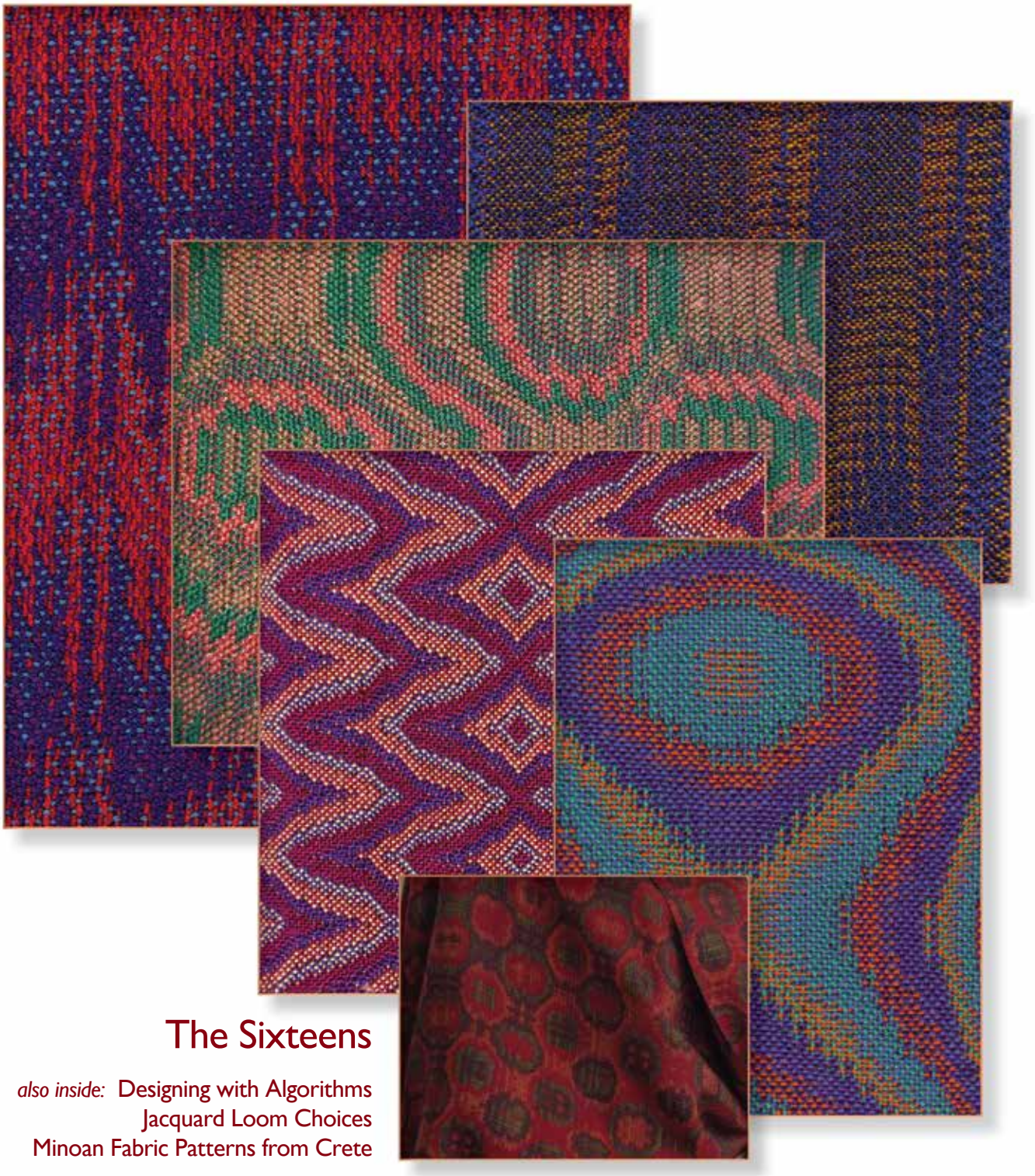
COMPLEX WEAVERS

June 2015 | Number 108

JOURNAL

Encouraging curiosity, exploration, innovation in weaving



The Sixteens

also inside: Designing with Algorithms
Jacquard Loom Choices
Minoan Fabric Patterns from Crete

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Deadline for Article Submission Articles for the next issue, October 2015, should be submitted by July 15, 2015. Please send your articles or questions to *CWJournalEditorRM@gmail.com.*

Complex Weavers Journal

June 2015 | Number 108

In This Issue

Do You Love Linen?

