't provide any additional advantage.

There is a little bit of friction on the yarn from your hand and thigh during a thigh-roll, but for most yarns, the result of the friction is negligible. I usually only thigh-roll once between wind-ons, maybe twice if I get interrupted while drafting. The slight friction on the yarn that results from this is only an issue for me if I am spinning a yarn that I want to be very smooth and lustrous, such as a worsted silk yarn. The friction from the thigh-roll may make the yarn look a little hairier, but for 90 percent of the yarn I spin, it isn't enough of an issue to worry about.

TRY THIS AT HOME

These aren't rules or spinning laws, just suggestions I have accumulated from years of research and experience. Experiment with these tips and take away the things you find useful and helpful. Then go and spread some spindle love.

Andrea Mielke Schroer learned to spin with a spindle twenty-five years ago and has been enamored with this simple and incredibly versatile tool ever since. She lives in Wisconsin with her husband and children, and she co-owns Mielke's Fiber Arts with her sister.

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The Butterfly Effect

How the Paisley Shawl Changed Our World

BY JUDITH MACKENZIE

A comb from Kashmir with un-dehaired fiber.

The Butterfly Effect, you may remember, is when a small change at one place results in much larger changes in another time and place.

In the textile world, one butterfly effect started in Srinagar, an ancient city in the province of Kashmir in northern India. Surrounded by the Himalayas and suspended between two endlessly beautiful lakes, Srinagar is nearly a floating city. Divided by the Jhelum River but connected by ancient stone bridges, it is a place of houseboats, flowers, and exquisite gardens dating back to the Mughal Empire. It has been the home of artists, musicians, and artisans for century upon century. It was the beloved summer home of the British Raj. And it gave birth to a shawl that would transform textiles worldwide.

When the Mughal Empire took over Kashmir and the city of Srinagar in the sixteenth century, Kashmiri weavers were already well known for

Right: an exquisite example of a traditional Kashmiri shawl from the early 1800s. It is handspun *pashm,* woven in the traditional 2/2 tapestry twill and elaborately hand embroidered. Sadly, it has been modified to look like a more modern European shawl by inserting a piece of black silk fabric into the middle and cutting out the original embroidered cloth. This was intended to imitate the style of shawls woven in Scotland and France. These shawls left the woven center free of design in an effort to reduce weight.

their fine shawls. But it is the emperor Akbar (reigned 1556–1605) who changed the shawl into a precious object. He had a passionate interest in the shawls, and he personally oversaw their production. He set up an institute to study the shawls and to train artisans. He made changes to the weave structure, the dyeing, and the designs for the shawls. He examined the fiber and the spinning, experimenting to achieve a better drape. Under his care and guidance, Kashmiri shawls became incredibly fine—fine enough that a standard shawl some 36 by 80 inches could be drawn through a finger ring. The patterned borders became larger and more intricately woven, often embellished with a layer of embroidery as well. They were worn by the elite, presented in elaborate ceremonies to kings, court favorites, and royal emissaries. They were a mark of privilege and distinction, worn only by men.

What made Akbar's work so successful other than his passion are two things: he had gifted people with highly developed skills, and he had perfect fiber.

The women in Kashmir were well known for their beautiful, extremely fine spinning. They spun their superfine threads on a charkha, a simple but very efficient hand-turned wheel. Most modern spinners are familiar with Gandhi's portable book charkha. The charkhas that spinners would have used to spin the fine shawl threads are bigger and have an upright wheel. These charkhas, brought back to England from India during the Crusades, are the basis for the design of the European great wheel. The fiber spun for these shawls was the exquisite, extremely fine down coats of two Himalayan animals: the chiru (*Pantholops hodgsonii*), a tiny Tibetan antelope, and the Changthangi (*Capra hircus laniger),* a small goat found both wild and domesticated in Tibet, Ladakh, and Kashmir.

Shatoosh, one of the rarest wild down fibers and certainly one of the most expensive, comes from the chiru. Traditionally, shatoosh was gathered from bushes by the goatherders as the chiru shed their winter undercoats. The shatoosh was brought down from the Himalayas to Srinagar in Kashmir province where it would be spun into the thread used to make the finest Kashmiri shawls. With a micron count of 9 to 11, shatoosh is incredibly fine, with a deeply indented crimp that makes it wonderfully soft and lightweight. Originally, all shatoosh was hand gathered, and all the processing was done by hand. Each shawl, excluding the spinning and dyeing time, took nearly two years to complete. Because the shawls were so labor-intensive, a large fiber supply was not critical. Later, British trade put extreme pressure on shatoosh production. The increase in demand coincided with the British introduction of guns; instead of gathering the

A sample of guard hair and an ebony and holly low-whorl spindle with singles spun Kashmiri-shawl-style from Changthangi-style goats.

PHOTOS COURTESY OF CONOR'S RUN FARM

Changthangi-style goats, raised in the United States, on Conor's Run Farm.

This shawl, woven in the 1990s from fine wool in Kashmir, has ornately woven ends and a gauze center. This pattern is a brocade doubleweave; the gauze layer is created by carefully and skillfully cutting away the second layer of cloth. This shawl uses only four different colors of thread to produce the rich pattern.

shed coats, the herders resorted to shooting the animals and stripping out the down.

The fiber from the Changthangi goats is called *pashm,* and it has a micron range similar to shatoosh, 9 to 14 microns. It was also traditionally hand gathered from the shed fibers of wild goats during their spring shedding. The pashm from domestic Changthangi goats was collected by plucking or combing the goats during their natural spring shedding. Pashm is still produced in the areas of Ladakh and Tibet. India produces an average of four thousand pounds a year. *Pashmina* is the name of the fine cloth made from the fiber from Changthangi goats, and unlike shatoosh, pashm is still legally collected and sold. Because the name is

The Threatened Chiru

The antelope population became severely diminished—from an estimated one million in the 1960s to only seventy-five thousand today. Many countries have made it illegal to own textiles made from shatoosh in an effort to restore these animals to a secure population. Even though the United States government put shatoosh on the banned list as an endangered species product in 1979, the shawls were still sold in the United States into the late 1990s. It is not legal in the United States to purchase or own the fiber, pelt, or textiles made from it. People have often asked me if their lovely soft shawl labeled pashmina might be shatoosh; unless you paid three or four thousand dollars for it, it is highly unlikely.

Weavers and spinners still make beautiful shawls by hand in Kashmir, and the shawls can still be pulled through a finger ring. The decimation of the chiru by poachers and the subsequent ban on the use or possession of shatoosh has meant that this long tradition, just like the antelope, is in danger of disappearing. When similar problems almost brought about the extinction of vicuñas in South America, a sanctuary was established that enabled the animals to return to a sustainable population and allowed a legal harvest of vicuña fiber. With such a positive outcome, perhaps this is a model that could be applied for the protection of the chiru.

1764, ENGLAND

James Hargreaves developed the spinning jenny. Although it was still turned by hand, it produced eight threads instead of just one. It was a first step toward the Industrial Revolution.

The drive to compete with shawls imported by the British East India Company had been limited by the yarn supply. Until this time, all yarn worldwide was spun by hand using the same type of equipment that handspinners use today: either a simple foot-powered wheel, a charkha, or a spindle. All textile production was still done in a cottage-industry system; families worked at home, sharing in the work. Women spun the thread, small children wound bobbins, men wove. All the power came from the human body. The work and the marketing were home and community based. Work hours were limited by the availability of natural light, and the use of artificial light to increase production was prohibited as an unnatural advantage.

With the development of the spinning jenny, spinning became men's work, and the bulky frames were soon moved out of the home and into the workplace. Spinning jennies, although faster, still could not spin the rare cashmere fiber that was now being imported in small quantities. It could only be spun by skilled handspinners, and none could produce a yarn from the cashmere that would be fine enough and strong enough to be used as warp on European looms. Most imitation cashmere shawls used silk as the warp and various combinations of cotton and silk for the weft. There was, of course, little comparison with the cashmere shawls; the imitation shawls were heavier and not as warm and did not have the same beautiful light-as-air drape that the authentic cashmere shawls had.

1779, ENGLAND

Samuel Crompton developed Crompton's mule, a water-powered spinning frame that could spin multiple threads at one time. While the spinning jenny was turned by a human hand, water power ran Crompton's mule. This is the era of the Industrial Revolution. Now yarn could be spun twenty-four hours a day by machines in factories, tended by workers. Crompton's mule was still unable to spin the fine cashmere fibers; the textile world searched for a fiber that would have a similar hand, drape, and warmth. (Sheep had been bred primarily for strong, silky fibers or coarse, robust tweed.)

This "postage stamp" tapestry was woven separately and then hand embroidered. This individual piece was then stitched to the edge of the shawl with tiny, invisible stitches. It clearly shows how the tapestry and embroidered threads are carried across the back of the fabric.

connected with rarity and wealth, "pashmina" has been badly misused in recent times. Shatoosh and pashmina are both secondary fibers (undercoat) and therefore have no sebaceous gland attached to produce lanolin or other wool waxes. Like all secondary fibers, they do have suint glands that produce a natural soap to help remove dirt and debris.

Traditionally, the women prepared the fiber for spinning by picking it clean of debris, then washing it by rubbing rice flour through the fleece. It was then dehaired by hand or by drawing it through a fine-toothed wooden comb. The fiber was teased into a fluffy mass and spun using a true long draw into very high-twist singles. Yarn was also spun using a supported spindle and occasionally a simple low-whorl spindle. It is this amazing thread that gave Kashmiri shawls such an unusually fine hand and a perfect drape.

It was men's work to do the dyeing and weaving. The shawls were woven on simple upright looms similar to modern tapestry looms. One man would prepare the warp and warp the loom. He would choose the handspun singles and twist together as many as needed to make the warp thread the right size for the fabric that was planned. A shawl would have between 2,000 and 3,000 ends of a usually doubled two-ply thread sett between 80 and 100 ends per inch. Each warp thread was made individually; it took a great deal of skill and patience to work with the fine, high-twist warp threads. The warps were usually two threads twisted together, one warp length at a time. The threads were attached to a hook in the wall, and the warper walked backwards, twisting the yarn until he had the twist and length he needed. It is still done this way, especially for silk rug warps in parts of Turkey. In the modern textile world, this is called doubling, not plying, and is often done in the same direction as the original singles.

The threads were raised and lowered by hand in small groups. The weaving was done with a needle using an interesting weaving technique called a 2/2 twill tapestry weave. Depending on the pattern, one line of weft might have dozens of tapestry bobbins, each with a different color. Instead of the weft thread passing over one warp thread as it does in classic tapestry weaving, the thread in a 2/2 tapestry twill passes over two threads at a time. Not only is this easier on the very delicate warp threads, it also produces a distinctive fine diagonal rib and gives the fabric its beautiful drape. Generally, the shawl would take two to three years for a skilled artisan to weave.

Kashmiri shawls were often embroidered as well, sometimes as they were woven, sometimes after.

1785, ENGLAND

Edmund Cartwright developed the first power loom. While not an immediate success—handweavers burned the first factory down—his loom was the precursor to modern power looms.

1796, AUSTRALIA

Colonist John Macarthur imported several fine Spanish Merino sheep to Australia. Against the advice of other Australian colonists, he decided not to crossbreed them with the local British-bred meat sheep but to breed them for finer fleece at the expense of a market carcass. Coming from England, he had seen the drive to spin finer, softer fibers and the industrialization of the spinning process. His breeding program produced a fiber with the hand, drape, and warmth of cashmere but strong enough to be mechanically spun extremely fine. His fleeces produced pounds of fiber, not ounces. Australia became the premier producer of fine-wool fleeces worldwide. (John Macarthur is seen as the founder of Australia's most important industry. In 2014, Australia's population of fine Merinos was over 100 million.)

1800, PAISLEY, SCOTLAND

Paisley mills learned how to make shawls in five colors instead of the prior limit of two. (Kashmiri shawls had at least sixty.) Finer wools from the new breeding program in Australia started to appear in Scotland, along with fiber from the increased pashmina production in India; mill machinery was adapted to spin finer wool fibers. Pashmina continued to be handspun.

A Paisley shawl woven in Kashmir using a doubleweave brocade. It is perfect on both sides.

Occasionally, the Kashmiri shawls were bordered with a separate edge made of small squares woven in intricate tapestry, then stitched together with tiny, invisible stitches. Representations of these little postage-stamp tapestries can still be seen in the borders of many modern machine-woven Paisley shawls.

During the time of the Mughals, the British began to set up trade arrangements along the coast of India. The original shawls that came to Britain in the sixteenth century, brought back by travelers and traders, were considered as precious as rare gems and counted as wealth, just as they had been in Kashmir. As clothing, however, they had been transformed; what was originally a status garment for men became a very desirable fashion garment for women. The shawls were first worn in Britain, later in France. The Kashmiri shawls were still produced as they had been since Akbar's time: spun, dyed, and woven by hand, one shawl at a time.

They were nearly priceless.

And now that butterfly, worlds away in that remote Himalayan valley, flexes its wings and the vibrations start to change the shape of textiles forever.

It is difficult to imagine from today's perspective how a single piece of clothing could be of such economic importance. In the 1760s, a single Kashmiri shawl would have cost between 250 and 300 guineas, the same price as a medium-sized house. While only the extremely wealthy could afford a Kashmiri shawl, it didn't mean that those who couldn't afford one didn't dream of doing so. The British textile industry definitely noticed both the cost of the shawls and their desirability. There was nothing that could compare to the work coming from Kashmir; there were no fine-wool sheep or other suitable fibers in Britain that could produce a fleece with the warmth, the light weight, or the

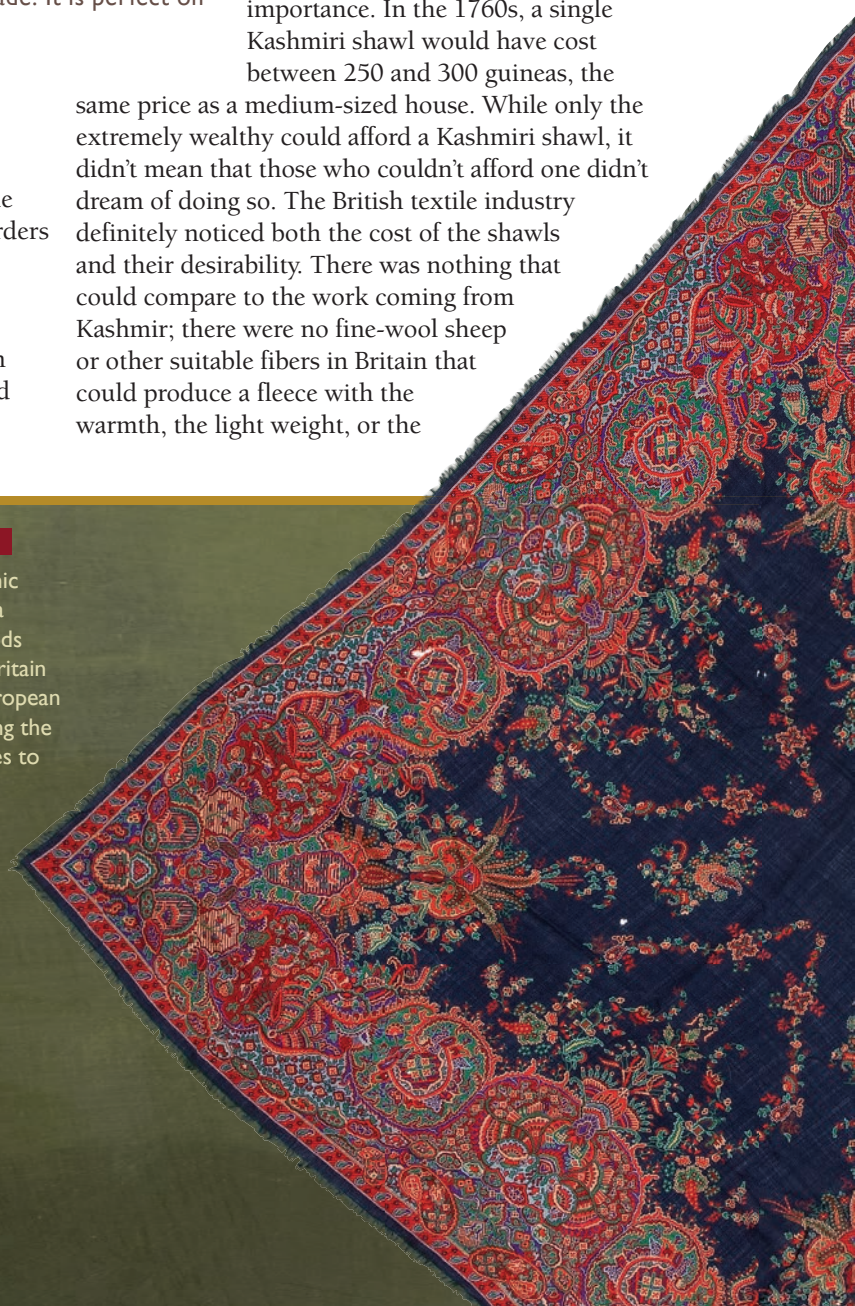
1801, FRANCE

Joseph Marie Jacquard developed the Jacquard loom to weave complex patterns with many color changes. He used a series of punch cards to transfer the design information to the weaving frames. The Jacquard loom could make fifteen colors, an improvement but still short of the sixty or so colors found in the original handwoven Kashmiri shawls.

Little more than a hundred years later, this method was used to start the computer industry.

1806, FRANCE

During the Napoleonic Wars, Napoleon set up a blockade to prevent goods from being shipped to Britain from France and her European trading partners, including the silk used to make heddles to weave Paisley shawls.



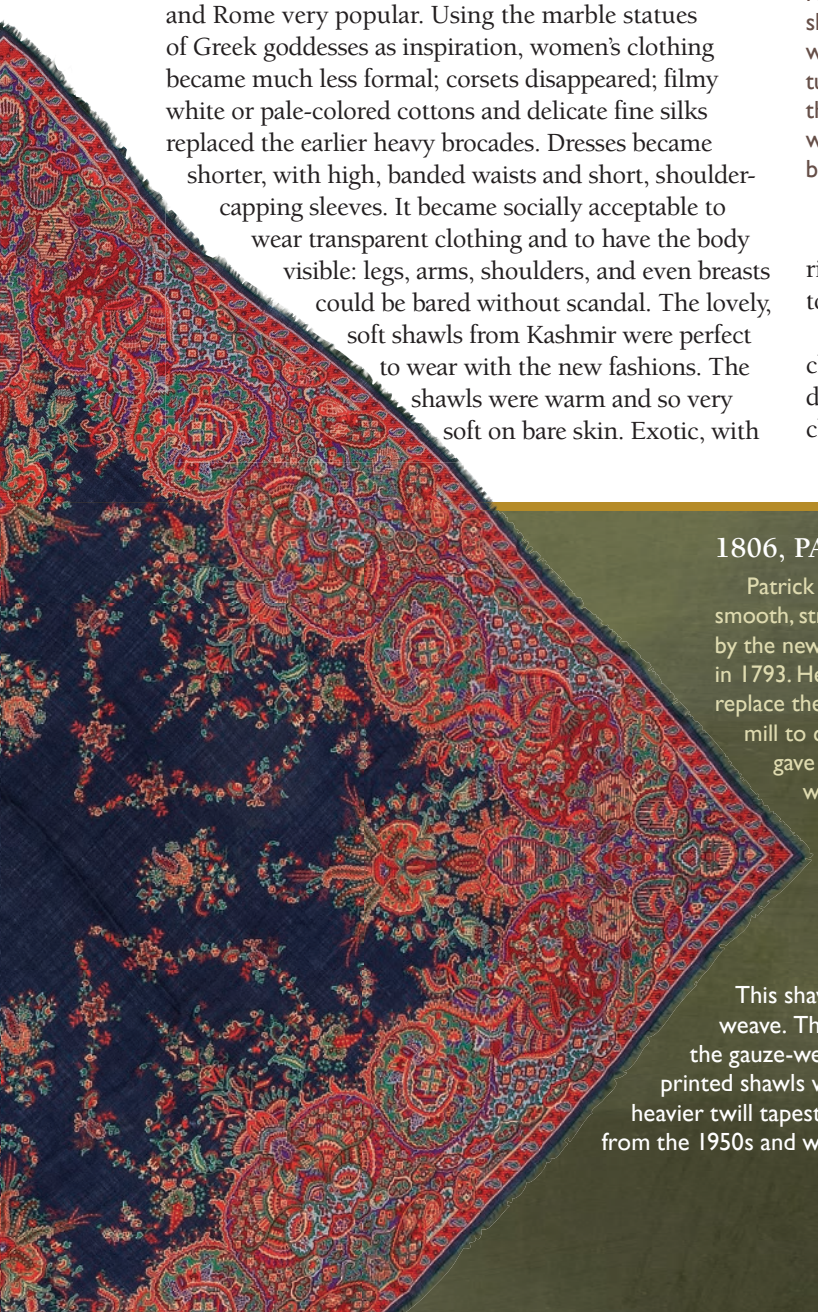
incredibly soft hand of the chiru or the Changthangi fleece. And if there had been, there were no spinning mills to spin such a fine thread from fiber as delicate as these rare fibers. Just as in Kashmir, all yarn was still spun by hand. Weaving in Britain and the rest of Europe was done by individual weavers in a cottage-industry system. There wasn't a weaving loom in Britain or Europe that could have woven the fine, delicate fiber in the rich multicolored patterns of the shawls. To the European textile manufacturers, the desirability of the shawl made it a challenge that was simply irresistible.

About this time, two things happened: there was a change in fashion in both Britain and France that made Kashmiri shawls the perfect accessory, and a few fine-wool sheep were introduced to Australia from Spain via South Africa.

Around 1790, women's fashions in Britain took a dramatic turn. Lord Byron, Keats, and other writers from the Romantic movement made images of early Greece and Rome very popular. Using the marble statues of Greek goddesses as inspiration, women's clothing became much less formal; corsets disappeared; filmy white or pale-colored cottons and delicate fine silks replaced the earlier heavy brocades. Dresses became shorter, with high, banded waists and short, shoulder-capping sleeves. It became socially acceptable to wear transparent clothing and to have the body visible: legs, arms, shoulders, and even breasts could be bared without scandal. The lovely, soft shawls from Kashmir were perfect to wear with the new fashions. The shawls were warm and so very soft on bare skin. Exotic, with rich, jewel-like colors, they were the perfect complement to the filmy, simple shape of the dresses.

France had recently undergone an abrupt fashion change similar to the one in Britain but for somewhat different reasons. Instead of the ornate, heavily corseted clothing and the elaborate wigs and makeup of pre-

This shawl is primarily a very fine white wool called botany, a reference to the fine white sheep raised in Australia. It has inserted bands of recycled paisley material cut from a much older shawl. It is a turnover shawl: one side of the bands is reversed, so that when it was folded to wear, both borders would appear on the finished side. As on the classic turnover shawl, the bands are different widths; it would be folded so that the wider band was at the lower edge of the shawl. These shawls were worn in the 1820s, when the Paisley shawl was no longer draped but displayed like a canvas on the body.



1806, PAISLEY, SCOTLAND

Patrick Clark developed a way to spin a very smooth, strong thread from cotton fiber processed by the new cotton gin developed by Eli Whitney in 1793. He had been trying to find a thread to replace the silk thread heddles necessary for his mill to continue weaving Paisley shawls. He gave hanks of his cotton heddle yarn to the women who worked in his mill for their home sewing. He realized two things: he could apply similar methods to spin fine wools, and he could market the finely spun cotton thread.

1812, PAISLEY, SCOTLAND

The Clark brothers began to sell cotton sewing thread on wooden spools. This was the first time commercially spun sewing thread was available to seamstresses and tailors.

This shawl is beautifully printed on a very fine worsted-wool gauze weave. These shawls first appeared in the 1840s with designs printed on the gauze-weave wool fabric that the Paisley mills were famous for. The printed shawls were wonderfully lightweight but couldn't take the place of the heavier twill tapestry shawls, which could be worn instead of a coat. This shawl is from the 1950s and was made in Scotland.

A modern shawl from Kashmir, woven in silk and fine wool. These beautiful shawls were woven on looms that were sent to the province of Kashmir from Scotland in the early 1900s.

revolutionary fashions, dress for women became more informal after the revolution. Dresses were designed to make women look more like milkmaids and less like aristocrats. The same Greek and Roman influences that shaped Britain's clothes also surfaced. During Napoleon's wars with the Ottoman Empire, objects from the Middle East became very popular. Napoleon brought several Kashmiri shawls back for the empress Josephine. Worn by Ottoman military leaders as turbans and sashes, these Kashmiri shawls brought to France as spoils of war were once again transformed into women's garments. The empress was enchanted with the shawls, and her collection soon numbered in the hundreds.

When fashions changed again in the 1820s, crinolines and hooped skirts dominated women's clothing. Jackets and coats were difficult to wear with the new silhouette, but the shawl (no longer called Kashmiri but Paisley after the town in Scotland that had been its most successful manufacturer) simply changed its shape. It became larger and was worn as a coat rather than a shawl. With this larger size, the pattern expanded to cover most of the shawl. Worn over the big crinolines, the intricate patterns of the shawls were displayed like the works of art they truly were.

By 1860, the fashion silhouette changed again; the large bell-like shape of the crinolined skirt decreased in the front and was gathered to the back, focusing on a very tiny waist and a boned corset that emphasized the breasts. The bustle, fully developed by the 1870s, brought about the end of the Paisley shawl. The shawl simply could not be worn with the shape of the bustle; small capes and jackets replaced what had been the heart of fashion for over a hundred years.

As ephemeral and flighty as a butterfly's wing, fashion flickers and moves on. The length of the life of the Paisley shawl, while phenomenal in the world of fashion, is just like a butterfly's life, hardly an eyeblink in the world of fabric. But in that spreading of its wings, in that blink of the eye, it changed the shape of our known world forever. Would it have changed without the shawl? Of course it would . . . but it didn't.

Judith MacKenzie of Forks, Washington, has been a textile artist for over thirty years. She is at work on a book about spinning luxury downs, and she's starred in a number of Interweave spinning videos.

1822, ENGLAND

The technology that enabled Jacquard to transfer complex information through punch cards ushered in a new revolution. Inspired by how the Jacquard loom used punch cards to program the loom to weave the complex shawl patterns, Charles Babbage developed the analytical engine, the precursor to the modern computer, which could compute mathematical problems.

1834, PAISLEY, SCOTLAND

Spinning methods improved enough to make it possible to commercially spin a cashmere yarn that could be used for warp. The Manufacturers Guild Show included a category for cashmere shawls spun and woven in Scotland.

This shawl has a Jacquard-woven fine-wool weft on a silk warp. Only six colors were used to produce the complex and colorful pattern. It was woven in Paisley in the 1860s.

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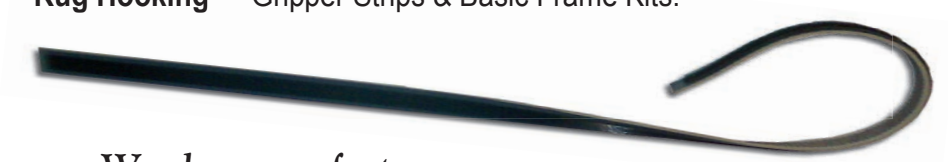

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Explore the Blending Board

You want one. Do you need one?

BY CONSTANCE HALL

Blending boards are experiencing a surge in popularity, but they are not a new tool; Ashford and Louet both manufactured them many years ago, and the less-known Duncan Carders debuted one in the 1990s. These three companies are now introducing new and improved models, while others are debuting blending boards of their own. We now have many choices—but is it something that you need in your fiber toolbox?

A blending board is more than an overgrown handcard, and it is not just a cheaper alternative to a drumcarder. What all three tools have in common is the carding cloth surface.

BOARDS OUT OF THE BOX

There are many similarities in the boards currently manufactured as well as a few significant differences. (See page 54 for blending board manufacturers.)

- The **wood backing** behind the carding cloth ranges from plywoods to various hardwoods.
- The number of **teeth per inch** (TPI) varies a great deal. The higher the TPI, the more closely set the teeth, and in general, the finer the fiber that will be used on it. Most of the boards come with 72 TPI carding cloth, but Ashford comes with 108 TPI and Fancy Kitty's boards can be custom ordered with 22 to 90 TPI.
- The overall **size** of the boards varies somewhat, along with the carding cloth working area.
- For ease of use, **keel placement and adjustability** are important. Some keels are adjustable and have more than one place to attach to the board, which can make them more comfortable to use. Most blending boards can be used flat on a table, standing on a table, or on your lap with the keel between your legs. If you plan to use the board on your lap, make sure the overall size will be comfortable for you.
- The **accessories** included are generally two dowels and a brush.

Striped rolags can be made on handcards, but with only a few colors and not much fiber.

Wrapping the fiber around a large dowel creates an airy rolag.

SUPPLEMENTARY MATERIALS

A trip to the hardware store can provide a few useful extra tools. A stiff-bristle paintbrush or wide wallpaper brush can be used to blend and brush the surface of the fibers. Stiffer floor brushes work well for packing fiber into the teeth.

You might find other helpful tools in your own fiber tool kit. A flicker or a small handcard is good for blending and straightening the fibers on the board. Forming a rolag around a large dowel or a large plastic knitting needle makes an airy rolag that is very easy to draft. Even a toothbrush can be a good tool to blend small areas without disturbing the surrounding fibers.

TESTING, STUDIO-STYLE

Deciding which of the three major blending tools—handcards, drumcarder, or blending board—will work best for a given project might take some sampling with the specific fibers you plan to use. Using the same fibers, I decided to compare the three devices to make striped rolags and lightly blended mixed-fiber batts. In the spirit of self-sacrifice, I ordered a Louet blending board, which arrived nicely packaged with two dowels and a wooden, bristled brush. The keel screws into one of three spots in the back of the board. It is fully adjustable: it can be rotated 360 degrees for the best angle for either tabletop or lap use.

Laying the blending board on my lap, I added Merino top in stripes to experiment with making striped rolags. It was easily done: The wide working surface could accommodate many colors and wide stripes.

The blending process is fairly straightforward. Using the bristle brush, pack each color down into the teeth, making sure to overlap the colors a bit to prevent bare spots. When the board is fully loaded with fiber, it is time to start pulling rolags off. (It can be valuable to take a picture of each board before the rolags are pulled off in order to match multiple rolags for a larger project.) Turn the board around and start at the bottom so that the teeth release the fiber. Fold the ends of the fibers over one dowel, then use the second dowel on top to trap the fibers. Pull up to stretch the fibers while winding the fiber around the dowel. Repeat this step: pull up and wrap, pull up and wrap. Keep in mind that the less fiber there is in each rolag, the more quickly the color will change when spinning; fat rolags equal long color changes, while skinny rolags equal shorter color changes. Stop when each rolag is the desired size, slide the fiber off the dowel, and repeat. It is possible to get many rolags off a single loading of the board.

I also tried to make the same striped rolags on the handcards and drumcarder. The handcards were fun to use, but the rolags were very small, and it was impossible to get many colors on the small working surface. The drumcarder is just not the tool for this job. It was very difficult to get even rolags and hard to get them off. It can be done—by clamping the handle down or enlisting help to keep the drum from turning while pulling the rolags off—but the process was awkward and the rolags turned out very uneven.

For the mixed-fiber batts, the goal was art batts with a variety of fibers that were not very well blended. Loading the Merino top, angelina, mohair locks, and soysilk on the blending board was easy, as was controlling where the fibers were placed and how much they were blended. The fibers could be blended with an overall surface brushing with the bristle brush or area by area. Pulling the fibers off as one sheet made a nice batt; the fibers could also be dizzed off or made into rolags.

With a blending board, creating batts and even punis for art yarns was a breeze.

On the drumcarder, controlling where the fibers end up is pure guesswork. Blending is accomplished by how many times the fibers are run through, and with each pass, control over the placement of colors and fibers is lost. The handcards are not the tool for art batts, at least not for more than one or two small ones.

SO . . . DO YOU NEED ONE?

Handcards and drumcarders are great tools with many uses. But if the goal is striped rolags or precise art batts, a blending board gives you a canvas to work on that the others cannot duplicate. Adding a blending board to your tool chest is a good choice if you are not getting the result you want with the tools you have—or just for fun!

Constance Hall loves that being creative is a journey that takes a lifetime and the fiber world is a wonderful place to travel. Now pattern design for Schacht Spindle Company teaching fiber arts fill her time. Introducing students to new skills and seeing where it takes them is the payoff of years of study.

The blending board allows you to place fiber precisely in an art batt.

Blending Board Manufacturers

If you're intrigued by the possibilities of this new-again tool, contact the following manufacturers to learn more.

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Quick on the Uptake

The Relationship Between Take-Up Tension and Take-Up Speed

BY AMY TYLER

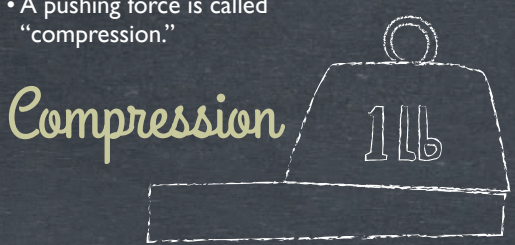
My urge to spin yarn is fundamentally a creative urge. But spinning on a spinning wheel is also fundamentally a mechanical process, a physical collaboration between a spinner and the spinner's wheel. It seems that the more I put my spinning into mechanical perspective, the better I am at creating the yarns I want. Here are some notions of Newtonian mechanics that I have found useful in developing a satisfying and fruitful friendship with my wheel.

A Few Concepts of Classical Mechanics

The following are simplifications:

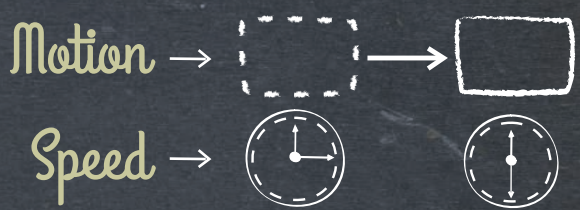
- A force is an influence that can cause a change in linear motion of a physical object.
- A pulling force is called "tension."

- A pushing force is called "compression."

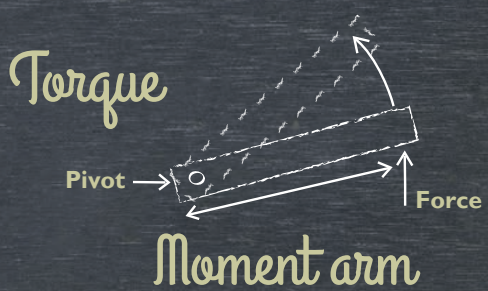


- Friction is a force that resists the sliding of two physical surfaces that are in contact. Friction is influenced by the smoothness of the surfaces involved and by how hard these surfaces are pushed together.

- Motion can be thought of as the relationship between distance and time: how far an object moves over how much time.
- Speed is a measure of motion: the amount of distance per amount of time.



- Torque is an influence that can cause a change in rotational motion of a physical object.
- Torque is produced when a force is applied at a distance away from the axis of rotation. That distance away from the axis of rotation is called the "moment arm."



ALL CHALKBOARDS ©ISTOCKPHOTO.COM/WILLARD

Spinning fiber into yarn involves three processes: first, fiber is drafted to a desired thickness; second, twist is added to the fiber; and third, the resulting yarn is wound onto something for storage.

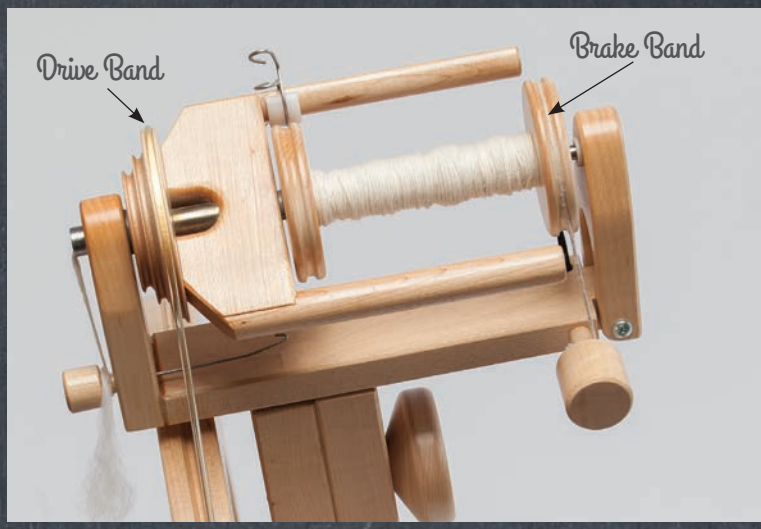
On a flyer-bobbin spinning wheel, that last step is accomplished by the wheel pulling on the yarn so that it can be "taken up" onto the bobbin. How *hard* the wheel is pulling is called "take-up tension." How *fast* the yarn is being taken up onto the bobbin is called "take-up speed." These two elements can be adjusted separately from each other.

TAKE-UP TENSION

How take-up tension is adjusted depends on the drive mechanism of your wheel. There are three common drive mechanisms of flyer-bobbin wheels.

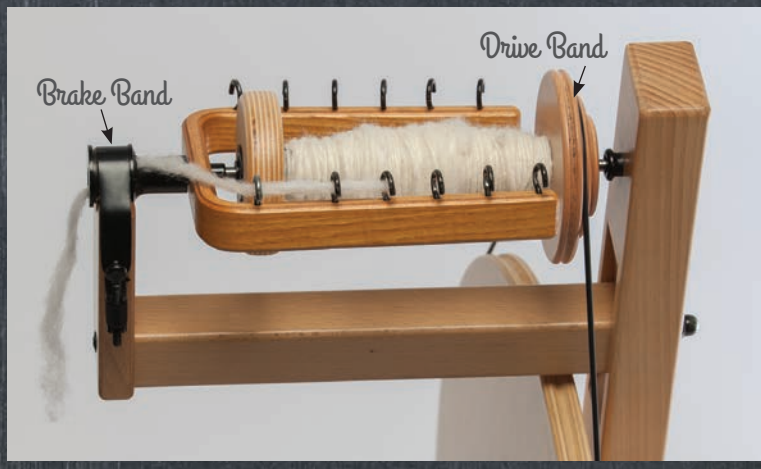
These adjustments to either the brake or drive band change the friction between the band and the bobbin or flyer. This change in friction results in a change in how hard the wheel is pulling on the yarn that is being spun. In other words, this is a place on your wheel where you want friction: if the surfaces of the brake or drive band and the bobbin or flyer are too smooth, it is more difficult to adjust the take-up tension.

In addition to the influence of friction, the



On flyer-lead (also known as scotch-tension) wheels, the drive band rotates the flyer. There is a separate brake band on the bobbin. This brake band is typically attached to a knob so that you can tighten or loosen this band. When the brake band is tightened, the take-up tension is stronger. When the brake band is loosened, the take-up tension is weaker.

On double-drive wheels, the drive band rotates both the flyer and the bobbin. Take-up tension is adjusted on these wheels by somehow adjusting the distance between the drive wheel and the flyer-bobbin (typically by knob and screw or by tilt). Moving the flyer-bobbin farther away from the drive wheel makes the take-up tension stronger. Moving the flyer-bobbin closer to the drive wheel makes the take-up tension weaker. (On the wheel shown here, the flyer-bobbin itself does not move, but an additional pulley creates more distance between drive wheel and flyer-bobbin. As for many contemporary wheels, there is both a double-drive and a flyer-lead option.)



On bobbin-lead (also known as Irish-tension) wheels, the drive band rotates the bobbin. There is a separate brake band on the flyer. As on the scotch-tension wheel, this brake band is adjustable so that when tightened, the take-up tension is stronger, and when loosened, the take-up tension is weaker.

amount of yarn on the bobbin also influences take-up tension. You may notice a reduction in take-up tension as your bobbin fills. This effect can be explained by the relationship between force (a linear influence) and torque (a rotational influence): mathematically, torque equals force times moment arm. The amount of torque required to rotate the bobbin is controlled by the tension on the brake or drive band and will only change if the band tension is changed. As the bobbin fills with yarn, the moment arm is increased. Since torque is constant and moment arm increases, that means that the force (how hard the yarn is pulling) decreases. But it's the pulling force that you feel through the yarn, not the torque. So to maintain the pulling force as the bobbin fills, you need to increase the torque. You need to increase the take-up tension.

Factors That Influence Twist

Three elements of spinning directly affect twist. Each element can be varied and controlled independently of the other two elements.

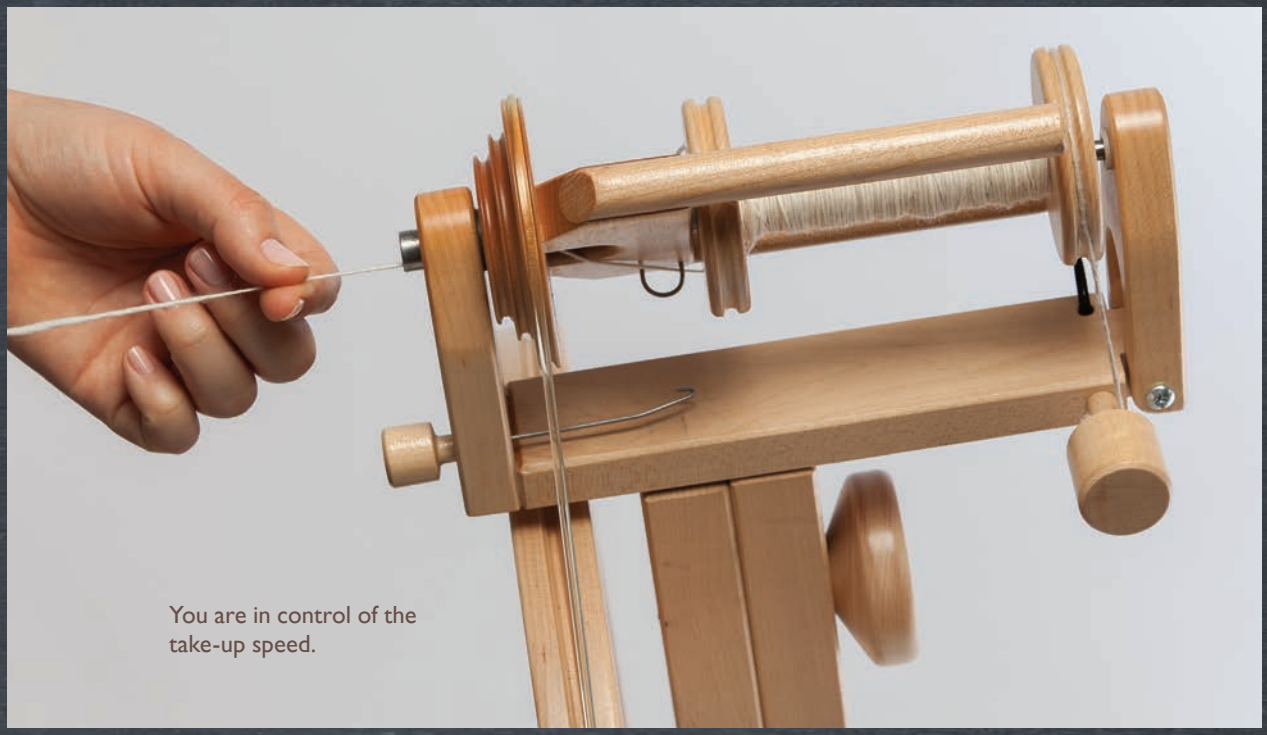
- Treadling rate: if you maintain constant drafting and constant drive ratio, the greater your treadling rate, the more twisted the yarn will be.
- Drafting rate: if you maintain constant treadling and constant drive ratio, the slower your drafting rate, the more twisted the yarn will be.
- Drive ratio (the larger the pulley, the lower the drive ratio): if you maintain constant treadling and constant drafting, the smaller the pulley, the greater the drive ratio and the more twisted the yarn will be.