This is a call for articles for the June 2016 issue of *Complex Weavers Journal*, which will focus on linen.

- Linen traditions
- Working with linen yarns
- Weave structures, and more

The deadline for submission is March 15, 2016. To send an article, or for more information, contact the *CWJ* Editor: *CWJEditorRM@gmail.com*

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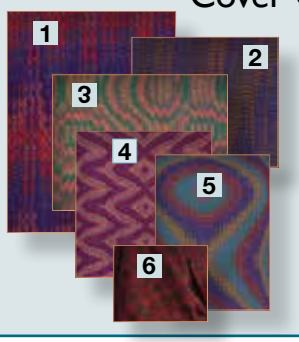


The Sixteens study group explores four-color double weave:
1 — Frances Osten
2 — Judith Yamamoto
3 — Donna Jean Barker
4 — Mary Doherty
5 — Linda Madden
6 — Brenda Gibson

Complex Weavers Book Reviews

Frances L. Goodrich's Brown Book of Weaving Drafts

Barbara Miller with Deb Schillo

Review by Norma Smayda

Years ago my husband and I visited the Folk Art Center on the Blue Ridge Parkway north of Asheville, North Carolina, and saw, spread out on a library table, old weaving drafts looking just like those of Weaver Rose (which I had acquired by happy accident some years before). These drafts in the library were part of a collection from Frances L. Goodrich. I later learned that Frances Goodrich and Weaver Rose preserved and exchanged old weaving drafts.

In the early 1980s Barbara Miller was assisting in an exhibition at the Folk Art Center when she first saw the *Brown Book of Weaving Drafts* and knew at once that what it contained would become a part of her life. She fell in love with the story of Frances Goodrich, the educated daughter of a Presbyterian minister who earned an art certificate from Yale University at a time when Yale did not confer degrees on women.

Miss Goodrich lived and practiced her art in New York City for some years before moving to the Asheville area in 1890. She took up residence in a two-room log cabin and worked for the Home Mission Board of the Presbyterian Church, teaching sewing, household arts and Bible reading to local women. It was serendipity that one of these women presented Miss Goodrich with a brown Double Bow Knot coverlet, accompanied by its handwritten threading draft. Thus began her passion for coverlet weaving. A wonderful story unfolds of Miss Goodrich seeking out the mountain women who knew how to dye wool, wind a warp, dress a loom and weave not only plain weave, but overshot coverlets.

She took one coverlet north to see if there might be a market for them and, learning there was, she had a vision of what could happen. She determined there should be three benefits from her plans: the opportunity for these mountain women to produce useful and beautiful things, sharing this new interest with like-minded women; markets for their work, giving these women a small income; and the rescue of these weaving drafts and the craft they represent from extinction. Although Miss Goodrich saw poverty, she also recognized in these women self-respect and a desire for education.

A few years after first seeing the Goodrich drafts, I met Barbara, and she took me behind the scenes at the Folk Art Center, into the library archives. We spent hours poring over these wonderful old drafts, written on scraps of fragile yellowed paper, full of pin holes showing that they had been much used. Barbara grew up in Appalachia, and as she speaks one senses her admiration and respect for these mountain women. She talked of a dream of preserving these drafts and making them accessible to weavers everywhere.

Miss Goodrich collected weaving drafts, most of which were overshot, and, as was the case with most drafts from that period, only threadings were given. Once the looms were threaded, the weavers figured out the treadlings, having no need to write them down. Tabbies were often 1-2 and 3-4, instead of 1-3 and 2-4. Although she was not herself a weaver, Miss Goodrich taught herself the treadlings and how to make drawdowns, and in order to do so she made her own graph paper and did her drawdowns in watercolor. She distinguished between pattern blocks and half tones, characteristic of overshot. Some drawdowns are small, but she also painted large ones up to 34 by 38 inches.

Miss Goodrich preserved all the drafts she came across, copying her favorites (more than 200 of them) into her Brown Book, and gluing all of them (over 400) into two scrapbooks. She copied dye recipes into a black notebook, along with plant sources and other information. Weavers were encouraged to avoid using the available commercial dyes, but to use natural dyes instead and record the recipes. She said "a characteristic of these dyes is their unfailing ability to live at peace with each other."

In 1908 Miss Goodrich established Allanstand Cottage Industries in Asheville, where baskets, handwovens, and products of other crafts were sold. She worked for the Home Mission Board for nearly 30 years, while continuing her work with the Allanstand Cottage Industries for another 13 years. Allanstand continued as a shop in downtown Asheville until it moved to the Folk Art Center in 1982, and there it continues as the oldest craft shop in the country. She thought that an organized craft guild would be the natural way to preserve what she had built and provide a marketplace for the mountain craftspeople; so in 1931 she turned over her Allanstand shop to the Southern Highland Craft Guild.

Miss Goodrich wrote *Mountain Homespun*, published by Yale University Press in 1930, reprinted in 1989 with an introduction by Jan Davidson. She corresponded and shared drafts with others who were also collecting and preserving old drafts throughout the country: Mrs. W. H. (Laura) Allen of Rochester, New

York, William H. H. Rose of Peace Dale, Rhode Island and Eliza Calvert Hall were among her correspondents.

With help and encouragement from Deb Schillo, the Folk Art Center Archivist, Barbara began hours of culling through the archives, entering over 200 drafts into a computer program (Fiberworks PCW). This book begins with a chapter taken from Miss Goodrich's writings, followed by the story of her life in the North Carolina mountains from 1890 until her death in 1944. Barbara then explains overshot and making drawdowns, and illustrates this with reproductions of Miss Goodrich's watercolors. There are dye recipes with their quaint and practical directions.

A full 110 pages from the original Brown Book are reproduced here. And over half of the book is devoted to computer-generated drafts and drawdowns of Miss Goodrich's favorite designs, shown with woven pieces where available.

Schiffer Publishing, Ltd recognized the importance of retaining the appearance of the original Brown Book, and their care contributed immensely to the charm of this book. From the book cover, designed to look like Miss Goodrich's Brown Book, to the charming photographs (with their corner tabs) of Miss Goodrich and the mountain women, to the lovely watercolor drawdowns, this book preserves the unique appeal that Miss Goodrich herself recognized. This is a book to be treasured by historians, coverlet weavers, and those who will simply view and appreciate the many overshot patterns contained here. It is a wonderful testament to the coverlet weaving of the mountain women, who would be amazed at our interest in their old drafts and the care taken to preserve them.

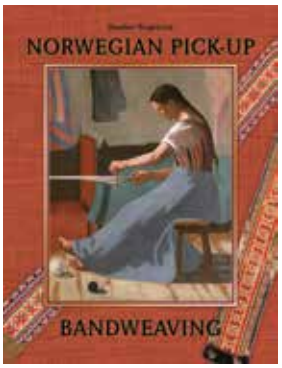
Miss Goodrich would be pleased and proud to see this new Brown Book. Barbara Miller has fulfilled her dream of preserving these drafts, and making them accessible to us.

Schiffer Publishing, Ltd. 2013
ISBN: 978-0-7643-4541-8

Norwegian Pick-Up Bandweaving

Heather Torgenrud

Review by Deanna Johnson



An excellent book title makes the topic and scope of a book very clear, and *Norwegian Pick-Up Bandweaving* is an excellent title. The author, Heather Torgenrud, is very clear about what this book is not (*i.e.*, an encyclopedia of general bandweaving techniques) and very specific about what the book is (*i.e.*, a description of the specific tools, techniques, and cultural context for pick-up bands woven in eastern, southern, and part of western Norway, excluding the Sámi areas in the north). As the author pursued her journey to learn these techniques, a journey that actually took her to Norway, she searched for a book in English that contained all of the pertinent information. Her search was unsuccessful, so she wrote the book she had hoped to find, and this is the result.