So here are the things you can do to control twist:

- For more twist: either increase treadling rate, or decrease drafting rate, or increase the drive ratio (use a smaller pulley), or use any combination of these three actions.
- For less twist: either decrease treadling rate, or increase drafting rate, or decrease the drive ratio (use a larger pulley), or use any combination of these three actions.

TAKE-UP SPEED

Take-up speed is the same thing as drafting rate, or the drafting distance per amount of time. This drafting rate (take-up speed) is one of three independent factors that influence the amount of twist that you are inserting in your yarn. The other two factors are treadling speed (or number of treadles per amount of time) and drive ratio (or pulley size).



You are in control of the take-up speed.

Take-up speed is controlled by the relative amount of both the take-up tension—how hard *the wheel* is pulling on the yarn—and how hard *you* are pulling on the yarn. At any point, the wheel pulls with only one amount of force. You, on the other hand, can pull with infinitely variable force. That's because you have a nervous system that controls the thousands of muscle fibers in your body. Essentially, you are controlling the take-up speed; the wheel is not.

Think of it this way: you are playing tug-of-war with your wheel. If the yarn is going onto the bobbin, the wheel is winning. If the yarn is coming off bobbin, you are winning. If the yarn is not moving, then you and the wheel are tied.

Many spinners think of take-up tension as controlling take-up speed and thereby controlling the amount of twist that is inserted in the yarn. But this is not quite right. Take-up tension only influences take-up speed to the extent that you let it. It is possible to change take-up tension (either up or down) and have absolutely no change in take-up speed (and therefore no change in twist).

Try this exercise of making three samples to demonstrate:

1. Spin a singles yarn at whatever drafting and treadling rate you choose. Make a plied-back-on-itself sample.
2. Now, reduce the take-up tension as much as you can while still getting take-up of the singles onto the bobbin. Using the same drafting and treadling rate as in step 1, spin another singles. To do this, you will have to reduce how hard you are pulling on the yarn. Make a plied-back-on-itself sample. If you maintained the same drafting and treadling rate, the amount of twist in this second sample would be the same as in the first sample.
3. Now, increase the take-up tension a lot. Using the same drafting and treadling rate as in step 1, spin another singles. To do this, you will have to increase how hard you are pulling on the yarn. Make a plied-back-on-itself sample. If you maintained the same drafting and treadling rates, the amount of twist in this third sample would be the same as in the first sample.

In both steps 2 and 3, you have changed the take-up tension without changing the amount of twist you are inserting in your yarn. What you have changed is how hard you are pulling. In this series of tugs-of-war, you are always pulling. And your wheel is always pulling. You are never pushing.

A number of muscle actions change as you vary how hard you are pulling. Not only are you using the muscles of your arm (and to a lesser extent of your shoulder and trunk) to pull the yarn in a direction away from the wheel, but you are also using your hand and finger muscles to pinch down on the yarn. As you increase your pulling force, you increase how much these muscles are active, both in pulling and pinching. It is fortunate that our nervous systems are well equipped to accomplish this task. It may take some practice, however, to become accomplished at controlling this pull/pinch.

Situations in which you might want strong(er) take-up tension:

- Drafting rovings that are "sticky," i.e., they have a lot of "internal friction."
- Spinning or plying some highly textured yarns that require a lot of hand manipulation.
- If you have a tendency to overtwist your yarn, it may help to increase the take-up tension.

Situations in which you might want weak(er) take-up tension:

- Spinning thin yarns from short fibers (e.g., cashmere, cotton) that require high twist.
- Spinning very slippery fibers (with low "internal friction").
- If you have trouble pulling hard enough to control the speed of take-up of the yarn, you may want to decrease the take-up tension.

Even though it is you who is controlling take-up speed, it is handy that take-up tension can be adjusted. There are times when a strong take-up tension is helpful, and there are times when a weak take-up tension is helpful.

Apart from all the mechanical explanations of take-up tension, I have come to view how much take-up tension a spinner needs is in no small part a matter of preference or personality. Some spinners just simply prefer to pull hard; some prefer to pull as little as possible. I think of it like the difference between dancing a waltz and dancing a polka. Waltzing with a partner requires a gentle pull, while dancing the polka with a partner can only be done with a strong pull! Do you prefer to waltz? Or polka?

I value the immutable facts of Newtonian physics, and I do not see the understanding of the mechanics of the spinning wheel as restrictive, dull, or dry. On the contrary, this understanding frees me to dance with my wheel—to make whatever yarn I want. And it helps me troubleshoot when spinning isn't going quite as smoothly as I would like.

Amy Tyler has found her years of studying and teaching dance, biomechanics, neuromotor control, and motor learning to come in handy in understanding the spinning process and making the most of her spinning wheels.

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Tips for Buying an Antique or Secondhand Wheel

Only needs a flyer and bobbin . . .

BY LINDA MARTIN

You've seen the ads: "works perfectly," "primitive," or "only needs a flyer and bobbin." "Works perfectly" may mean only that when you stomp on the "peddle," the wheel turns; that does not a working spinning wheel make. Ironically, "primitive" may indicate a rather sophisticated wheel whose limbs have grayed from dehydration . . . or a wheel in parts, most of them missing. "Only needs a flyer and bobbin?" A custom-made replacement flyer and bobbins made by a woodworker with experience in spinning wheel parts will likely run upwards of $200.

There are deals out there, and neglected wheels that deserve to spin—and can, with a bit of tweaking. So whether it's your first wheel or you're adding to your flock, here are some tips for telling the darlings from the duds.

1

WHEEL DETAILS

1. If you're looking at ads on Craigslist, eBay, or other online sources, don't let lack of a photo in the ad discourage you. Elderly sellers who are downsizing and ridding themselves of family heirlooms may not have a digital camera or smartphone and may not be computer savvy. If you suspect that this is the case, contact the seller and ask for photos, either by email or regular mail. Ask for close-ups of flyer and bobbin and any other difficult-to-view sections of the wheel.
2. If you can get photos, examine them carefully. Is it a spinning wheel? Sounds obvious, but I've seen warping mills and skein winders listed as spinning wheels. If the wheel you're looking at doesn't look at least vaguely like other wheels you've seen, it may not be a spinning wheel. There are lots of lovely textile tools out there, but if you're focused on finding a wheel, best to keep looking.
3. If it's not listed in the ad, ask the seller if there is a maker's mark or date on the wheel. You may be able to research the builder online and learn more about the wheel you're considering. Often, markings are under the table or on the front table edge and may have been overlooked by sellers.
4. Don't rely on the seller's provenance unless there is supporting documentation; family history is known to become distorted over time, and dealers have been known to exaggerate. I recently saw a wheel dated to the 1700s and listed at $6,000. While it appeared to be an antique, the seller was off by a hundred years and $5,700, by my estimate. Because a wheel belonged to someone's grandmother and she's ninety-eight, it doesn't make it an antique. I'm a sexagenarian but not everything I own is six decades old.

2 FLYER WHEELS

1. Do the major components (i.e., wheel, treadle, bobbin, flyer, whorl) all appear to be there? I've seen wheels creatively assembled by nonspinners, but if the parts are all there, there's hope. (If missing, the footman that connects the treadle to the wheel axle can easily be replaced.)
2. Examine the bobbin and flyer components as best you can. Are there any signs of breakage or cracks to the wishbone-shaped flyer? A broken flyer arm which has been merely glued back on may look nice, but a glue joint won't hold up to the force placed upon the flyer in use. A missing flyer arm will cause the flyer to spin unbalanced. A glued flyer arm may separate and fly off, hurling a "stick" full of nails into someone's face.
3. Are the flyer, bobbin, and whorl both present and functional? For a double-drive wheel to work properly, the whorl grooves must be larger in diameter than the groove at the end of the bobbin. Sellers have been known to cobble mismatched parts together. Do the wood finish, condition, and turning style of the parts match each other and the rest of the wheel, suggesting that they are original?
4. Check the size of the orifice. If you have your heart set on spinning lofty, fat art yarn, a small-orificed flax wheel isn't going to suit you. You can spin wool on a flax wheel, but the diameter of the yarn you produce will be limited by the size of the orifice. For art yarn, you might be better off looking for a contemporary rather than an antique wheel.

A chipped bobbin may be no problem. For a quick fix, a used can lid (here, an orange plastic lid from a nut can) with a center circle the size of the circumference of the bobbin shaft cut out, and a slit from center to edge allows placement on the bobbin.

3 SPINDLE WHEELS

Great wheels or walking wheels are the giants of the spinning clan. They don't have flyers and bobbins, nor do their smaller spindle-wheel sisters.

1. Prices for these wheels vary greatly by geographic region, likely because their size makes them difficult to transport and they tend to live near their place of birth.
2. Spindle wheels, both large and smaller versions, tend to be of one of two styles. They have either two uprights on the maiden to which a spindle has been attached (often affixed with a corn husk) or in addition to a spindle, they have an accelerator wheel—a smaller wheel that speeds up the drive wheel and may be commercially machined. Replacement antique accelerator wheels, when they can be found, can easily range in price between $100 and $200.
3. Take note: Quill winders are not spinning wheels. They are used to wind quills of yarn for a weaver's shuttle. Antique quill winders can look a great bit like spindle wheels and are often offered as such. A quill winder typically has a blunt spindle, whereas a spindle wheel's spindle is more pointed; ask Sleeping Beauty. I keep mine protected by a cork, as it's quite sharp.

4 UP CLOSE AND PERSONAL WITH A WHEEL

1. What is the condition of the wood? If it's shiny, it is likely either a modern wheel or an antique that's been bathed in varnish (and there is a risk that the varnish has frozen the working parts).
2. Gray, dry wood shouldn't turn you away. A spa treatment of equal parts turpentine and linseed oil will nourish the wood and bring back the grain. But watch for telltale signs of water damage, which may have caused warping.
3. Look for wear on the treadle and oil stains on the leather flyer bearings and axle. A wheel at work must be oiled, and oil stains are evidence of use, a good thing.
4. Look for worm holes. A few may not be significant, but an abundance may indicate wood that will crumble between your fingertips.

5

HOMING IN ON A WHEEL

1. Once you've located a likely prospect within visiting distance, contact the seller and make an appointment. I've found that fiber enthusiasts are overwhelmingly decent people; scam artists seem to stick with knockoff purses, watches, and electronics. However, be careful and keep safe. One seller increased the price after I contacted him, then insisted on meeting me late in the day in a parking lot off the interstate. He indicated that he had other buyers and I needed to bring the money quickly before a competing buyer stole the wheel out from under me. I didn't schedule a rendezvous and watched as the wheel lingered on Craigslist for weeks. It's great to have another spinner accompany you, but in any event, don't go alone. It is customary to pay in cash and to take the wheel with you when you purchase it. However, if you sense any red flags, avoid the deal; trust your instincts.
2. When checking out a wheel, I bring a roll of cotton survey twine, scissors, spinning wheel oil, fiber, slot and Phillips screwdrivers, standard pliers, and small adjustable pliers. The first four allow me to spin, the latter four to remove the drive wheel when I break down the wheel for the trip home.
3. Plan your time and arrange with the seller to have time to put the wheel through its paces, though sometimes that's not possible. If, for instance, the leather bearings are damaged or missing, I can often use cotton twine to create a temporary bearing or footman or to replace a missing drive band and get myself to spinning. Remember that as they age, wheels tend to develop their own personalities in response to their care and environmental issues such as humidity. You may have spun on a wheel belonging to a friend and it spun as smooth as butter, but its twin out in the wild may not spin nearly as well. The best way to judge how a wheel spins is to spin on it.
4. Is the flyer missing hooks, or are the hooks rusted? If the wood is so deteriorated that hooks are loose, you may need to replace the flyer, which will certainly add to your final costs. A number of contemporary and even some antique wheels have sliding mechanisms to fill the bobbin, but flyers have traditionally been lined with nails or metal hooks. One exception is antique German/Tyrolean wheels, which sometimes use a pegging system in which the spinner moves a single peg along the holes as she fills the bobbin. You may find a flyer where someone has replaced those "missing" hooks with kitchen cup hooks, destroying the flyer.
5. Do the flyer parts unscrew, or are they frozen? If they are frozen from solidified grease but intact, this is not a deal breaker; they may be loosened with a degreaser. But if the parts seem mismatched, are fashioned from a different wood or in a different style from the wheel, or are lacquered together, you need to consider carefully.
6. Examine the drive-band tension-adjustment screw (the knob on the end of the table which moves the mother-of-all forward and back to create or relieve tension on the drive band). Does it turn easily without being loose? Looking across the wheel from the edge, is it "true," or is it warped? Does the wheel align with the whorl so it doesn't wobble when it's turned? Does it turn smoothly with little effort?
7. Examine the hub. Any cracks? That's a deal breaker. Missing drive-wheel spokes? Missing spokes may throw the wheel off balance, but a wood turner may be able to turn replacement spokes at a reasonable cost.

This hub has a hairline fracture. This wheel is stable, but it would be a concern if the rift were larger.

How to spot a SWSO (spinning-wheel-shaped object)

When "country" was a hot decorating style, decorative wheels where churned out by furniture builders with no intent that they should ever spin. While you may be able to convert some of them to spinners, there is no assurance they'll be functional despite your investment of time and money for the conversion. Here's a list of red flags that should be deal breakers:

- No orifice.
- The flyer has no hooks.
- The bobbin and whorl were built as one piece and don't separate.
- No oil stains around the axle or on the flyer bearings.
- Pristine; no signs of wear or use.

6 ONCE YOU GET THE WHEEL HOME

1. I like Mr. Clean sponges to remove grime without chemicals or abuse. Dampen the sponge, then squeeze out all the water before using it. The sponge will remove dirt and grime. Then, to nourish the wheel, saturate it with equal parts turpentine and linseed oil. (In humid climates, you may need to reduce the oil-to-turpentine ratio.) Leave the wheel in the sun to bake.
2. While the wheel is receiving its spa bath, I use very fine sandpaper to remove any rust from flyer parts or other exposed metal. Unlubricated leather becomes rigid over time, but replacement leather bearings can easily be fashioned from thick leather. Use thick belt leather rather than bonded leather (thin layers of leather bonded to paper or fabric). I've scavenged belt leather from thrift store belts and shoe repairmen's scraps.
3. Missing footman? A hardwood stick from the hardware store can be crafted with a hole at the bottom (to tie on to the footman with a leather bootlace) and a slot at the top (to hook on the axle). Canadian production wheels (CPWs) often used wire footmen; I used a wire coat hanger to replace a missing footman on my French metal wheel.
4. Tighten up joints, but *don't* use Gorilla Glue! It expands as it cures and will force the joined pieces out of place. And *don't* use Super Glue! It will crack and break up with the vibrations of the spinning wheel. If a joint isn't snug, you may be able to snug it up by wrapping strips of moist newspaper around the member and then twisting it back into its hole. If a bobbin end or a spoke needs gluing, use wood glue and pressure. Use small clamps or a vise where you can. If the pieces are not clampable, use cotton twine to create tension, using a screwdriver to twist the string snug.

This Rick Reeves frame wheel was found on Craigslist, offered by an owner who had purchased it with the notion to learn to spin but never touched it. Really, never touched it, leading to decades of cooking oil film, roach droppings, and grime. The grime was removed using a Mr. Clean sponge, then the wheel was freshened with an oil treatment.

FOUND TREASURE.

"Debi," rescued from a storage unit in California, is a 1980s wheel with a solid brass drive wheel. The solid oak castle wheel has scotch tension and an innovative system for tensioning: the arm pivots up and down to provide tension on the drive bands. Subsequent research revealed that the builder, C. Norman Hicks, was a physicist who worked on the Manhattan Project and was later a Southern California college professor who developed a passion for wheels and spinning.

While these tips are offered to help you make a rational decision when acquiring a secondhand wheel, adopting a wheel is an emotional process. Does the wheel speak to you? More than one wheel has called my name after I'd resolved, "No more wheels." I purchased Debi from eBay without being able to examine her first. I was delighted to discover upon receipt that the gaudy gold-painted drive wheel was in fact glowing solid brass (see page 65). Later research established that her aesthetically unrefined particleboard whorls and tensioning system were designed by a nuclear physicist. She spins like a dream and is right at home with her oddball sisters. Enjoy your quest.

Linda Martin, a college psychology instructor who maintains a small clinical practice, lives a seabreeze from Florida's Gulf Coast, which gives the title to her blog, www.seabreezespinners.com. Her article "Fibonacci Colors" appeared in *Spin·Off* Spring 2014.

This wheel is an Appalachian Smoky Mountains find. Away from the shop, I used string, bungee cords, and a screwdriver to hold the parts under tension while the glue dried. (I'm a fanatic; I travel with small C-clamps.)

RESOURCES:

Florence Feldman-Wood, *The Spinning Wheel Sleuth*, www.spwhsl.com

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Finding Balance

In Yarn and Life

BY LESLIE HAUCK

When beginning spinning students ask how to balance their plied yarn, I first explain why balance is so important: If finished yarn isn't balanced, a knitted rectangle will skew into a parallelogram. Recall how children twist around on a swing and then let go to spin the other way, making them dizzy. We know that something twisted will untwist if left alone. Yarn wants to be balanced; if it isn't, it will tell the spinner what it needs to be happy.

It's important to check for balance at the beginning of plying so you can adjust the amount of twist and see a lovely balanced U when a section of the yarn is loosely suspended. Look closely at the angle of that perfect twist, the angle of the newly plied singles; then burn that image in your brain so that you can repeat it throughout the plying. Try this: ply about 18 inches of the singles, pull it back off the bobbin, and check it for balance. Does it hang in a U, or does it twist one way or the other? The unbalanced yarn is saying something by the direction of the twisting.

What is this communication device that the yarn has naturally? Assume that the spinner has made Z-twist (clockwise) singles and is plying counterclockwise, making an S-twist in the plied yarn. If the direction of twist of the unbalanced yarn shows a Z inclination (far left), the yarn has too much twist in the ply direction. The remedy is to let out the extra twist by moving the pinching fingers away from the orifice a few inches at a time until the plied yarn hangs in the perfect U.

If, on the other hand, under scrutiny, the sample length twists in the S direction the same way that it's being plied (near left), the yarn is asking for some more twist to be happy. The remedy here, of course, is to hold the pinch and treadle lightly to increase the twist until the perfect U is accomplished. Don't forget to wind the corrected yarn onto the bobbin rather than treadling it on, or you will have overdone your remedy and have too much twist.

RULES AND EXCEPTIONS

I ask students to make this check several times while plying. It does take time to get an eye for the correct angle of twist for plied yarns as you are working. One caveat: some fibers can handle more twist, and they actually look and wear better that way. In my experience, Merino wool can be spun with more twist in both the singles and in plying because of the nature of the fiber: Merino has such lovely bounce. I put more twist into Merino yarns, particularly the singles, and spin a bit finer than I would other wools to allow for the springy bloom of the finished yarn.

Scrutinize the finished skein in the same way as the plied yarn, looking for the perfect loop or O shape that means "balanced." If it has an inclination to curve one way when hanging, you can tell why it's not perfectly balanced: it needed either more or less plying twist. Check more carefully with the next bobbin. If the skew is not very extreme, spraying and weighting this skein will probably help it feel happier and set the twist.

If a finished skein turns out to be very overtwisted, you can try running it onto the bobbin again very quickly in the opposite direction from the ply. The results are not as good when the skein happens to be undertwisted. In this case, run your yarn very quickly onto the bobbin in the same direction as the ply, giving it just a bit more twist and being careful not to overdo it!

THE SPIRITUAL SIDE OF SPINNING

Speaking of finding balance in yarn and life, I believe that learning to spin on a wheel offers the opportunity to learn two basic life skills: letting go and allowing. In life, as in spinning, we need to let go of our hold on some things to allow others to unfold. Even before we get to plying, I start beginner's workshops with the drop spindle, and they often have the opportunity to learn a third life lesson. When a student comes to a section of new yarn so thin she fears it will break, I say, "Give a bit more twist to the spindle and *trust*."

Handspinning grabbed **Leslie Hauck** through a drop spindle thirty-six years ago and has never let go. Teaching and demonstrating for the last eighteen years, she opened her studio space, The Spinner's Loft, by the sea in Nova Scotia, Canada. Find her at www.thespinnersloft.ca.

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Lars and Joran Moen

The Yarn Project

A family heirloom kindles the love of spinning in a new generation.

BY KATHY SLETTO

According to my husband, the arrival of the spinning wheel in our household set off the downward spiral that ended his peaceful and well-organized life. I don't see it in quite the same light. My version of the story is far more upbeat. About fifteen years ago, my aunt gave me a spinning wheel that had been made by my great-great-grandfather Lars Moen sometime around 1870. Thus began "the yarn project," as my husband called it. He assumed (hoped and prayed) that it would be a short-lived phase.

A tiny hat, mitten, and pair of stockings knitted by Mari Moen.

Mari Evenson Moen

Lars Moen and his family emigrated from Norway to America in 1867. They made the eight-week voyage across the Atlantic by sailing ship. Lars and his family then traveled hundreds of miles by covered wagon to the plains of Dakota Territory, where they homesteaded.

The arrival of the spinning wheel in my home made me curious about Lars and his story. My mother unearthed a family history that had been written in 1958. I hoped to find something there about Lars and his connection to my spinning wheel, or any mention of other spinners and knitters on the family tree. I was delighted to see a wealth of information about Lars, as well as documentation that "the yarn project" has been an issue in the family for at least two hundred years. (My husband paged through the history and said grimly, "It appears to be genetic.")

From the family history, I learned that Lars was a pretty handy guy. After building a log cabin when he arrived in Dakota Territory, he kept himself busy the first winter making household furniture and tools. Lars had brought a turning lathe with him from Norway. With this he made tables, chairs, kitchen utensils, and (of course!) spinning wheels. He made a spinning wheel for his wife and one for each of his daughters.

Lars had neither nails nor glue to hold his creations together. He made his own glue by boiling horns and hooves from the cattle that he butchered for the family table, and he used wooden pegs in place of nails.

I leafed through the family history booklet, scanning the text and photos for a glimpse into the lives of the women

Lars Moen's handmade spinning wheel was held together using glue and pegs.

on the frontier. The brief biographies of the women included notations about spinning, knitting, and the raising of fiber animals. Four women, in particular, caught my attention: Lars's sisters Mari and Gjertrud, his daughter Marit, and his mother Gjertrude.

Lars's sister Mari was among those who came with him to Dakota Territory. Mari Evenson Moen (1830–1920) was called "Vesle (little) Mari" on account of her small stature. The family history describes her as being kind and considerate and always on the go. She often walked the seven miles to her nearest neighbor's home for a visit. "As Mari walked along, her knitting needles clicked in time with her steps," says the family history. She carded wool, spun, and knitted almost constantly with her handspun yarn. "She was especially clever at knitting tiny mittens and stockings with colored designs."

Marit Larson Moen

Another of Lars's sisters, Gjertrud Arnegard, was a no-nonsense widow living a hardscrabble existence and managing her own homestead in Dakota Territory. According to the family history, "Gjertrud was fearless. In the event of an Indian uprising, she stayed home alone, while the other settlers gathered together in one place. An axe by the door was her only companion."

Lars's daughter, Marit Larson Moen (1862–1939), was born in Norway, and she came to America with her parents at the age of nine. Marit, too, was known for her knitting ability and also her affinity for animals. She knitted long woolen stockings from her handspun yarn for everyone in the family. Each spring, she helped to shear the neighbors' sheep and was paid in wool. She carried the wool home, where she washed, carded, spun, and knitted it into stockings and other garments.

In 1874, Lars and his siblings sent money for their mother's passage so that she could join them in America. Old Gjertrude, as she was known, was born in 1806 in Norway. She married at an early age, bore ten children, and was widowed when the youngest child was two. She supported her family in Norway by working as a midwife and tending a few acres of land where she kept

A hand-shaped metal bearing holds the axle of the wheel's hub.

The wooden tension screw in the table is hand-turned. The metal screw was added during restoration.

cows, sheep, and goats. She is remembered as a fine spinner and weaver, and she made all of the clothing that her large family required. She was sixty-eight when her children sent for her. Upon her arrival in Dakota Territory, her children considered Gjertrude to be retired—she had done enough hard work in her day. But even in her latest years, she continued to card and spin wool for pleasure, knitting mittens and socks for the entire family. She died at the age of ninety.

I asked my aunt if she knew the identity of my spinning wheel's original owner. Melinda told me that it was Marit's, made for her by her father, Lars. Melinda entrusted me with some tiny knitted items made by Lars's sister Mari, probably knitted sometime around 1900.

After Marit Moen's death in 1939, her well-used spinning wheel was tucked away in an attic. Fifty years later, as my aunt Melinda was preparing to sell her home, she discovered it lying in pieces on the attic floor. The homemade glue that held it together for over one hundred years had dried out, the wooden pegs loosened, and the spinning wheel had simply fallen apart.

Melinda had taught me to knit when I was a child, and she thought of me when she came upon the remains of the spinning wheel in the attic. I remember her phone call and the tentative question, "I don't suppose you'd have any interest in an old spinning wheel?"

Luckily, all the parts were still there in the attic, and Melinda found a man who could rebuild and restore it to working order. When it was finished, I brought the spinning wheel home.

Though I had no idea then how it worked, I was fascinated by the spinning wheel itself, both as a historic artifact and a family heirloom. Lars had carved his initial into it—M for Moen. The treadle is worn down by more than five decades of Marit's use. Some metal screws were used in the restoration, but for the most part, it is still held together by Lars's original wooden pegs.

There has always been a strong knitting and weaving tradition among the women of my family, but no one in the generations still living knew how to spin, nor did any of our friends and acquaintances. My husband, Terry, was the one who actually figured out how to use the wheel to spin wool. He taught me, and soon the old spinning wheel was back in business.

Over the past fifteen years, my obsession with the "the yarn project" has not lessened. Instead, it has grown. I know that my life would appear to be a leisurely walk in the park compared to that of my ancestors. The pioneer women back then needed to spin and knit to ensure their families' survival in the harsh climate of Dakota Territory. There were no idle hands on the frontier, and it wasn't purely for pleasure that they spent all those hours bent over a spinning wheel. Yet when the women had a few spare minutes to spend as they wished, many of them chose to work with fiber and wool and knitting needles, just as many of us still do.

That 1958 family history booklet has become a real keepsake. It has given me insight into the lives of those who came before me in a vivid and meaningful way. One woman's story says, "She gladly offered assistance to her neighbors whenever help was needed, and she tended her family cheerfully. She lived a quiet life, spinning wool and working with her hands."

I can't think of a better way to be remembered.

Kathy Sletto is a shepherdess and author who lives near Alexandria, Minnesota. Kathy's memoir, *Keeping Watch: 30 Sheep, 24 Rabbits, 2 Llamas, 1 Alpaca, and a Shepherdess with a Day Job*, was recently published by the Minnesota Historical Society Press. Photos of and information about Kathy's diverse flock are available on her farm's website: www.shepherdsbayfarm.com.

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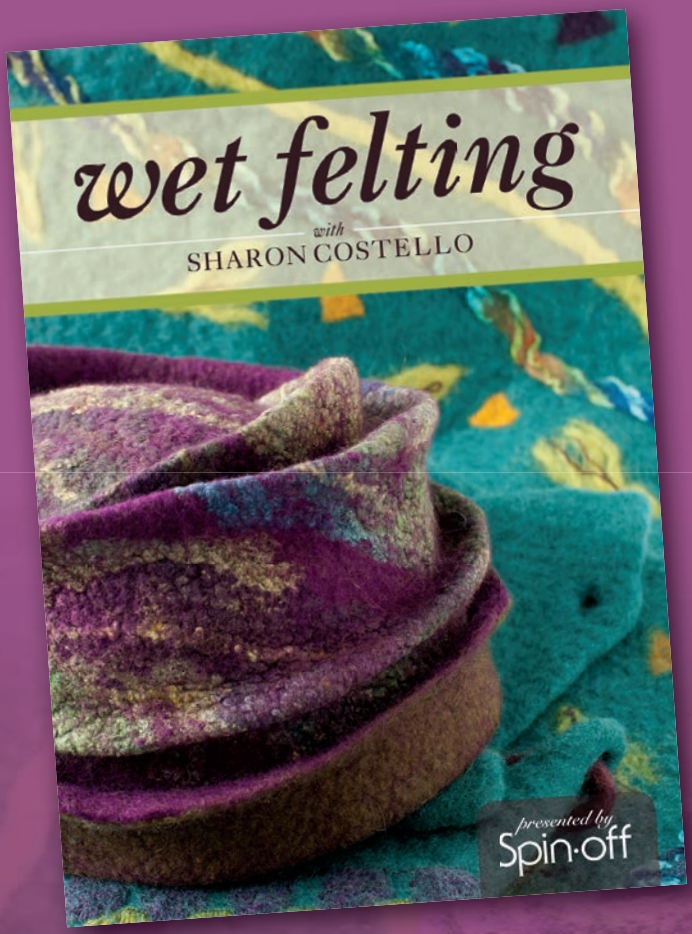

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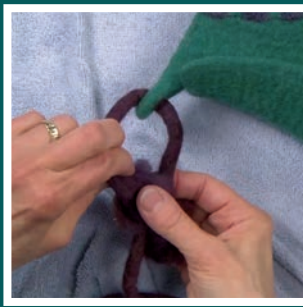

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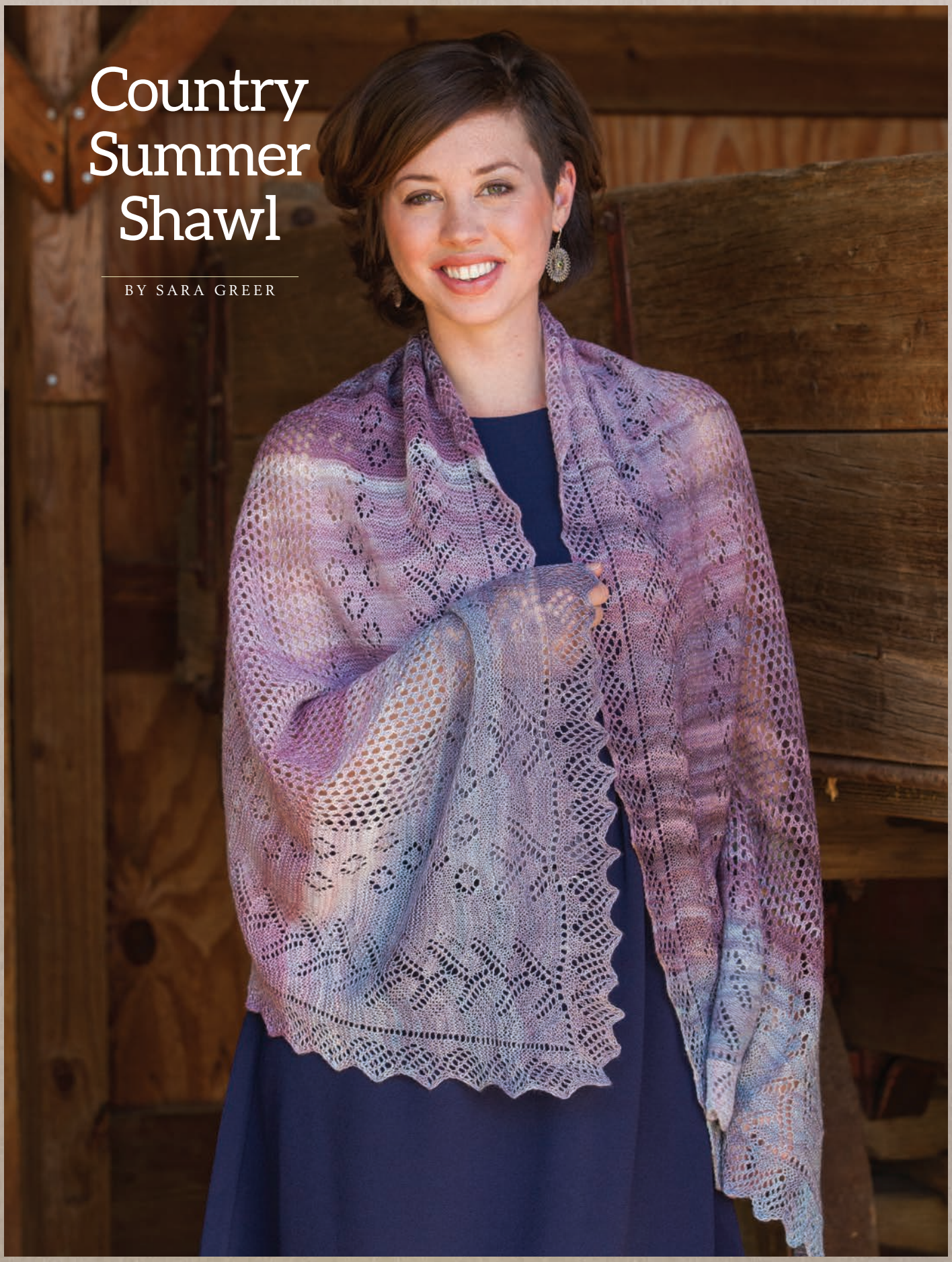
Country Summer Shawl

BY SARA GREER



I began this project at the end of summer 2013, my first full summer in the country. I enjoyed watching all the different stages the wheat goes through out here, from planting to harvesting to loading the trains headed to the mill.

When the Lace edition of *Knitting Traditions* came out last fall, it held a motif from Russian knitting that I hadn't seen before: wheat. I knew I had to make something with it. I started looking for other motifs and found strawberries and honeycomb, both big parts of a country summer, so the following shawl was born.

It is a long shawl, assembled in the traditional Russian way: one piece with no sewing. The edgings are worked as you go and the final two ends are joined in the traditional manner. The edging, called teeth, is a traditional five-hole tooth, with lace diamonds that remind me of the breezes out here. The outer border is the wheat motif, the inner border is strawberries, and the center is honeycomb.

Dyeing

Shortly after moving to our new house I pulled out some top to dye. I wet it out in water and placed it in Kool-Aid dye to soak. I then forgot about it and didn't set it until a couple of days later. It came out a great color, which I now call blueberry—more country summer. It seems that letting the top sit in the dye makes the fiber act as a filter. Some color particles float to the top, while others sink to the bottom. It only works well with grape, but I can't wait to see how it works with other fiber preparations. After a few trials and errors I can now replicate the color.

The top in the dye jar with just the grape Kool-Aid. You can see that the blue has already risen to the top.

PHOTO BY SARA GREER

Two full bobbins.

PHOTOS ON THIS PAGE BY SARA GREER

Getting ready to ply.

When plying, my ball is inside the pot, with the end coming from the hole.

All plied. The white ball is the foam my singles were wrapped around.

Fold the length of top in half and place one half in one jar and the other half in another jar, leaving both ends in one and the middle in another. In the glass jar with the ends add 2 ounces of fiber, 1 packet of grape drink mix, 1 packet of wild berry blue, ½ cup of vinegar, and enough water to cover the fiber. In the jar with the middle add 4 ounces of fiber, 4 packets of grape, 1 cup of vinegar, and enough water to cover the fiber.

After soaking for at least 14 hours, set the dye using your favorite heating method. I used the microwave as the heat source because it was already too cold for solar dyeing. I set it for three minutes on, then a three minute break, and repeated twice more.

Let the fiber and jars stand until cool. Carefully remove the fiber from the jars and rinse it in similar temperature water so it won't felt. No wringing—squeeze only to remove the water. Lay the fiber out to dry. You'll notice that you have blue, purple, and blue in the coloring of the top.

SPINNING

I spun the top from one end to the other. I didn't use all 6 ounces, but dyeing the full quantity left plenty to shift the colors as I liked and to put away for repairs should they be needed later. I spun this top into a 2-ply laceweight yarn that is 34 wpi. I used my beetle-kill drop spindle, made by my husband, which weighs 19 grams empty. Spinning clockwise, I put 4 grams of yarn on the bobbin, then switched to another interchangeable shaft on my spindle and spun another 4 grams. After letting them rest for 12 hours to calm the spinning energy, I placed the two shafts in my lazy kate and wound the plies together into a ball for plying. (Winding the ball around a small foam ball makes it easier to handle.) Winding a ball before plying is an extra step, but saves dealing with pigtails and other unevenness while plying.

For plying, I placed my ball of yarn onto a clay saucer. I pulled my working end through the hole of a clay pot and placed the pot on top of the saucer to prevent it from rolling away. I used my 28-gram particle-board drop spindle, also made by my husband, for plying. I plied in the counter-clockwise direction and put the entire 8 grams of fiber onto the spindle.

When a color change in the top approached, I purposely spun one bobbin of each color and then plied them together, hoping for a more gradual change. Some were successful and some weren't. With this mottled dyeing method, a surprise color or lighter area would pop up when knitting. I left them, and I like them.

After letting the plied yarn sit for another 12 hours, I wound it around my niddy-noddy, soaked it for an hour,

and then hung it to dry, lightly weighted.

I didn't finish spinning before I began knitting. I recommend either spinning the yarn all at once or spinning on the project often for consistent yarn.

PHOTO BY SARA GREER

All the materials used and the finished shawl.

KNITTING

The shawl begins with a provisional cast-on so that you will have live stitches when it is time to pick up for the left edging. Use any provisional cast-on that you like. I cast on with waste yarn, then started knitting with my project yarn. When it was time to pick up those stitches, I picked out the waste yarn.

The honeycomb and strawberry patterns both come from Galina Khmeleva's *Gossamer Webs Design Collection* (Interweave, 2000). The wheat pattern is from *Knitting Traditions* Fall 2013. I designed the diamond teeth using the Russian diagonals motif and a basic template for teeth that I've created based on Galina's edging designs.

The bottom edging is worked first: Cast on, work the bottom teeth, then pick up along the straight edge for the body. Working across the shawl, first work the edging, then the borders, then the center, then the borders, then the opposite edging. From one end to the other, work the outer border, add the inner border, then add the center; this is reversed at the other end. The top teeth are worked by joining to the top stitches as you go.

All the motifs are worked on the right side only except the honeycomb (center chart) and the wrong-side decrease of the teeth. Believe it or not, these motifs will become easy to feel and memorize.

Read the chart from right to left on the right side and from left to right on the wrong side. If you are a true left-handed knitter as I am (the stitches are taken off the right needle and put onto the left), then read the chart in reverse. Charts have helped me to be a better lefty knitter.

FIBER 6 oz Table Rock Llamas 50% Merino/50% Tencel roving (www.tablerockllamas.com).
YARN 2-ply; 1,730 yd; 5,040 ypp; 34 wpi.
NEEDLES U.S. size 1 (2.25 mm). Adjust needle size if necessary to obtain the correct gauge.
GAUGE 30 sts and 46 rows = 4" in garter st, after blocking.
NOTIONS Markers (m); waste yarn for provisional CO; tapestry needle.
FINISHED SIZE 23" wide and 66" long.

See knittingdaily.com/glossary for terms you don't know.

NOTES

- This shawl is worked in garter stitch.
- All decreases lean in the same direction except k2tog through back loop (tbl), which joins the top edging to the shawl body.
- Slip the first stitch of each row purlwise with yarn in front unless otherwise indicated.

SHAWL

Bottom edging:

Using a provisional method, CO 9 sts. Work Rows 1 and 2 of Bottom Edging chart once, then work Rows 3–18 twenty-one times—10 sts.

Turn corners:

Work Rows 1–7 of Right Edging chart. Place marker (pm). Using an empty needle and beg at opposite end of bottom edging, pick up (but do not knit) 169 sts along straight edge: 1 st in set-up rows, 8 sts in each tooth. With RS facing, [k1tbl] 169 times. Pm. Remove provisional CO and place 9 sts onto empty needle. Work Rows 1–7 of Left Edging chart over these 9 sts (inc'd to 14 sts). *Next row* (WS) Work Row 8 of Left Edging chart, sl m, k169, sl m, work Row 8 of Right Edging chart. *Next row* Work Row 9 of Right Edging chart, *k2tog, yo; rep from * to 3 sts before m, k3tog, yo, sl m, work Row 9 of Left Edging chart—168 sts rem between m. *Next row* Work Row 10 of Left Edging chart, knit to m, work Row 10 of Right Edging chart.

Outer border:

Next row (RS) Work Row 11 of Right Edging chart, sl m, yo, k2tog, k1, pm, work Row 1 of Outer Border chart over 162 sts, pm, k1, k2tog, yo, sl m, work Row 11 of Left Edging chart. Cont in patt through Row 20 of Outer Border chart, then work Rows 5–10 once more.

Inner border:

Next row (RS) Work Row 21 of Right Edging chart, sl m, yo, k2tog, k1, sl m, work Row 11 of Outer Border chart over 27 sts, pm, k5, pm, work Row 1 of Inner Border chart over 97 sts, pm, k4, k2tog, pm, work Row 11 of Outer Border chart over 27 sts, sl m, k1, k2tog, yo, sl m, work Row 21 of Left Edging chart. Cont in patt through Row 28 of Inner Border chart, then work Rows 5–16 once more.