First impressions — this is a beautiful book — hardback with a dust cover (and the cover image on both) that has the characteristics of a museum catalog — plenty of white space where appropriate, many large, full-colored photos, and clear pattern diagrams for all of the bands described in the book. I preordered my copy and it was surprisingly inexpensive.

The book has three main parts.

Part 1 — History and Tradition discusses the cultural context for these bands, focusing mostly on the 1700 and 1800's. She describes the role these bands played in the textile traditions of Norwegian communities, and the main uses for the bands — including belts and hair ties in folk dress, swaddling for babies, and strong handles for tools and commonly used items.

Part 2 — Vesterheim Collection includes detailed information on 20 bands from the Vesterheim Norwegian-American Museum in Decorah, Iowa. For each band presented, she includes where it came from, what materials it is made of, the dimensions, and one or more photos. The descriptions also include who wove the band and what it was used for. She provides basic information on the two types of pick-up weaves used in the bands, the traditional materials and colors that were used and the pattern motifs. The section closes with a brief history of the museum followed by pattern charts for all of the bands.

Part 3 — How to Weave Pick-up. This is my favorite section, and it contains all of the information the reader needs to be able to weave these bands. She begins with a description of the two styles of heddles used for the bands, basic weaving terminology, and diagrams showing the two types of bandweaving and the bands that result from each type. There are lovely photos of tools needed (band heddle or pattern heddle, shuttle, band clasp, and weaving belt). I especially like the

features of her weaving belt (*a.k.a.* backstrap) — she attaches triangular rings to the ends of the backstrap for hooking the band clasp, but she also sews on ties to allow the backstrap to remain around the weaver's waist when the band is detached. There's a description of the types of yarns typically used — linen or cotton for the ground weave, and often Spelsau wool yarn for the pattern warps. She provides very detailed weaving instructions for weaving Type 1 with a band heddle, Type 2 with a band heddle, and Type 2 with a pattern heddle. She even has a description of how to go about unweaving to fix mistakes. Each set of instructions has detailed steps and clear photos.

Finally, the *Pattern Supplement* contains weaving diagrams for a number of bands, organized by the band type, the number of pattern threads, and for Type 2, which part of Norway the pattern comes from. The final page of that section contains warp drafts.

I don't have Norwegian heritage (although this book makes me wish I did), but I love bandweaving, beautiful books, and bargains, and I was delighted to add this to my library.

Schiffer Publishing, Ltd. 2014
ISBN 9780764347511

The Spinning Wheel Sleuth Hand Looms Supplements #1 to #10 — 1998 to 2007

Florence Feldman-Wood, Editor

Review by Pat Donald

Florence Feldman-Wood has been weaving and spinning for over thirty years and along the way became interested in antique looms and spinning wheels. She disseminates information through her website (*www.spwhsl.com*) and through 'supplements' (newsletters). The *Hand Looms Supplements* began in 1998 and are published annually as a multi-page periodical.

In 2014 Florence presented the first *Hand Looms Supplements* compilation CD which contains issues one through ten, complete with an index of those issues by article title and by author.

Articles in the Supplements are submitted by individual contributors and therefore each issue contains a variety of topics under the broad umbrella of 'hand looms.' However, by reading through the full collection of issues from the first ten years, various threads emerge, such as a discussion of three-shaft looms, with three articles submitted over three different issues from two different authors. This compilation includes descriptions of 38 different looms from across the United States, Scandinavian countries, British Columbia and northern Europe, from 38 contributors.

The Supplements are not an attempt to document all known looms but rather the pursuit of historic looms and all the questions they raise. Often the journey of a loom to its current location is unknown. Even when the journey is known, there are still questions about missing or potentially missing parts, or why the loom's design deviates from that of other looms. There are articles on the beginnings of loom companies and their history. There are articles on loom restoration, loom plans, looms of well-known weavers, questions about weaving hardware and much more. There is even an article on looms made by Roger Lawrence during the time when his kids were engrossed in their own lives. As the looms resurface, the children of Roger Lawrence are asking people to contact them as they had no idea he had made so many looms.