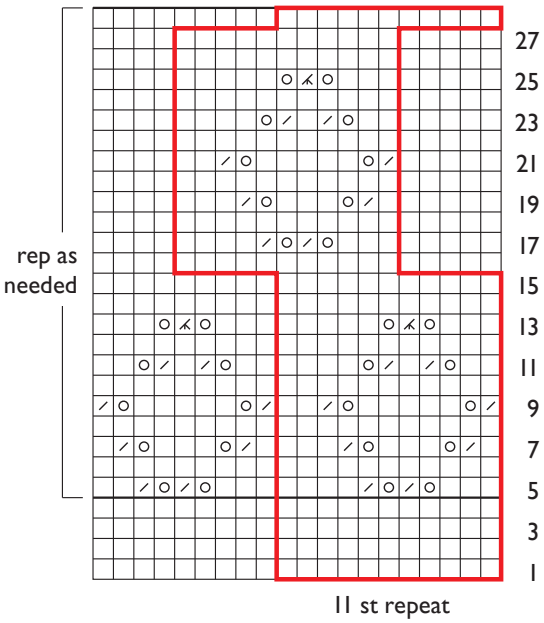
Center:

Next row (RS) Work Row 13 of Right Edging chart, sl m, yo, k2tog, k1, sl m, work Row 19 of Outer Border chart to m, sl m, k5, sl m, work Row 17 of Inner Border chart over 20 sts, pm, work Row 1 of Center chart over 57 sts (inc'd to 58 sts), pm, work Row 17 of Inner Border chart over 20 sts, sl m, k5, sl m, work Row 19 of Outer Border chart to m, sl m, k1, k2tog, yo, sl m, work Row 13 of Left Edging chart. Cont in patt until Rows 4–7 of Center chart have been worked 121 times, then work Row 8 of chart, removing Center chart m on last row.

Inner border:

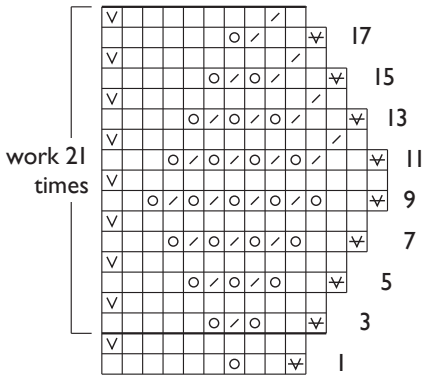
Next row (RS) Work Row 21 of Right Edging chart, sl m, yo, k2tog, k1, sl m, work Row 11 of Outer Border chart over 27 sts, sl m, k5, sl m, work Row 25 of Inner Border chart over 97 sts, sl m, k5, sl m, work

Inner Border



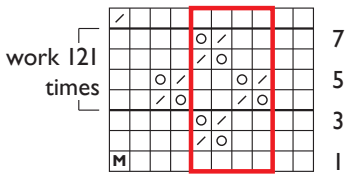
11 st repeat

Bottom Edging



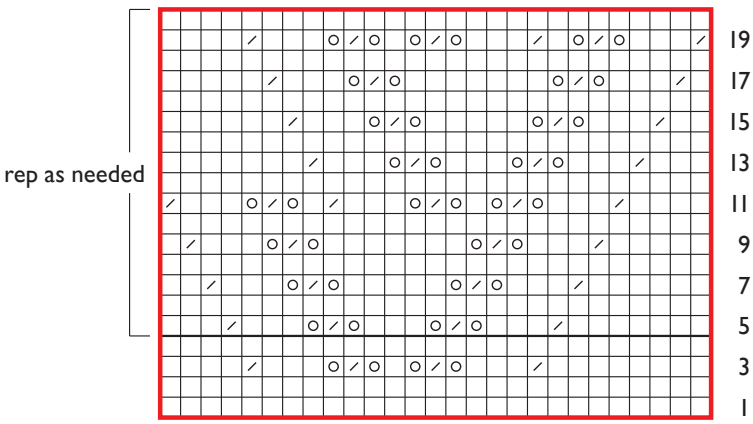
9 sts to 14 sts to 10 sts

Center



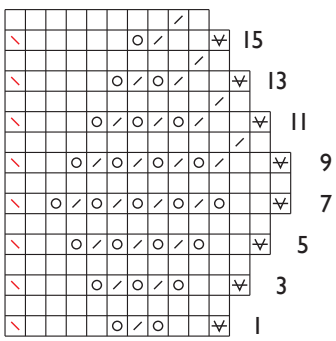
4 st repeat

Outer Border



27 st repeat

Top Edging

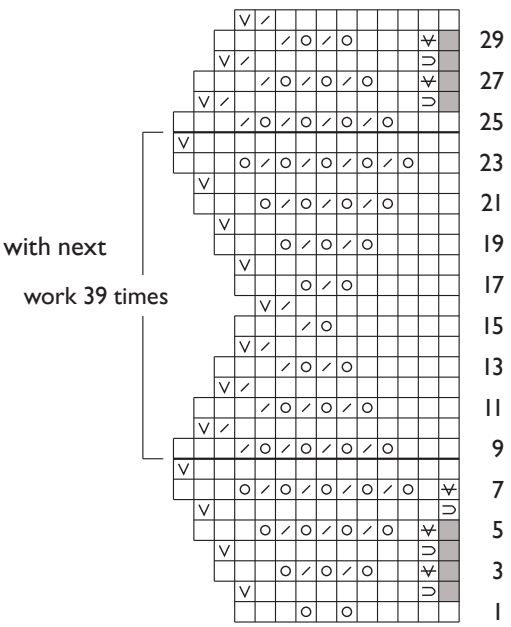


10 sts to 14 sts to 10 sts

Key

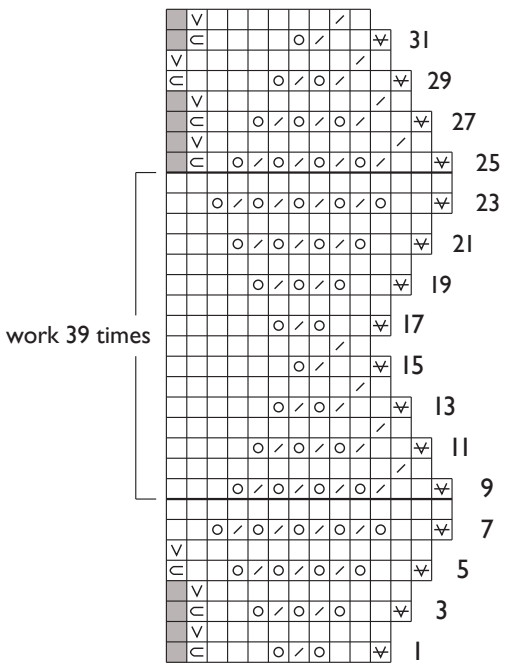
- k on RS and WS
- yo
- k2tog on RS and WS
- k2tog tbl (last edging st with next shawl st), then turn
- k3tog
- sl 1 pwise wyf on RS
- sl 1 pwise wyf on WS
- M1
- k1, then turn
- k1, then turn
- no stitch
- pattern repeat

Left Edging



9 sts to 14 sts to 11 sts

Right Edging



10 sts to 14 sts to 10 sts

Row 11 of Outer Border chart over 27 sts, sl m, k1, k2tog, yo, sl m, work Row 21 of Left Edging chart. Work 38 more rows in patt, ending with Row 15 of Inner Border chart (Row 17 of Outer Border chart, Row 11 of Edging charts). *Next row* (WS) Work Row 12 of Left Edging chart, sl m, k3, sl m, work Row 18 of Outer Border chart to m, remove m, M1, k5, remove m, [knit to m, remove m] 2 times, work Row 18 of Outer Border chart to m, sl m, k3, sl m, work Row 12 of Right Edging chart—162 sts between center m.

Outer border:

Next row (RS) Work Row 13 of Right Edging chart, sl m, yo, k2tog, k1, sl m, work Row 19 of Outer Border chart over 162 sts, sl m, k1, k2tog, yo, sl m, work Row 13 of Left Edging chart. Work 23 more rows in patt, ending with Row 10 of Outer Border chart (Row 20 of Edging charts). *Next row* (RS) Work Row 21 of Right Edging chart, sl m, yo, k2tog, k1, sl m, knit to m, sl m, k1, k2tog, yo, sl m, work Row 21 of Left Edging chart. *Next row* Work Row 22 of Left Edging chart, sl m, k3, remove m, knit to m, remove m, k3, sl m, work Row 22 of Right Edging chart. *Next row* Work Row 23 of Right Edging chart, *k2tog, yo; rep from * to m, work Row 23 of Left Edging chart. *Next row* Work Row 24 of Left Edging chart, sl m, knit to m, work Row 24 of Right Edging chart.

Top edging:

Work Rows 25–32 of Right Edging chart—10 right edging sts rem. Work Rows 1–16 of Top Edging chart 20 times, then work Rows 1–15 once more, joining edging to body of shawl with k2tog tbl as shown on chart—11 top edging sts rem, 14 left edging sts rem. Work Rows 25–30 of Left Edging chart over left edging sts—11 left edging sts rem. Join sts using Russian grafting as foll:

Step 1: Insert right needle tip into first st on left needle, draw 2nd st on left needle through first st and onto tip of right needle. Drop first st from left needle.

Step 2: Insert left needle tip into first st on right needle, draw 2nd st on right needle through first st and onto tip of left needle. Drop first st from right needle.

Rep Steps 1 and 2 until 2 sts rem. Sl st from left needle to right needle. Draw 2nd st on right needle through first st and onto tip of left needle. Drop first st from right needle. Thread a 5" length of yarn on tapestry needle, draw yarn through rem st, and tie a knot through rem st to prevent it from unraveling.

FINISHING

Weave in ends, but do not cut yarn tails. Soak shawl in lukewarm water with no-rinse soap for about an hour. Squeeze out excess water. Block to desired measurements, pinning bottom border first, then top border, then sides. Adjust top and bottom as desired. Cover shawl with a sheet or lightweight piece of fabric and let dry for at least 24 hours. Trim ends.

Sara Greer began her fiber journey at age 19, with crochet. In the twelve years since she has learned to knit, dye, spin and process many fibers; exotics are her favorite. She lives in Deer Trail, Colorado with her husband, three kids, and an assortment of animals, including a Jacob ram.

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Spring Hope Shawl

BY KRIS JAEGER

After quitting a job that left me burned out, one of the first things I did was to take a Russian spindle class from Galina Khmeleva. In Galina's class, the mysteries of the Russian spindle were dispelled and I soon found myself spinning gossamer threads. I was enchanted by the fairy-tale quality of the yarn, and so I began to explore ideas for a project in lace.

I decided to make a shawl using a nontraditional structure by converting a triangular shawl into something more like a short cape. I had previously experimented with a lace edging and quickly realized it could be turned into a full-fabric stitch pattern. I wanted it to be simple and elegant, contemporary with a nod to the past, lacy and delicate but not old-fashioned. Rather than adding buttons, I left it plain so that I could fasten it with a beautiful pin.

I spun the singles from less than 2 ounces of a blend of gray yak/silk blend on a Russian spindle. As a crocheter, I've learned to spin all my yarn with S-twist and Z-ply since it helps ensure that the yarn won't lose twist as I work. Crochet tends to naturally twist the yarn in the opposite direction that knitting does.

When the spinning was done, I wound it onto another Russian spindle with a fine silk thread and plied it off the spindle while winding it onto a small cardboard disk. (For more information on Russian-style plying, see "The Spinner's Story" by Galina Khmeleva, *Spin·Off* Winter 1998.) Using silk thread to ply makes handspun go further, adds strength and sheen, and gives the finished fabric a lovely drape. I steamed it by wrapping two balls of yarn in a slightly damp cotton cloth and putting the bundle in a warm place for a while.

FIBER 1.8 oz 55% silk/45% yak, plied with 0.7 oz Treenway Silks Myojo 60/2 spun silk (fiber and yarn from www.treenwaysilks.com).
YARN 2-ply; 650 yd; 3,100 ypp; 32 wpi.
HOOK U.S. size B/1 (2.25 mm). Adjust hook size if necessary to obtain the correct gauge.
NOTIONS Tapestry needle.
GAUGE 33 dc and 17 rows = 4".
FINISHED SIZE About 25" × 25", laid flat.

See crochetme.com/glossary for terms you don't know.

STITCH GUIDE

Picot: Ch 4, sl st in 4th ch from hook.

Turning dec: After turning ch, sk first and second st of previous row and work foll dc as normal.

Dc2tog-dec: Dc2tog with 1 st skipped between both dc legs.

SHAWL

Ch 68.

Row 1 (Dc, ch 2, 2 dc) in 4th ch from hook (skipped 3 ch count as dc), dc in next 31 ch, (2 dc, ch 2, 2 dc) in next ch, dc in next 31 ch, (2 dc, ch 2, 2 dc) in last ch, ch 5, turn.

Row 2 (3 dc, ch 2, 2 dc) in first ch-2 sp, ch 2, sk 2 dc, dc in next 4 dc, [ch 3, sk 2 dc, sc in next dc, ch 3, sk 2 dc, dc in next 4 dc] 3 times, ch 2, sk 2 dc, (2 dc, ch 2, 2 dc) in ch-2 sp, ch 2, sk 2 dc, dc in next 4 dc, [ch 3, sk 2 dc, sc in next dc, ch 3, sk 2 dc, dc in next 4 dc] 3 times, ch 2, sk 2 dc, (2 dc, ch 2, 3 dc) in ch-2 sp, ch 2, dc in top of tch, ch 5, turn.

Row 3 Work 2 dc in first ch-2 sp, dc in next 3 dc, (2 dc, ch 2, 2 dc) in next ch-2 sp, *dc in next 2 dc, ch 2, sk ch-2 sp, dc in next 4 dc, [ch 4, sk ch-3 sp, sc in sc, ch 4, sk ch-3 sp, dc in next 4 dc] 3 times, ch 2, sk ch-2 sp, dc in next 2 dc, (2 dc, ch 2, 2 dc) in ch-2 sp; rep from *, dc in next 3 dc, (2 dc, ch 2, dc) in tch sp, ch 5, turn.

Row 4 Work 2 dc in ch-2 sp, dc in next dc, ch 9, sk 5 sts, dc in next dc, (2 dc, ch 2, 2 dc) in ch-2 sp, *dc in next dc, ch 9, sk 5 sts, dc in next 4 dc, [ch 9, sk 9 sts, dc in next 4 dc] 3 times, ch 9, sk 5 sts, dc in next dc, (2 dc, ch 2, 2 dc) in ch-2 sp; rep from *, dc in next dc, ch 9, sk 5 sts, dc in next dc, (2 dc, ch 2, dc) in tch sp, ch 5, turn.

Row 5 Work 2 dc in ch-2 sp, dc in next 3 dc, ch 3, sc in ch-9 sp, ch 3, dc in next 3 dc, (2 dc, ch 2, 2 dc) in ch-2 sp, *dc in next 3 dc, [ch 3, sc in ch-9 sp, ch 3, dc in next 4 dc] 4 times, ch 3, sc in ch-9 sp, ch 3, dc in next 3 dc, (2 dc, ch 2, 2 dc) in ch-2 sp; rep from *, dc in next 3 dc, ch 3, sc in ch-9 sp, ch 3, dc in next 3 dc, (2 dc, ch 2, dc) in tch sp, ch 5, turn.

Row 6 Work 2 dc in ch-2 sp, dc in next 5 dc, ch 2, sk ch-3 sp, sc in sc, ch 2, sk ch-3 sp, dc in next 5 dc, (2 dc, ch 2, 2 dc) in ch-2 sp, *dc in next 5 dc, [ch 2, sk ch-3 sp, sc in sc, ch 2, sk ch-3 sp, dc in next 4 dc] 5 times, dc in next dc, (2 dc, ch 2, 2 dc) in ch-2 sp; rep from *, dc in next 5 dc, ch 2, sk ch-3 sp, sc in sc, ch 2, sk ch-3 sp, dc in next 5 dc, (2 dc, ch 2, dc) in tch sp, ch 5, turn.

Row 7 Work 2 dc in ch-2 sp, dc in next dc, ch 2, sk 2 dc, dc in next 4 dc, ch 3, sk ch-2 sp, sc in sc, ch 3,

sk ch-2 sp, dc in next 4 dc, ch 2, sk 2 dc, dc in next dc, (2 dc, ch 2, 2 dc) in ch-2 sp, *dc in next dc, ch 2, sk 2 dc, dc in next 4 dc, [ch 3, sk ch-2 sp, sc in sc, ch 3, sk ch-2 sp, dc in next 4 dc] 5 times, ch 2, sk 2 dc, dc in next dc, (2 dc, ch 2, 2 dc) in ch-2 sp; rep from *, dc in next dc, ch 2, sk 2 dc, dc in next 4 dc, ch 3, sk ch-2 sp, sc in sc, ch 3, sk ch-2 sp, dc in next 4 dc, ch 2, sk 2 dc, dc in next dc, (2 dc, ch 2, dc) in tch sp, ch 5, turn.

Row 8 Work 2 dc in ch-2 sp, ch 3, sk 2 dc, sc in next dc, ch 3, sk ch-2 sp, dc in next 4 dc, ch 4, sk ch-3 sp, sc in sc, ch 4, sk ch-3 sp, dc in next 4 dc, ch 3, sk ch-2 sp, sc in next dc, ch 3, sk 2 dc, (2 dc, ch 2, 2 dc) in ch-2 sp, *ch 3, sk 2 dc, sc in next dc, ch 3, sk ch-2 sp, dc in next 4 dc, [ch 4, sk ch-3 sp, sc in sc, ch 4, sk ch-3 sp, dc in next 4 dc] 5 times, ch 3, sk ch-2 sp, sc in next dc, ch 3, sk 2 dc, (2 dc, ch 2, 2 dc) in ch-2 sp; rep from *, ch 3, sk 2 dc, sc in next dc, ch 3, sk ch-2 sp, dc in next 4 dc, ch 4, sk ch-3 sp, sc in sc, ch 4, sk ch-3 sp, dc in next 4 dc, ch 3, sk ch-2 sp, sc in next dc, ch 3, sk 2 dc, (2 dc, ch 2, dc) in tch sp, ch 5, turn.

Row 9 Work 2 dc in ch-2 sp, dc in next 2 dc, ch 9, sk 7 sts, dc in next 4 dc, ch 9, sk 9 sts, dc in next 4 dc, ch 9, sk 7 sts, dc in next 2 dc, (2 dc, ch 2, 2 dc) in ch-2 sp, *dc in next 2 dc, ch 9, sk 7 sts, dc in next 4 dc, [ch 9, sk 9 sts, dc in next 4 dc] 5 times, ch 9, sk 7 sts, dc in next 2 dc, (2 dc, ch 2, 2 dc) in ch-2 sp; rep from *, dc in next 2 dc, ch 9, sk 7 sts, dc in next 4 dc, ch 9, sk 9 sts, dc in next 4 dc, ch 9, sk 7 sts, dc in next 2 dc, (2 dc, ch 2, dc) in tch sp, ch 5, turn.

Row 10 Work 2 dc in ch-2 sp, dc in next 4 dc, [ch 3, sc in ch-9 sp, ch 3, dc in next 4 dc] 3 times, (2 dc, ch 2, 2 dc) in ch-2 sp, *dc in next 4 dc, [ch 3, sc in ch-9 sp, ch 3, dc in next 4 dc] 7 times, (2 dc, ch 2, 2 dc) in ch-2 sp; rep from *, dc in next 4 dc, [ch 3, sc in ch-9 sp, ch 3, dc in next 4 dc] 3 times, (2 dc, ch 2, dc) in tch sp, ch 5, turn.

Row 11 Work 2 dc in ch-2 sp, ch 2, sk 2 dc, dc in next 4 dc, [ch 2, sk ch-3 sp, sc in sc, ch 2, sk ch-3 sp, dc in next 4 dc] 3 times, ch 2, sk 2 dc, (2 dc, ch 2, 2 dc) in ch-2 sp, *ch 2, sk 2 dc, dc in next 4 dc, [ch 2, sk ch-3 sp, sc in sc, ch 2, sk ch-3 sp, dc in next 4 dc] 7 times, ch 2, sk 2 dc, (2 dc, ch 2, 2 dc) in ch-2 sp; rep from *, ch 2, sk 2 dc, dc in next 4 dc, [ch 2, sk ch-3 sp, sc in sc, ch 2, sk ch-3 sp, dc in next 4 dc] 3 times, ch 2, sk 2 dc, (2 dc, ch 2, dc) in tch sp, ch 5, turn.

Row 12 Work 2 dc in ch-2 sp, dc in next 2 dc, ch 2, sk ch-2 sp, dc in next 4 dc, [ch 3, sk ch-2 sp, sc in sc, ch 3, sk ch-2 sp, dc in next 4 dc] 3 times, ch 2, sk ch-2 sp, dc in next 2 dc, (2 dc, ch 2, 2 dc) in ch-2 sp, *dc in next 2 dc, ch 2, sk ch-2 sp, dc in next 4 dc, [ch 3, sk ch-2 sp, sc in sc, ch 3, sk ch-2 sp, dc in next 4 dc] 7 times, ch 2, sk ch-2 sp, dc in next 2 dc, (2 dc, ch 2, 2 dc) in ch-2 sp; rep from *, dc in next 2 dc, ch 2, sk ch-2 sp, dc in next 4 dc, [ch 3, sk ch-2 sp, sc in sc, ch 3, sk ch-2 sp, dc in next 4 dc] 3 times, ch 2, sk ch-2 sp, dc in next 2 dc, (2 dc, ch 2, dc) in turning-ch sp, ch 5, turn.