The CD format is a convenient way to store all the issues in one location for future reference, but I also found it wonderful to read all these articles in a compressed timeframe, rather than reading them a few at a time over a period of years. The information contained here is useful, but it is the stories about looms found in different places with different features, and how contributors pulled together each loom's story that capture and hold our interest.

Viewed as a whole, this compilation gives a unique perspective on weaving as well as presenting the adventures of finding and documenting these looms.

For more information on the *Hand Looms Supplements* and this CD, visit the Spinning Wheel Sleuth website: *www.spwhsl.com*

The Spinning Wheel Sleuth, 2014
ISSN #1072-1509

Remembering Wanda Shelp

A Complex Weavers Wonder

Linda Davis

The list of people who have contributed significantly to the inception, growth and development of Complex Weavers (CW) would be long, if one could even be put together. One of those who would be at the top would have to be Wanda Shelp, a past president and editor of the *Complex Weavers Journal*. Her contributions went above and beyond in those positions and others. Wanda died in March 2015 after an extended illness. The legacy she leaves Complex Weavers is impressive.

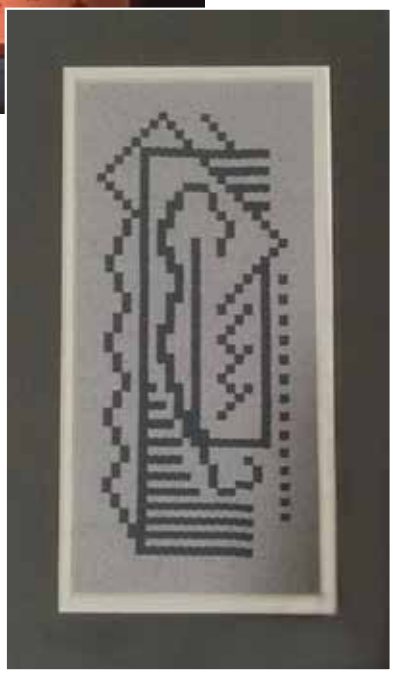
It would not be surprising to learn that few members knew Wanda. Wanda was not one to seek center stage in anything she did. Rather, she preferred and felt more comfortable backstage where she quietly mentored, encouraged and helped others. She freely offered her advice and assistance to any who requested it. Her demeanor was always calm, patient, tactful and professional.

Wanda started weaving in 1978 when her daughter Cheri was 12 years old. This was soon after she and her husband adopted two boys, and a friend suggested she needed to find a diversion. She soon took a class at the local high school and was hooked. Together Wanda and Cheri learned how to warp a loom using the upturned legs of chairs before they had a warping board. Wanda always made sure that she left some warp at the end of every project for Cheri to weave. Through the years they shared the love of weaving and supported each other in their endeavors.

The date when Wanda joined CW is not certain but likely not long after its inception. In 1994, she became editor of the *Complex Weavers Newsletter*, predecessor to the *Journal*, after Eleanor Best retired from the position. She started with issue Number 45 which at that time was a 5.5 inch by 8.5 inch publication with a brown cover. With issue Number 62, January 2000, the name was changed to the *Complex Weavers Journal* with a standard 8.5 by 11 inch page size. She continued as editor until 2005 when Judie Eatough took on the job. Even after turning over the reins to Judie Eatough, then Linda Davis, and later, Lynn Smetko, Wanda willingly continued helping 'backstage' as an advisor and mentor, sharing her expertise, ideas, experience and knowledge of the process. In addition, Wanda continued to manage the printing and distribution from their home town of Worland, Wyoming until the *Journal* started to be produced in color. And as if being editor was not a big enough job, Wanda began the arduous task of putting together *Compilation 2* of the *Newsletter/Journal* (May 1990 through September 1997) into a bound publication. Later she completed editing *Compilations 3* and *4*, both published in 2012.

Within a year of retiring from the *Journal* Wanda served as CW President (from 2006 to 2008). From her years of sitting in the Editor's seat and being a member of the Board, Wanda had gained a knowledge and understanding of the workings of CW as an organization, including the roles and responsibilities of all the board positions. This background enabled her to provide not only continuity over twenty active years, but

Above:
Trees



Right:
Symmetry

also to be an advisor and assistant to presidents, Seminars chairs, study group leaders and many others who served on the Board or committees or who developed various products for CW. Past President Laurie Autio remembers her as fun, constructively supportive, and always knowledgeable.