Row 13 Work 2 dc in ch-2 sp, dc in next dc, ch 3, sk 2 dc, sc in next dc, ch 3, sk ch-2 sp, dc in next 4 dc, [ch 4, sk ch-3 sp, sc in sc, ch 4, sk ch-3 sp, dc in next 4 dc] 3 times, ch 3, sk ch-2 sp, sc in next dc, ch 3, sk 2 dc, dc in next dc, (2 dc, ch 2, 2 dc) in ch-2 sp, *dc in next dc, ch 3, sk 2 sts, sc in next dc, ch 3, sk ch-2 sp, dc in next 4 dc, [ch 4, sk ch-3 sp, sc in sc, ch 4, sk ch-3 sp, dc in next 4 dc] 7 times, ch 3, sk ch-2 sp, sc in next dc, ch 3, sk 2 dc, dc in next dc, (2 dc, ch 2, 2 dc) in ch-2 sp; rep from *, dc in next dc, ch 3, sk 2 dc, sc in next dc, ch 3, sk ch-2 sp, dc in next 4 dc, [ch 4, sk ch-3 sp, sc in sc, ch 4, sk ch-3 sp, dc in next 4 dc] 3 times, ch 3, sk ch-2 sp, sc in next dc, ch 3, sk 2 dc, dc in next dc, (2 dc, ch 2, dc) in tch sp, ch 5, turn.

Row 14 Work 2 dc in ch-2 sp, dc in next 3 dc, ch 9, sk 7 sts, dc in next 4 dc, [ch 9, sk 9 sts, dc in next 4 dc] 3 times, ch 9, sk 7 sts, dc in next 3 dc, (2 dc, ch 2, 2 dc) in ch-2 sp, *dc in next 3 dc, ch 9, sk 7 sts, dc in next 4 dc, [ch 9, sk 9 sts, dc in next 4 dc] 7 times, ch 9, sk 7 sts, dc in next 3 dc, (2 dc, ch 2, 2 dc) in ch-2 sp; rep from *, dc in next 3 dc, ch 9, sk 7 sts, dc in next 4 dc, [ch 9, sk 9 sts, dc in next 4 dc] 3 times, ch 9, sk 7 sts, dc in next 3 dc, (2 dc, ch 2, dc) in tch sp, ch 5, turn.

Row 15 Work 2 dc in ch-2 sp, dc in next 5 dc, [ch 3, sc in ch-9 sp, ch 3, dc in next 4 dc] 5 times, dc in next dc, (2 dc, ch 2, 2 dc) in ch-2 sp, *dc in next 5 dc, [ch 3, sc in ch-9 sp, ch 3, dc in next 4 dc] 9 times, dc in next dc, (2 dc, ch 2, 2 dc) in ch-2 sp; rep from *, dc in next 5 dc, [ch 3, sc in ch-9 sp, ch 3, dc in next 4 dc] 5 times, dc in next dc, (2 dc, ch 2, dc) in tch sp, ch 5, turn.

Row 16 Work 2 dc in ch-2 sp, dc in next dc, ch 2, sk 2 dc, dc in next 4 dc, [ch 2, sk ch-3 sp, sc in sc, ch 2, sk ch-3 sp, dc in next 4 dc] 5 times, ch 2, sk 2 dc, dc in next dc, (2 dc, ch 2, 2 dc) in ch-2 sp, *dc in next dc, ch 2, sk 2 dc, dc in next 4 dc, [ch 2, sk ch-3 sp, sc in sc, ch 2, sk ch-3 sp, dc in next 4 dc] 9 times, ch 2, sk 2 dc, dc in next dc, (2 dc, ch 2, 2 dc) in ch-2 sp; rep from *, dc in next dc, ch 2, sk 2 dc, dc in next 4 dc, [ch 2, sk ch-3 sp, sc in sc, ch 2, sk ch-3 sp, dc in next 4 dc] 5 times, ch 2, sk 2 dc, dc in next dc, (2 dc, ch 2, dc) in turning-ch sp, ch 5, turn.

Row 17 Work 2 dc in ch-2 sp, dc in next 3 dc, ch 2, sk ch-2 sp, dc in next 4 dc, [ch 3, sk ch-2 sp, sc in sc, ch 3, sk ch-2 sp, dc in next 4 dc] 5 times, ch 2, sk 2 sts, dc in next 3 dc, (2 dc, ch 2, 2 dc) in ch-2 sp, *dc in next 3 dc, ch 2, sk ch-2 sp, dc in next 4 dc,

[ch 3, sk ch-2 sp, sc in sc, ch 3, sk ch-2 sp, dc in next 4 dc] 9 times, ch 2, sk ch-2 sp, dc in next 3 dc, (2 dc, ch 2, 2 dc) in ch-2 sp; rep from *, dc in next 3 dc, ch 2, sk ch-2 sp, dc in next 4 dc, [ch 3, sk ch-2 sp, sc in sc, ch 3, sk ch-2 sp, dc in next 4 dc] 5 times, ch 2, sk ch-2 sp, dc in next 3 dc, (2 dc, ch 2, dc) in tch sp, ch 5, turn.

Row 18 Work 2 dc in ch-2 sp, dc in next 2 dc, ch 3, sk 2 dc, sc in next dc, ch 3, sk ch-2 sp, dc in next 4 dc, [ch 4, sk ch-3 sp, sc in sc, ch 4, sk ch-3 sp, dc in next 4 dc] 5 times, ch 3, sk ch-2 sp, sc in next dc, ch 3, sk 2 dc, dc in next 2 dc, (2 dc, ch 2, 2 dc) in ch-2 sp, *dc in next 2 dc, ch 3, sk 2 dc, sc in next dc, ch 3, sk ch-2 sp, dc in next 4 dc, [ch 4, sk ch-3 sp, sc in sc, ch 4, sk ch-3 sp, dc in next 4 dc] 9 times, ch 3, sk ch-2 sp, sc in next dc, ch 3, sk 2 dc, dc in next 2 dc, (2 dc, ch 2, 2 dc) in ch-2 sp; rep from *, dc in next 2 dc, ch 3, sk 2 dc, sc in next dc, ch 3, sk ch-2 sp, dc in next 4 dc, [ch 4, sk ch-3 sp, sc in next sc, ch 4, sk ch-3 sp, dc in next 4 dc] 5 times, ch 3, sk ch-2 sp, sc in next dc, ch 3, sk 2 dc, dc in next 2 dc, (2 dc, ch 2, dc) in tch sp, ch 5, turn.

Row 19 Work 2 dc in ch-2 sp, dc in next 4 dc, ch 9, sk 7 sts, dc in next 4 dc, [ch 9, sk 9 sts, dc in next 4 dc] 5 times, ch 9, sk 7 sts, dc in next 4 dc, (2 dc, ch 2, 2 dc) in ch-2 sp, *dc in next 4 dc, ch 9, sk 7 sts, dc in next 4 dc, [ch 9, sk 9 sts, dc in next 4 dc] 9 times, ch 9, sk 7 sts, dc in next 4 dc, (2 dc, ch 2, 2 dc) in ch-2 sp; rep from *, dc in next 4 dc, ch 9, sk 7 sts, dc in next 4 dc, [ch 9, sk 9 sts, dc in next 4 dc] 5 times, ch 9, sk 7 sts, dc in next 4 dc, (2 dc, ch 2, dc) in tch sp, ch 5, turn.

Row 20 Work 2 dc in ch-2 sp, dc in next 6 dc, [ch 3, sc in ch-9 sp, ch 3, dc in next 4 dc] 7 times, dc in next 2 dc, (2 dc, ch 2, 2 dc) in ch-2 sp, *dc in next 6 dc, [ch 3, sc in ch-9 sp, ch 3, dc in next 4 dc] 11 times, dc in next 2 dc, (2 dc, ch 2, 2 dc) in ch-2 sp; rep from *, dc in next 6 dc, [ch 3, sc in ch-9 sp, ch 3, dc in next 4 dc] 7 times, dc in next 2 dc, (2 dc, ch 2, dc) in tch sp, ch 5, turn.

Row 21 Work 2 dc in ch-2 sp, dc in next 2 dc, ch 2, sk 2 dc, dc in next 4 dc, [ch 2, sk ch-3 sp, sc in sc, ch 2, sk ch-3 sp, dc in next 4 sts] 7 times, ch 2, sk 2 dc, dc in next 2 dc, (2 dc, ch 2, 2 dc) in ch-2 sp, *dc in next 2 dc, ch 2, sk 2 dc, dc in next 4 dc, [ch 2, sk ch-3 sp, sc in sc, ch 2, sk ch-3 sp, dc in next 4 dc] 11 times, ch 2, sk 2 dc, dc in next 2 dc, (2 dc, ch 2,

2 dc) in ch-2 sp; rep from *, dc in next 2 dc, ch 2, sk 2 dc, dc in next 4 dc, [ch 2, sk ch-3 sp, sc in sc, ch 2, sk ch-3 sp, dc in next 4 dc] 7 times, ch 2, sk 2 dc, dc in next 2 dc, (2 dc, ch 2, dc) in tch sp, ch 5, turn.

Row 22 Work 2 dc in ch-2 sp, dc in next 4 dc, ch 2, sk ch-2 sp, dc in next 4 dc, [ch 3, sk ch-2 sp, sc in sc, ch 3, sk ch-2 sp, dc in next 4 dc] 7 times, ch 2, sk ch-2 sp, dc in next 4 dc, (2 dc, ch 2, 2 dc) in ch-2 sp, *dc in next 4 dc, ch 2, sk ch-2 sp, dc in next 4 dc, [ch 3, sk ch-2 sp, sc in sc, ch 3, sk ch-2 sp, dc in next 4 dc] 11 times, ch 2, sk ch-2 sp, dc in next 4 dc, (2 dc, ch 2, 2 dc) in ch-2 sp; rep from *, dc in next 4 dc, ch 2, sk ch-2 sp, dc in next 4 dc, [ch 3, sk ch-2 sp, sc in sc, ch 3, sk ch-2 sp, dc in next 4 dc] 7 times, ch 2, sk ch-2 sp, dc in next 4 dc, (2 dc, ch 2, dc) in tch sp, ch 5, turn.

Row 23 Work 2 dc in ch-2 sp, dc in next 3 dc, ch 3, sk 2 dc, sc in next dc, ch 3, sk ch-2 sp, dc in next 4 dc, [ch 4, sk ch-3 sp, sc in sc, ch 4, sk ch-3 sp, dc in next 4 dc] 7 times, ch 3, sk ch-2 sp, sc in next dc, ch 3, sk 2 dc, dc in next 3 dc, (2 dc, ch 2, 2 dc) in ch-2 sp, *dc in next 3 dc, ch 3, sk 2 dc, sc in next dc, ch 3, sk ch-2 sp, dc in next 4 dc, [ch 4, sk ch-3 sp, sc in sc, ch 4, sk ch-3 sp, dc in next 4 dc] 11 times, ch 3, sk ch-2 sp, sc in next dc, ch 3, sk 2 dc, dc in next 3 dc, (2 dc, ch 2, 2 dc) in ch-2 sp; rep from *, dc in next 3 dc, ch 3, sk 2 dc, sc in next dc, ch 3, sk ch-2 sp, dc in next 4 dc, [ch 4, sk ch-3 sp, sc in sc, ch 4, sk ch-3 sp, dc in next 4 dc] 7 times, ch 3, sk ch-2 sp, sc in next dc, ch 3, sk 2 dc, dc in next 3 dc, (2 dc, ch 2, dc) in tch sp, ch 5, turn.

Row 24 Work 2 dc in ch-2 sp, dc in next 5 dc, ch 9, sk 7 sts, dc in next 4 dc, [ch 9, sk 9 sts, dc in next 4 dc] 7 times, ch 9, sk 7 sts, dc in next 5 dc, (2 dc, ch 2, 2 dc) in ch-2 sp, *dc in next 5 dc, ch 9, sk 7 sts, dc in next 4 dc, [ch 9, sk 9 sts, dc in next 4 dc] 11 times, ch 9, sk 7 sts, dc in next 5 dc, (2 dc, ch 2, 2 dc) in ch-2 sp; rep from *, dc in next 5 dc, ch 9, sk 7 sts, dc in next 4 dc, [ch 9, sk 9 sts, dc in next 4 dc] 7 times, ch 9, sk 7 sts, dc in next 5 dc, (2 dc, ch 2, dc) in tch sp, ch 5, turn.

Row 25 Work 2 dc in ch-2 sp, dc in next dc, ch 2, sk 2 dc, dc in next 4 dc, [ch 3, sc in ch-9 sp, ch 3, dc in next 4 dc] 9 times, ch 2, sk 2 dc, dc in next dc, (2 dc, ch 2, 2 dc) in ch-2 sp, *dc in next dc, ch 2, sk 2 sts, dc in next 4 dc, [ch 3, sc in ch-9 sp, ch 3, dc in next 4 dc] 13 times, ch 2, sk 2 dc, dc in next dc, (2 dc, ch 2, 2 dc) in ch-2 sp; rep from *, dc in next dc, ch 2, sk 2 dc, dc in next 4 dc, [ch 3, sc in ch-9 sp, ch 3, dc in next 4 dc] 9 times, ch 2, sk 2 dc, dc in next dc, (2 dc, ch 2, dc) in tch sp, ch 5, turn.

Row 26 Work 2 dc in ch-2 sp, dc in next 3 dc, ch 2, sk ch-2 sp, dc in next 4 dc, [ch 2, sk ch-3 sp, sc in sc, ch 2, sk ch-3 sp, dc in next 4 dc] 9 times, ch 2, sk

ch-2 sp, dc in next 3 dc, (2 dc, ch 2, 2 dc) in ch-2 sp, *dc in next 3 dc, ch 2, sk ch-2 sp, dc in next 4 dc, [ch 2, sk ch-3 sp, sc in sc, ch 2, sk ch-3 sp, dc in next 4 dc] 13 times, ch 2, sk ch-2 sp, dc in next 3 dc, (2 dc, ch 2, 2 dc) in ch-2 sp; rep from *, dc in next 3 dc, ch 2, sk ch-2 sp, dc in next 4 dc, [ch 2, sk ch-3 sp, sc in sc, ch 2, sk ch-3 sp, dc in next 4 dc] 9 times, ch 2, sk ch-2 sp, dc in next 3 dc, (2 dc, ch 2, dc) in tch sp, ch 5, turn.

Row 27 Work 2 dc in ch-2 sp, dc in next 2 dc, ch 3, sk 2 dc, sc in next dc, ch 3, sk ch-2 sp, dc in next 4 dc, [ch 3, sk ch-2 sp, sc in sc, ch 3, sk ch-2 sp, dc in next 4 dc] 9 times, ch 3, sk ch-2 sp, sc in next dc, ch 3, sk 2 dc, dc in next 2 dc, (2 dc, ch 2, 2 dc) in ch-2 sp, *dc in next 2 dc, ch 3, sk 2 dc, sc in dc, ch 3, sk ch-2 sp, dc in next 4 dc, [ch 3, sk ch-2 sp, sc in sc, ch 3, sk ch-2 sp, dc in next 4 dc] 13 times, ch 3, sk ch-2 sp, sc in next dc, ch 3, sk 2 dc, dc in next 2 dc, (2 dc, ch 2, 2 dc) in ch-2 sp; rep from *, dc in next 2 dc, ch 3, sk 2 dc, sc in next dc, ch 3, sk ch-2 sp, dc in next 4 dc, [ch 3, sk ch-2 sp, sc in sc, ch 3, sk ch-2 sp, dc in next 4 dc] 9 times, ch 3, sk ch-2 sp, sc in next dc, ch 3, sk 2 dc, dc in next 2 dc, (2 dc, ch 2, dc) in tch sp, ch 5, turn.

Row 28 Work 2 dc in ch-2 sp, dc in next 4 dc, [ch 4, sk ch-3 sp, sc in sc, ch 4, sk ch-3 sp, dc in next 4 dc] 11 times, (2 dc, ch 2, 2 dc) in ch-2 sp, *dc in next 4 dc, [ch 4, sk ch-3 sp, sc in sc, ch 4, sk ch-3 sp, dc in next 4 dc] 15 times, (2 dc, ch 2, 2 dc) in ch-2 sp; rep from *, dc in next 4 dc, [ch 4, sk ch-3 sp, sc in sc, ch 4, sk ch-3 sp, dc in next 4 dc] 11 times, (2 dc, ch 2, dc) in tch sp, ch 5, turn.

Row 29 Work 2 dc in ch-2 sp, dc in next 6 dc, [ch 9, sk 9 sts, dc in next 4 dc] 11 times, dc in next 2 dc, (2 dc, ch 2, 2 dc) in ch-2 sp, *dc in next 6 dc, [ch 9, sk 9 sts, dc in next 4 dc] 15 times, dc in next 2 dc, (2 dc, ch 2, 2 dc) in ch-2 sp; rep from *, dc in next 6 dc, [ch 9, sk 9 sts, dc in next 4 dc] 11 times, dc in next 2 dc, (2 dc, ch 2, dc) in tch sp, ch 5, turn.

Row 30 Work 2 dc in ch-2 sp, dc in next 2 dc, ch 2, sk 2 dc, dc in next 4 dc, [ch 3, sc in ch-9 sp, ch 3, dc in next 4 dc] 11 times, ch 2, sk 2 dc, dc in next 2 dc, (2 dc, ch 2, 2 dc) in ch-2 sp, *dc in next 2 dc, ch 2, sk 2 dc, dc in next 4 dc, [ch 3, sc in ch-9 sp, ch 3, dc in next 4 dc] 15 times, ch 2, sk 2 dc, dc in next 2 dc, (2 dc, ch 2, 2 dc) in ch-2 sp; rep from *, dc in next 2 dc, ch 2, sk 2 dc, dc in next 4 dc, [ch 3, sc in ch-9 sp, ch 3, dc in next 4 dc] 11 times, ch 2, sk 2 dc, dc in next 2 dc, (2 dc, ch 2, dc) in tch sp, ch 5, turn.

Row 31 Work 2 dc in ch-2 sp, dc in next 4 dc, ch 2, sk ch-2 sp, dc in next 4 dc, [ch 2, sk ch-3 sp, sc in sc, ch 2, sk ch-3 sp, dc in next 4 dc] 11 times, ch 2, sk ch-2 sp, dc in next 4 dc, (2 dc, ch 2, 2 dc) in ch-2 sp, *dc in next 4 dc, ch 2, sk ch-2 sp, dc in next 4 dc, [ch 2, sk ch-3 sp, sc in sc, ch 2, sk ch-3 sp, dc in next 4 dc] 15 times, ch 2, sk ch-2 sp, dc in next 4 dc, (2 dc, ch 2, 2 dc) in ch-2 sp; rep from *; dc in next 4 dc, ch 2, sk ch-2 sp, dc in next 4 dc, [ch 2, sk ch-3 sp, sc in sc, ch 2, sk ch-3 sp, dc in next 4 dc] 11 times, ch 2, sk ch-2 sp, dc in next 4 dc, (2 dc, ch 2, dc) in tch sp, ch 5, turn.

Row 32 Work 2 dc in ch-2 sp, dc in next 3 dc, ch 3, sk 2 dc, sc in next dc, ch 3, sk ch-2 sp, dc in next 4 dc, [ch 3, sk ch-2 sp, sc in sc, ch 3, sk ch-2 sp, dc in next 4 dc] 11 times, ch 3, sk ch-2 sp, sc in next dc, ch 3, sk 2 dc, dc in next 3 dc, (2 dc, ch 2, 2 dc) in ch-2 sp, *dc in next 3 dc, ch 3, sk 2 dc, sc in next dc, ch 3, sk ch-2 sp, dc in next 4 dc, [ch 3, sk ch-2 sp, sc in sc, ch 3, sk ch-2 sp, dc in next 4 dc] 15 times, ch 3, sk ch-2 sp, sc in next dc, ch 3, sk 2 dc, dc in next 3 dc, (2 dc, ch 2, 2 dc) in ch-2 sp; rep from *, dc in next 3 dc, ch 3, sk 2 dc, sc in next dc, ch 3, sk ch-2 sp, dc in next 4 dc, [ch 3, sk ch-2 sp, sc in sc, ch 3, sk ch-2 sp, dc in next 4 dc] 11 times, ch 3, sk ch-2 sp, sc in next dc, ch 3, sk 2 dc, dc in next 3 dc, (2 dc, ch 2, dc) in tch sp, ch 5, turn.

Row 33 Work 2 dc in ch-2 sp, dc in next 5 dc, [ch 4, sk ch-3 sp, sc in sc, ch 4, sk ch-3 sp, dc in next 4 dc] 13 times, dc in next dc, (2 dc, ch 2, 2 dc) in ch-2 sp, *dc in next 5 dc, [ch 4, sk ch-3 sp, sc in sc, ch 4, sk ch-3 sp, dc in next 4 dc] 17 times, dc in next dc, (2 dc, ch 2, 2 dc) in ch-2 sp; rep from *, dc in next 5 dc, [ch 4, sk ch-3 sp, sc in sc, ch 4, sk ch-3 sp, dc in next 4 dc] 13 times, dc in next dc, (2 dc, ch 2, dc) in tch sp, ch 5, turn.

Row 34 Work 2 dc in ch-2 sp, dc in next 7 dc, [ch 9, sk 9 sts, dc in next 4 dc] 13 times, dc in next 3 dc, (2 dc, ch 2, 2 dc) in ch-2 sp, *dc in next 7 dc, [ch 9, sk 9 sts, dc in next 4 dc] 17 times, dc in next 3 dc, (2 dc, ch 2, 2 dc) in ch-2 sp; rep from *, dc in next 7 dc, [ch 9, sk 9 sts, dc in next 4 dc] 13 times, dc in next 3 dc, (2 dc, ch 2, dc) in tch sp, ch 5, turn.

Row 35 Work 2 dc in ch-2 sp, dc in next 3 dc, ch 2, sk 2 sts, dc in next 4 dc, [ch 3, sc in ch-9 sp, ch 3, dc in next 4 dc] 13 times, ch 2, sk 2 dc, dc in next 3 dc, (2 dc, ch 2, 2 dc) in ch-2 sp, *dc in next 3 dc, ch 2, sk 2 dc, dc in next 4 dc, [ch 3, sc in ch-9 sp, ch 3, dc in next 4 dc] 17 times, ch 2, sk 2 dc, dc in next 3 dc, (2 dc, ch 2, 2 dc) in ch-2 sp; rep from *, dc in next 3 dc, ch 2, sk 2 dc, dc in next 4 dc, [ch 3, sc in ch-9 sp, ch 3, dc in next 4 dc] 13 times, ch 2, sk 2 dc, dc in next 3 dc, (2 dc, ch 2, dc) in tch sp, ch 5, turn.

Row 36 Work 2 dc in ch-2 sp, dc in next 5 dc, ch 2, sk ch-2 sp, dc in next 4 dc, [ch 2, sk ch-3 sp, sc in sc, ch 2, sk ch-3 sp, dc in next 4 dc] 13 times, ch 2, sk ch-2 sp, dc in next 5 dc, (2 dc, ch 2, 2 dc) in ch-2 sp, *dc in next 5 dc, ch 2, sk ch-2 sp, dc in next 4 dc, [ch 2, sk ch-3 sp, sc in sc, ch 2, sk ch-3 sp, dc in next 4 dc] 17 times, ch 2, sk ch-2 sp, dc in next 5 dc, (2 dc, ch 2, 2 dc) in ch-2 sp; rep from *, dc in next 5 dc, ch 2, sk ch-2 sp, dc in next 4 dc, [ch 2, sk ch-3 sp, sc in sc, ch 2, sk ch-3 sp, dc in next 4 dc] 13 times, ch 2, sk ch-2 sp, dc in next 5 dc, (2 dc, ch 2, dc) in tch sp, ch 5, turn.

Row 37 Work 2 dc in ch-2 sp, dc in next 4 dc, ch 3, sk 2 dc, sc in next dc, ch 3, sk ch-2 sp, dc in next 4 dc, [ch 3, sk ch-2 sp, sc in sc, ch 3, sk ch-2 sp, dc in next 4 dc] 13 times, ch 3, sk ch-2 sp, sc in next dc, ch 3, sk 2 dc, dc in next 4 dc, (2 dc, ch 2, 2 dc) in ch-2 sp, *dc in next 4 dc, ch 3, sk 2 dc, sc in next dc, ch 3, sk ch-2 sp, dc in next 4 dc, [ch 3, sk ch-2 sp, sc in sc, ch 3, sk ch-2 sp, dc in next 4 dc] 17 times, ch 3, sk ch-2 sp, sc in next dc, ch 3, sk 2 dc, dc in next 4 dc, (2 dc, ch 2, 2 dc) in ch-2 sp; rep from *, dc in next 4 dc, ch 3, sk 2 dc, sc in next dc, ch 3, sk ch-2 sp, dc in next 4 dc, [ch 3, sk ch-2 sp, sc in sc, ch 3, sk ch-2 sp, dc in next 4 dc] 13 times, ch 3, sk ch-2 sp, sc in next dc, ch 3, sk 2 dc, dc in next 4 dc, (2 dc, ch 2, dc) in tch sp, ch 5, turn.

Row 38 Work 2 dc in ch-2 sp, dc in next 6 dc, [ch 4, sk ch-3 sp, sc in sc, ch 4, sk ch-3 sp, dc in next 4 dc] 15 times, dc in next 2 dc, (2 dc, ch 2, 2 dc) in ch-2 sp, *dc in next 6 dc, [ch 4, sk ch-3 sp, sc in sc, ch 4, sk ch-3 sp, dc in next 4 dc] 19 times, dc in next 2 dc, (2 dc, ch 2, 2 dc) in ch-2 sp; rep from *, dc in next 6 dc, [ch 4, sk ch-3 sp, sc in sc, ch 4, sk ch-3 sp, dc in next 4 dc] 15 times, dc in next 2 dc, (2 dc, ch 2, dc) in tch sp, ch 5, turn.

Row 39 Work 2 dc in ch-2 sp, dc in next 8 dc, [ch 9, sk 9 sts, dc in next 4 dc] 15 times, dc in next 4 dc, (2 dc, ch 2, 2 dc) in ch-2 sp, *dc in next 8 dc, [ch 9, sk

9 sts, dc in next 4 dc] 19 times, dc in next 4 dc, (2 dc, ch 2, 2 dc) in ch-2 sp; rep from *, dc in next 8 dc, [ch 9, sk 9 sts, dc in next 4 dc] 15 times, dc in next 4 dc, (2 dc, ch 2, dc) in tch sp, ch 5, turn.

Row 40 Work 2 dc in ch-2 sp, dc in next 4 dc, ch 2, sk 2 dc, dc in next 4 dc, [ch 3, sc in ch-9 sp, ch 3, dc in next 4 dc] 15 times, ch 2, sk 2 dc, dc in next 4 dc, (2 dc, ch 2, 2 dc) in ch-2 sp, *dc in next 4 dc, ch 2, sk 2 dc, dc in next 4 dc, [ch 3, sc in ch-9 sp, ch 3, dc in next 4 dc] 19 times, ch 2, sk 2 dc, dc in next 4 dc, (2 dc, ch 2, 2 dc) in ch-2 sp; rep from *, dc in next 4 dc, ch 2, sk 2 dc, dc in next 4 dc, [ch 3, sc in ch-9 sp, ch 3, dc in next 4 dc] 15 times, ch 2, sk 2 dc, dc in next 4 dc, (2 dc, ch 2, dc) in tch sp, ch 5, turn.

Row 41 Work 2 dc in ch-2 sp, dc in next 6 dc, ch 2, sk ch-2 sp, dc in next 4 dc, [ch 2, sk ch-3 sp, sc in sc, ch 2, sk ch-3 sp, dc in next 4 dc] 15 times, ch 2, sk ch-2 sp, dc in next 6 dc, (2 dc, ch 2, 2 dc) in ch-2 sp, *dc in next 6 dc, ch 2, sk ch-2 sp, dc in next 4 dc, [ch 2, sk ch-3 sp, sc in sc, ch 2, sk ch-3 sp, dc in next 4 dc] 19 times, ch 2, sk ch-2 sp, dc in next 6 dc, (2 dc, ch 2, 2 dc) in ch-2 sp; rep from *, dc in next 6 dc, ch 2, sk ch-2 sp, dc in next 4 dc, [ch 2, sk ch-3 sp, sc in sc, ch 2, sk ch-3 sp, dc in next 4 dc] 15 times, ch 2, sk ch-2 sp, dc in next 6 dc, (2 dc, ch 2, dc) in tch sp, ch 5, turn.

Row 42 Work 2 dc in ch-2 sp, dc in next 5 dc, ch 3, sk 2 dc, sc in next dc, ch 3, sk ch-2 sp, dc in next 4 dc, [ch 3, sk ch-2 sp, sc in sc, ch 3, sk ch-2 sp, dc in next 4 dc] 15 times, ch 3, sk ch-2 sp, sc in next dc, ch 3, sk 2 dc, dc in next 5 dc, (2 dc, ch 2, 2 dc) in ch-2 sp, *dc in next 5 dc, ch 3, sk 2 dc, sc in next dc, ch 3, sk ch-2 sp, dc in next 4 dc, [ch 3, sk ch-2 sp, sc in sc, ch 3, sk ch-2 sp, dc in next 4 dc] 19 times, ch 3, sk ch-2 sp, sc in next dc, ch 3, sk 2 dc, dc in next 5 dc, (2 dc, ch 2, 2 dc) in ch-2 sp; rep from *, dc in next 5 dc, ch 3, sk 2 sts, sc in next dc, ch 3, sk ch-2 sp, dc in next 4 dc, [ch 3, sk ch-2 sp, sc in sc, ch 3, sk ch-2 sp, dc in next 4 dc] 15 times, ch 3, sk ch-2 sp, sc in next dc, ch 3, sk 2 sts, dc in next 5 dc, (2 dc, ch 2, dc) in tch sp, ch 7, turn.

Row 43 Sl st in 4th ch from hook (picot made), work 2 dc in ch-2 sp, dc in next 5 dc, picot, [dc2tog (see Glossary), ch 4, sk ch-3 sp, sc in sc, ch 4, sk ch-3 sp, dc2tog, picot] 17 times, dc in next 5 dc, (2 dc, picot, 2 dc) in ch-2 sp, *dc in next 5 dc, picot, [dc2tog, ch 4, sk ch-3 sp, sc in sc, ch 4, sk ch-3 sp, dc2tog, picot] 21 times, dc in next 5 dc, (2 dc, picot, 2 dc) in ch-2 sp; rep from *, dc in next 5 dc, picot, [dc2tog, ch 4, sk ch-3 sp, sc in sc, ch 4, sk ch-3 sp, dc2tog, picot] 17 times, dc in next 5 dc, (2 dc, picot, dc) in tch sp. Fasten off.

Collar

Row 1 With RS facing, counting from right tip toward center, join yarn with sl st in 23rd row-end, ch 2, working along row-ends toward center, [work 3 dc around end st of next row] 19 times, work 1 dc around end st of Row 1 of body, work along foundation ch as foll: sk first st, dc in next 31 sts, sk 1 st, dc in next 31 sts, sk last st, work along row-ends as foll: work 1 dc around end st of Row 1, [work 3 dc around end st of next row] 18 times, work 2 dc around end st of next row, dc2tog over same end st and next end st, ch 2, turn.

Row 2 Sk first dc, dc in next 37 dc, [ch 3, sk 2 dc, sc in next dc, ch 3, sk 2 dc, dc in next 4 dc] 2 times, dc in next dc, sk 2 dc, *dc in next 3 dc, [ch 3, sk 2 dc, sc in next dc, ch 3, sk 2 dc, dc in next 4 dc] 2 times, ch 3, sk 2 dc, sc in next dc, ch 3, sk 2 dc, dc in next 3 dc, sk 2 dc; rep from *, dc in next 5 dc, [ch 3, sk 2 dc, sc in next dc, ch 3, sk 2 dc, dc in next 4 dc] 2 times, dc in next 32 dc, dc2tog-dec (see Stitch Guide), ch 3, turn.

Row 3 Work turning dec (see Stitch Guide), dc in next 34 dc, ch 4, sk ch-3 sp, sc in sc, ch 4, sk ch-3 sp, dc in next 4 dc, ch 4, sk ch-3 sp, sc in sc, ch 4, sk ch-3 sp, dc in next 3 dc, sk 2 dc, dc in next 3 dc, [ch 4, sk ch-3 sp, sc, ch 4, sk ch-3 sp, dc in next 4 dc] 2

times, ch 4, sk ch-3 sp, sc in sc, ch 4, sk ch-3 sp, dc in next 2 dc, sk 2 dc, dc in next 2 dc, [ch 4, sk ch-3 sp, sc in sc, ch 4, sk ch-3 sp, dc in next 4 dc] 2 times, ch 4, sk ch-3 sp, sc in sc, ch 4, sk ch-3 sp, dc in next 3 dc, sk 2 dc, dc in next 3 dc, [ch 4, sk ch-3 sp, sc in sc, ch 4, sk ch-3 sp, dc in next 4 dc] 2 times, dc in next 30 dc, dc2tog-dec, ch 3, turn.

Row 4 Work turning dec, dc in next 32 dc, ch 9, sk 9 sts, dc in next 4 dc, ch 9, sk 9 sts, dc in next 2 dc, sk 2 dc, dc in next 2 dc, [ch 9, sk 9 sts, dc in next 4 dc] 5 times, ch 9, sk 9 sts, dc in next 2 dc, sk 2 dc, dc in next 2 dc, [ch 9, sk 9 sts, dc in next 4 dc] 2 times, dc in next 28 dc, dc2tog-dec, ch 3, turn.

Row 5 Work turning dec, dc in next 30 dc, [ch 3, sc in ch-9 sp, ch 3, dc in next 4 dc] 10 times, dc in next 26 dc, dc2tog-dec, ch 3, turn.

Row 6 Work turning dec, dc in next 22 dc, ch 2, sk 2 dc, dc in next 4 dc, [ch 2, sk ch-3 sp, sc, ch 2, sk ch-3 sp, dc in next 4 dc] 10 times, ch 2, sk 2 dc, dc in next 22 dc, dc2tog-dec, ch 3, turn.

Row 7 Work turning dec, dc in next 17 dc, ch 3, sk 2 dc, sc in next dc, ch 3, sk ch-2 sp, dc in next 4 dc, [ch 3, sk ch-2 sp, sc in sc, ch 3, sk ch-2 sp, dc in next 4 dc] 10 times, ch 3, sk ch-2 sp, sc in next dc, ch 3, sk 2 dc, dc in next 17 dc, dc2tog-dec, ch 3, turn.

Row 8 Work turning dec, dc in next 15 dc, [ch 4, sk ch-3 sp, sc in sc, ch 4, sk ch-3 sp, dc in next 4 dc] 12 times, dc in next 11 dc, dc2tog-dec, ch 3, turn.

Row 9 Work turning dec, dc in next 13 dc, [ch 9, sk 9 sts, dc in next 4 dc] 12 times, dc in next 9 dc, dc2tog-dec, ch 3, turn.

Row 10 Work turning dec, dc in next 11 dc, [ch 3, sc in ch-9 sp, ch 3, dc in next 4 dc] 12 times, dc in next 7 dc, dc2tog-dec, ch 3, turn.

Row 11 Work turning dec, dc in next 9 dc, [ch 2, sk ch-3 sp, sc in sc, ch 2, sk ch-3 sp, dc in next 4 dc] 12 times, dc in next 4 dc, dc2tog-dec, ch 3, turn.

Row 12 Work turning dec, dc in next 6 dc, [ch 3, sk ch-2 sp, sc in sc, ch 3, sk ch-2 sp, dc in next 4 dc] 12 times, dc in next 3 dc, dc2tog-dec, ch 3, turn.

Row 13 Work turning dec, dc in next 3 dc [picot, dc2tog, ch 4, sk ch-3 sp, sc in sc, ch 4, sk ch-3 sp, dc2tog] 12 times, picot, dc in next 3 dc, dc2tog-dec. Fasten off.

FINISHING

Weave in ends.

Kris Jaeger has been crocheting since she was seven years old. She was introduced to spinning through a General Crafts class and immediately fell in love with making her own yarn. Follow her at www.unyunga.blogspot.com.

Autumn Leaves Scarf and Shawl

Transparencies to Wear

BY BOBBIE IRWIN

Traditional transparencies have inlaid patterning on an open-weave background, typically linen. Linen's stiffness keeps the relatively unstable fabric from collapsing, making transparencies most suitable for decorative hangings and screens. I decided to make transparencies practical for scarves and shawls by using wool instead of linen, then fulling the fabric to lock the fibers together during finishing. This creates a lightweight fabric that drapes beautifully, lets light shine through, and is surprisingly stable.

Spinning

The warp, tabby (plain-weave) weft, and border inlays are spun from a Romney-cross fleece, washed and combed with English wool combs. The locks were pale tan at the tips and darker at the base, producing a slightly variegated yarn even after plying. (Carding might have blended the colors better, but I much prefer combing.) The leaf inlays use a soft, warm brown wool of uncertain parentage, also combed.

Both yarns are spun Z-twist with a short backward draw from the end of the combed top, then plied S-twist. For the ground cloth, my aim was to produce a yarn with a grist similar to Harrisville Shetland yarn, which has worked well in similar projects. My two-ply tan yarn has 20 wraps per inch, a little finer than Harrisville Shetland, which has 17 wraps per inch. Like Harrisville Highland yarn, my brown four-ply yarn for the pattern inlay has 11 wraps per inch.

To sample and leave extra to splice or repair threads, spin a third more yarn than the minimum you think you'll need. For this project, it's important to choose a fiber and spinning method that produce a yarn that will full. You want the woven fabric to full in the finishing, so don't wash or block the yarn before you weave it.

Designing the Inlay Pattern

The open sett of this shawl does not allow intricate details, so relatively large and simple designs work best. Most transparency weavers use a "cartoon," a paper or Pellon pattern the size of the complete project. The cartoon is pinned underneath the warp to provide a visual guide for weaving the inlay patterns. For my scarf and shawl, I instead drew single leaves on separate pieces of paper, allowing plenty of margin around the drawings for pinning to the warp. I moved the separate patterns around as I finished weaving each leaf. The patterns are drawn from actual leaves of Gambel oak, the diminutive oak of the central Rocky Mountains, and enlarged by more than a third for the shawl. I used six different leaf designs for the shawl. You may want to have different kinds of leaves, and you may want to weave more than one leaf at a time in some places, so you will need to make multiple cartoons.

I decided the leaf placement as I wove, changing the orientation of the cartoon to make it look as if leaves had randomly fallen onto the background, and I deliberately ran some patterns off the sides of the fabric.

Weaving

For maximum stability, I wove both the plain-weave ground cloth and the inlays in a balanced plain weave of six ends per inch and six picks per inch. For each inlaid leaf, cut no more than a yard of the inlay yarn and wind it into a butterfly (figure-eight wrapped around thumb and little finger). You could also use a small tapestry shuttle or a yarn bobbin from knitting, if you have one. (You can make your own yarn bobbins from flat plastic-bag tabs, shaped with scissors to hold the yarn, a tip I learned from an old issue of *Handwoven* magazine.)

Spinning:

Fiber: *Warp, border inlay, and tabby weft:* Soft medium wool top, 8 oz tan. *Inlay weft:* Soft medium wool top, 1 oz brown. *Shown here:* Romney-cross (tan yarn) and unknown breed (brown yarn). Amounts given allow for sampling.

Yarn: *Warp, border inlay, and tabby weft:* 2-ply (spun Z, plied S); 1,114 yd; 2,272 ypp, 20 wpi. *Inlay weft:* 4-ply (spun Z, plied S); 44 yd (enough

for 25 leaves); 1,136 ypp, 11 wpi.
Warp Length: 180 ends, 3½ yd long (allows 8" for take-up, 30" for loom waste; loom waste includes fringe).

Weaving:
Structure: Plain weave with inlay.
Equipment: 2-shaft (or more) loom, 30" weaving width; 6-dent reed; 1 boat shuttle.
Setts: *Warp and weft:* 6 epi.
Dimensions: *Width in reed:* 30". *Woven length (measured under tension on loom):* 88". *Finished size after washing:* 1 shawl about 24" x 72" plus 7" fringe at each end.

SHAWL

Wind 180 warp ends 3½ yd long. Center the warp for a weaving width of 30" and warp for plain weave using your preferred method. Note that, because this is plain weave, you don't need floating selvedges. (Free warping directions are available to download at weavingtoday.com.)

Wind a bobbin with the tan yarn to use as tabby (plain-weave) weft. Wind two butterflies of tan yarn 9 yd long, which you will use for inlay on the ends and sides to strengthen the selvedges. Leaving at least 10" for fringe, begin weaving with the tabby weft, leaving a 3-yard tail for

hemstitching. After you insert the first weft pick, change sheds, and use one of the 9-yard butterflies to lay in an inlay from selvedge to selvedge, weaving in the same direction as the weft pick that will follow. Make the tabby weft pick, then close the shed and beat gently. Repeat for two more weft picks, continuing with the selvedge-to-selvedge inlay before each pick.

When you have woven three picks of tan inlay plus tabby, hemstitch across the edge, stitching bundles of 3 warp ends.

Start the other side inlay as follows: before you lay in your next tabby weft pick, insert ½" of tan inlay (three warp threads wide) at each side, still weaving in the same direction and in the same shed as the weft pick that will follow. (You will continue with the inlay yarn you've been using at the first edge. At the second edge use the other butterfly and begin the inlay three weft picks in from the edge, leaving a tail that you will work in later.) Continue in this way throughout the weaving. The edge inlay area will strengthen the selvedges and help keep the open weave even.

Begin weaving leaf inlays whenever you like, following the inlay instructions (see Weaving Inlay opposite). You can orient the leaves in different directions, have partial leaves at the edges of the shawl, or use whatever arrangement appeals to you. (As you work, don't let the cartoon wind around the front or cloth beam.) If you weave leaf patterns at the edges, those will temporarily replace the border inlays.

The general rule for inlay designs is that you don't want the inlay edges to increase or decrease by more than one warp thread with each pick. However, depending on the orientation, these leaf patterns may have three or more separate areas of inlay happening at the same time. In these areas, weave with separate strands until the areas merge, and overlap ends to secure them. (Again, never carry an inlay thread across the back of the cloth.) In some cases, you might choose to needle-weave the inlay into the previous inlay row and then bring it up to start a new area.

The other challenge is the stem, which sticks out several warp threads from the body of the leaf. Rather than starting a new inlay thread for the stem, I will continue the inlay in the same direction as the previous pick to make the stem, loop it around a warp thread, then weave it back on top of itself in the other direction and across the leaf. I wouldn't do this if I needed to overlap a strand for more than an inch, but in this case, since the stems are only one pick thick, having the doubled inlay pick makes them more visible.

As you weave, place terry-cloth towels no wider than the inside of your loom between the fabric and the cloth beam to help keep the delicate fabric from becoming distorted. As the cloth winds on, it also helps to use an additional towel or a slit cardboard tube around the cloth beam to cover the knots. Weave with leaf inlays until the shawl measures about 85". Finish your last leaf inlay, weave on in plain weave with the edge inlay until the scarf measures 88", doing selvedge-

to-selvedge inlay on the last three picks and then hemstitching the edge as you did at the beginning.

Carefully remove the cloth from the loom, leaving at least 10" for fringe. Twist hemstitched bundles into fringe, tie a knot at around 6¾", then trim the ends to 7". Double check to be sure all inlay tails are woven in and trimmed to 1".

Weaving Inlay

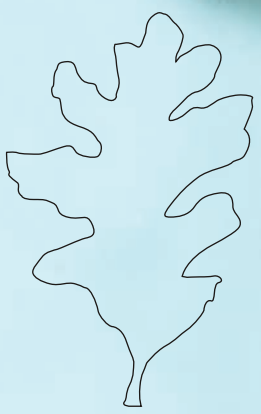
In a transparency, the pattern is made by weaving in small areas of extra weft picks in between the tabby (plain-weave) weft picks. The closer you "color inside the lines," the better your finished design will resemble your original pattern. A transparency has a textured side, where the inlays turn to weave back and forth, and a smoother side, which I prefer as the "right" side. It's easiest to weave the rough side up.

Pin the cartoon for the inlay area to the back of the cloth you've woven, extending over the area you will weave.

Start and end each inlay with a tail 3" long, and weave in the tails as you go by taking them around a warp end and laying them into the next shed for about ¾", then follow them with the inlay pass. In narrow areas, tails may need to zigzag for a couple of rows before they are fully secured. Try to end tails inside a pattern area rather than on an edge. Once the tail is secured, bring the excess yarn to the surface and trim the end temporarily, leaving an inch hanging. (You'll trim this after the cloth is fulled.) At the end of a pattern, leave a tail long enough to needle-weave into previous rows using a blunt (tapestry) needle. With wool transparencies, it's much easier and neater to secure the ends as soon as you finish an inlay, rather than after the project is off the loom.

To weave each inlay pass, change the shed from the previous weft pick, and lay the inlay weft in the area indicated by the cartoon, going in the direction of the next weft pick. In small pattern areas such as these, there is little take-up of the pattern yarn, so you don't need to bubble for extra weft in the shed. Each inlay pattern travels back and forth in its own area, turning around the warp thread closest to the pattern line. There should be no floats on either side of the fabric, so don't carry a strand across the back to start a new inlay. When inlay areas merge, end one of them by overlapping into the adjoining inlay. Follow the row of inlay with the weft pick, then close the shed and press the weft pick into place.

Weaving proceeds one row at a time. In any row, all inlays travel in the same direction and shed as the tabby weft that will follow. Complete all inlays in that row, weave tabby with the background weft, and beat very gently on a closed shed only after laying in both the inlay areas and the tabby row. One firm beat can collapse your whole project, so when weaving transparencies, think of the beater as a gentle "weft placer."



This cartoon is drawn from an actual Gambel oak leaf. Enlarge it to use as the cartoon for your shawl or create your own leaf designs.

Finishing

You want the threads in your ground cloth to be evenly spaced before you wet-finish the fabric. Some distortion while weaving is normal and can be corrected with a pin or a fingernail. Off the loom, you can also pull gently on the bias to correct distortion, but don't be too concerned. With wool, many inconsistencies on the loom seem to disappear when tension is released.

To full and stabilize the cloth, soak the shawl in hot water with shampoo or wool wash. After 10 minutes, agitate the fabric gently by hand to encourage fulling, gradually increasing the agitation and checking the cloth frequently; when fulling happens, things change quickly. Fulling time will depend on the wool and the way the yarn is spun. The fibers should lock together without felting, and the cloth should remain open enough to let light through and show off the inlay patterns.

When the cloth has fulled sufficiently, rinse it in tepid water, roll in a towel to remove excess moisture, and hang to dry. Cut the inlay tails close to the fabric and trim the fringe. If the fringe seems too skimpy, tie on additional yarn with lark's head knots, using a crochet hook to pull the fringe bundles through the edge of the cloth.

Scarf

If you have a rigid-heddle loom with a weaving width of at least 12" (or any shaft loom), you can weave this project as a scarf. When I wove this as a scarf, I used a stick shuttle as long as the warp is wide for the plain-weave weft, since it lets me measure the yarn as I wind it on, and I can wrap on enough to complete a scarf. Since transparency weaving is not speedy, a stick shuttle does not slow the process.

If you spin half as much yarn for the scarf as for the shawl, you'll have plenty for sampling. (For my scarf, I made a four-ply for the brown pattern yarn.) When you weave, you can leave only 6" of warp for fringe at either end.

Spinning:

Fiber: As for Shawl (4 oz tan and ½ oz brown). Amounts given allow for sampling.

Yarn: *Warp, border inlay, and tabby weft:* 2-ply (spun Z, plied S); 557 yd; 2,272 ypp, 20 wpi. *Inlay weft:* 4-ply (spun Z, plied S); 22 yd (enough for 12 leaves); 1,136 ypp, 11 wpi.

Warp Length: 72 ends, 2½ yd long (allows 6" for take-up, 24" for loom waste and fringe).

Weaving:

Structure: Plain weave with inlay.

Equipment: 2-shaft loom or rigid-heddle loom, 12" weaving width; 6-dent reed or rigid heddle; 1 stick shuttle.

Setts: *Warp and weft:* 6 epi.

Dimensions: Width *in reed:*12". *Woven length (measured under tension on loom):* 60".*Finished size after washing:* 1 scarf about 9" × 53" plus 3" fringe at each end.

Bobbie Irwin is a contributing editor to *Spin Off* living in Montrose, Colorado, who has been weaving since 1973 and spinning since 1981. She travels frequently to teach weaving classes.

Resources

Romney cross: Mendenhall Wool Ranch, 4519 Fruitland Rd., Loma Rica, CA 95901; www.woolranch.com

Unknown brown wool: Doni Slanina, 2425 Fly Creek Rd., Pompeys Pillar, MT 59064

Starry Night Jacket

Challenges and triumphs on the way to a stellar jacket

BY BETTY PAEPKE

Looking at spinning fibers at my local yarn store, I was intrigued by some tweed rovings I saw. How, I wondered, did they get those colored bits in there? And was this something I could do? I thought about felting wool and cutting it up into small pieces, but it sounded like way too much work. Still thinking about handspun tweed yarn, though, I went online for more information. In short order, I was pointed in the direction of silk noil, the leftover bits from producing smooth, shiny silk. When noil is spun, it creates a nubby yarn, just right for tweed.

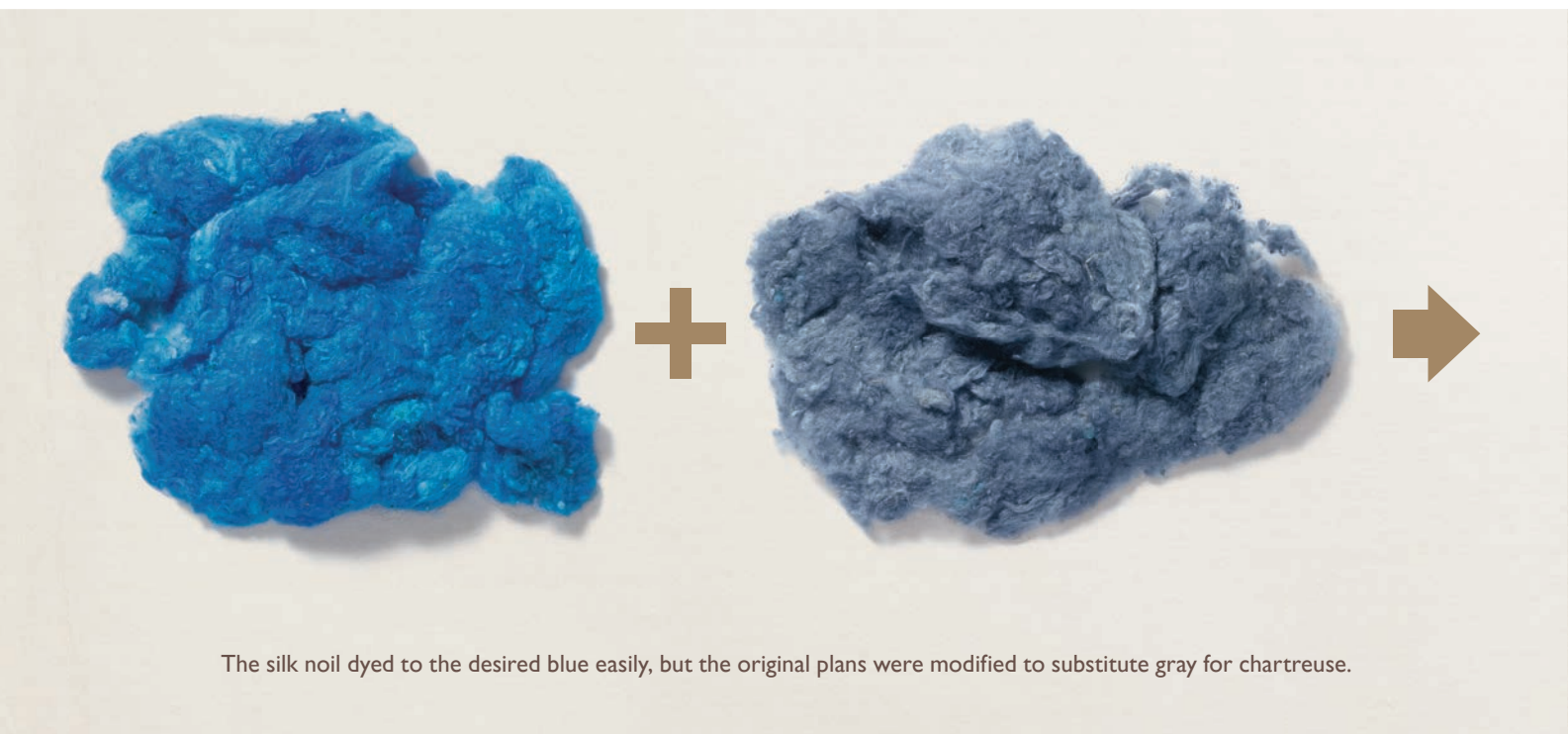
Spinners are often told to spin for a specific project, but I am more likely simply to spin what I have on hand and determine what to make with it later—probably the reason I have such a large handspun stash! This time, however, I wanted to spin tweed yarn for a handwoven 1940s-style tailored jacket.

DYEING

I like to dye fiber to get the desired colors, and in this case, I wanted blue and chartreuse noils to brighten a black alpaca fleece from my stash. My attempts at dyeing silk noil were far from successful. The silk would not dye chartreuse; it seemed not to accept yellow dye, and I ended up with dull green. After trying different batches using different brands of dye without success, I changed my plan to blue and gray and dyed 70 grams (2.5 ounces) of silk noil in each color.

CARDING

I used my drumcarder to card all of the alpaca into large batts, then split the large batts into 40-gram sections to card with 2.2 grams of each color of silk noil. The silk fibers had become compacted during the



The silk noil dyed to the desired blue easily, but the original plans were modified to substitute gray for chartreuse.

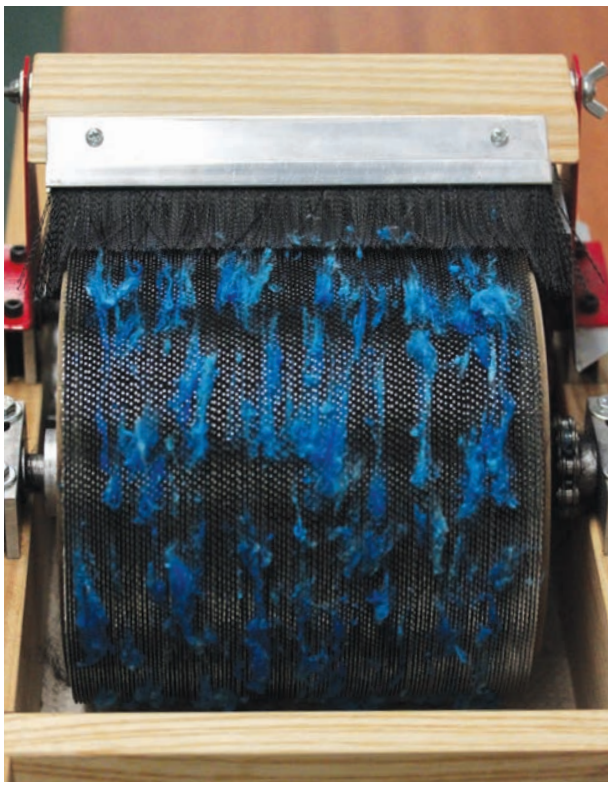


PHOTO BY BETTY PAEPKE.

Placing the silk noil directly on the drum of the carder allowed for a thin layer.

dyeing process, so I carded them with handcards. This was also a good time to pick out the pieces of cocoon and other hard bits that I found in the fibers.

When I combined the two fibers on the drumcarder, I broke each 40-gram alpaca batt roughly into thirds and the 2.2-gram silk noil bundles in half. I created a layered batt, alternating alpaca, the two silk noil colors, more alpaca, more silk noil, and finally ending with alpaca. I then carded the batt again to incorporate the silk and alpaca together.

When putting the silk noil on the drumcarder, I placed it directly on the large drum. I gently ran the noil along the length of the carder without turning the drum, allowing a thin layer of silk to adhere to the carder teeth. I put on the blue silk noil and then the gray silk noil, with no alpaca between the silk colors. I tried to keep the silk bits small, thinning the larger bits with my fingers. The idea was to get small amounts of color, not long lengths in the spun yarn. I used 1,210 grams (2.7 pounds) of washed alpaca fiber and 70 grams (2.5 ounces) of each color of silk noil in total.

Not all drumcarders have the same size large drum as the one I used, so the amounts of alpaca and silk I used may not be right for yours. Experiment to determine the ratio of alpaca and silk that works on the drumcarder you use.

Each layered batt was divided, then carded to combine the fibers.

At top, the tweed two-ply; at bottom, the singles yarn.

SPINNING

I spun the fibers with a short backward draw. If I encountered too large an area of silk noil, I removed some with my fingers or drafted it out while spinning to avoid large sections of color. I also removed sections of alpaca that had no silk noil to avoid long sections with no colored bits.The singles measured 22 wraps per inch and the two-ply, 14 wraps per inch.

WEAVING

My loom weaves a maximum fabric width of 26 inches. To determine the amount of fabric I needed, I arranged the pieces from my commercial pattern on paper of that width, allowing for draw-in. I needed a warp 5½ yards long and 25 inches wide.

To minimize the handspun used for loom waste, I put on a 1-yard dummy warp of cotton carpet warp and tied the handspun to the carpet warp after threading the heddles and reed. After winding on the warp, I tied small amounts of warp (in this case, 8 ends) together and lashed the warp to the front apron rod using a strong cord. Because the yarn has lots of texture, I wove the fabric as a balanced plain weave with 8 ends per inch and 8 picks per inch.

After removing the woven fabric from the loom, I agitated it in the washing machine with hot water and detergent for about 4 minutes, checking it every 30 seconds. After weaving and wet-finishing the fabric, shrinkage was 14% in width and 16% in length.

The fabric fulled and became slightly fuzzy. The finished fabric measured 21½ inches wide and 4¾ yards long.

SEWING

I used a simple-to-sew contemporary sewing pattern, although it was not the 1940s style I had originally envisioned. I substituted frog fasteners for the zipper and added a placket where the zipper was called for. I backed the cut-out fabric pieces with iron-on interfacing to stiffen them and create a more durable jacket.

This project has been both difficult and rewarding. I spent a lot of time dyeing silk and getting unacceptable results before I had success. The carding and spinning were time consuming, more than for any one project I've ever done. But I was pleased with the yarn itself, especially since it won both the Judges' Choice and Peoples' Choice awards at the Estes Park Wool Market. The resulting fabric is wonderful and luxurious, more than the sum of its parts.

Betty Paepke weaves, spins, dyes, and gardens in Boulder, Colorado. She works in the shipping department at Schacht Spindle Company.

RESOURCES

Sewing pattern: McCall's M6441
Silk noil purchased from Louet
For directions on making frog closures, see www.bridgesonthebody.blogspot.com/2009/12/frog-closure-how-to.html

Knitting Abbreviations

* *—repeat all instructions between
beg—begin(ning)
BO—bind off
CC—contrast color
cn—cable needle
CO—cast on
dec—decrease
dpn—double-pointed needle(s)
inc—increase
k—knit
k1f&b—knit into front and back of stitch
k2tog—knit 2 together
k3tog—knit 3 together
kwise—knitwise
M1—make 1 by picking up running thread between 2 stitches front to back, place on left needle and knit into back of loop
M1L—work same as M1
M1R—make 1 by picking up running thread between 2 stitches back to front, place on left needle and knit into front of loop
MC—main color
p—purl
pm—place marker
p2sso—pass 2 slipped stitches over
p2tog—purl 2 together
pwise—purlwise
rem—remain(ing)
rep—repeat
rnd(s)—round(s)
RS—right side
sl—slip
sl 1, k2tog, psso—slip 1 stitch knitwise, knit 2 together, pass slipped stitch over the knit 2 together
sl 2, p1, p2sso—with yarn in front, slip 2 stitches purlwise through back loops (insert right needle into back of second and then first stitch on left needle and slip both stitches together to right needle), purl 1 and then pass the 2 slipped stitches over at the same time
s2kp—slip 2 stitches as if to knit 2 together, knit 1, pass 2 slipped stitches over
ssk—[slip 1 knitwise] 2 times, place these 2 stitches onto left needle and knit together through back loops
ssp—[slip 1 knitwise] 2 times, place these 2 stitches onto left needle and purl 2 stitches together through the back loops
sssk—[slip 1 knitwise] 3 times, place these 3 stitches onto left needle and knit together through back loops
st(s)—stitch(es)
tbl—through the back loop
WS—wrong side
wyb—with yarn in back
wyf—with yarn in front
yo—yarnover

Crochet Abbreviations

ch—chain
dc—double crochet
dc2tog—double crochet 2 together
hdc—half double crochet
rev sc—reverse single crochet
sc—single crochet
sk—skip
sp—space
SR—stitch repeat
tch—turning chain
tr—treble crochet

Spinning Abbreviations

tpi—twists per inch
wpi—wraps per inch
ypp—yards per pound

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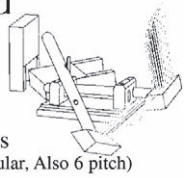

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Low-Tech Equipment

Found Spinning Tools for Empty Afternoons

BY DALE JACKSON

August 2004 marked a period when I was without my high-tech fiber equipment for some time, rather traumatic for a fiber junkie. After reading most of the Tarzan books in the library and weaving a few small baskets, time was wearing on me. Daily walks helped some, but during inclement weather, those weren't possible. Looking around, I noticed the growing pile of cotton stuffing from pill bottles. "Wow," I thought, "they almost look like the cotton bolls I used to grow in my garden! If I had my spinning wheel, I could convert them into thread." But alas, no spinning wheel!

"Come on, Dale, you learned to spin on a drop spindle!" But there was no spindle and no wooden dowels and wooden disks to create one. Alas, poor me. "Think, man—there has to be a way!" What about the cardboard backs from the writing tablets? Okay, but I didn't have a compass to make a circle on the cardboard. But there were pencils. Take a piece of paper, mark off the length I needed to create the circle, then put a pencil through each mark on the ends of the paper and proceed to scribe a circle on the cardboard. That not only scribed the circle but also marked the center. Now cut it out, and we are ready.

But that is awfully lightweight; maybe we should use two circles. That is better—a few tabs of tape around the perimeter and we are ready to go. Press a sharp pencil through the middle, and look—it's a top, it's a flying saucer! (Shh, don't tell anyone. It's a drop spindle.)

Now to start spinning. I finger-twist enough fiber to create the leader needed to start using the spindle. Soon the spindle is full enough to ply the yarn. This I did by laying the single strand across my bed and off onto the floor. Attaching the two ends to the drop spindle, I made several feet of two-ply fingering-weight yarn.

Of course, it was all white, or maybe a little off-white when my hands weren't quite clean enough. What could I use to create colors? How about the watercolors from the craft room? Neat. I now had colored string.

Now what? No knitting needles . . . Maybe weaving? But no loom! Well, I still had more cardboard. "Remember," I thought, "when you made a small loom from cardboard?" Now I could use up some of the yarn that I had spun. What a wonderful way to spend my free time! I even solved the problem of no needle by breaking a paper clip, folding it into a needle shape, and putting scotch tape around it so that it would pass through the threads without snagging.

Dale Jackson owned a florist shop for several years before training as an art educator. Raised on a farm, he didn't discover spinning until later, when he fell in love with the drop spindle. He is now retired from teaching after twenty-five years, most recently at a community college in Iowa.

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