Squeezed in between her activities with CW, Wanda was a board member and Communications Chair of the Association of Northwest Weavers Guilds (ANWG) from 2003 to 2005. One of her responsibilities was to build a new website and, for the first time, that organization utilized the website for its biennial weaving conference.

Wanda the Wonder Weaver

Wanda put the same enthusiasm, energy and dedication into her weaving and was considered an outstanding weaver. She loved structure and took on challenges willingly, whether it was for something she wanted to produce or to help others. She preferred classic structures, materials and fibers, but Cheri said that in the last few years she was taking an increasing interest in non-traditional materials and had started to experiment a bit. She was almost always willing to try something different at least once. Over the years she received many awards and recognition for her weaving, including an HGA Award for a lace tablecloth and napkins.

Lace tablecloth, recipient of the HGA Award, woven by Wanda Shelp

As a member of Western Weavers Guild in central Wyoming, one of the smallest guilds within the ANWG region, Wanda challenged her sister weavers to greater heights and to try new things. The guild, whose members are required to be focused on structure, is well-known for producing one of the best guild booths at ANWG regional conferences. Betty Alexander nicknamed her "Wanda the Wonder Weaver." She was definitely the spark that ignited Western Weavers, according to Betty, and she questions if the guild can survive without her. "Wanda answered our questions, solved our problems and inspired us no end. No one could ever fill her shoes. What she did for Western Weavers, she did for every organization she belonged to. She took on jobs no one else would touch and handled them with aplomb and success."

Amy Buchan says her favorite memory of Wanda will be the smile on her face as she carried an armful of handwovens to the guild meeting. "Wanda was always so excited to show us what she had accomplished since the previous meeting and share the knowledge gained. We knew we were in for pages of wonderful samples to add to our notebooks and a detailed explanation of each draft."

Guild member Roxanne Zahller said, "One could find themselves a bit intimidated by Wanda's vast knowledge of weaving, her computer-like mind that could interpret the most complicated weave structure, the beautiful pieces she produced with ease, and her gorgeous home studio filled with many looms dressed with works in progress. She, however, was the least intimidating, most encouraging person one could hope to meet. She was always ready and more than willing to share what she knew, even when she was asked to 'repeat that in layman's terms!'"

In 1991 Wanda and fellow guild member Carolyn Wostenberg published *Eight Shafts, A Place to Begin*. Carolyn said that this endeavor came about in the late 1980's when both she and Wanda acquired eight-shaft looms and were looking for sources of information similar to that in Marguerite Davison's *A Handweaver's Pattern Book*. Finding almost none, they decided to publish their own book, and soon learned what a daunting task they had set for themselves.

"We soon found out that to make the photographs of the woven samples easy to see in the book, all samples would have to be woven using black and white yarns. After we each had woven samples in the weave structure we were working on at the time, we would get together, look over the samples and choose the ones that we liked the best. Wanda figured out a system of

Coverlet, woven by Wanda Shelp

The following is a Yahoo Group message from Wanda to the Bateman Study Group in January 2014, explaining her approach to designing tied-weave drafts and referring to pages in Monograph Thirty-Six Bateman Blends*. "He" refers to Dr. William Bateman.*

Each draft has five elements: threading, tie-up, treadling, color and yarn sizes. Each design starts by changing only one element. The sample on page 44 was chosen because the polychrome treadling indicated possibilities. This was entered into the computer to see exactly what he did.

The tie-up was the first element to be modified. To do this the number of treadles is extended to 32, not that all will be used but the possibility is there. In 'different tie-ups' the shafts are in groups. The first 8 treadles have two adjacent pattern shafts on each treadle. For this tie-up, 3 was treated as a pattern shaft. The next 12 treadles have a single pattern shaft in ascending order. The last 8 treadles have the pattern shafts in a 1/3/1/1/ order. That is shaft 3 tied, shafts 4,5,6 not tied, shaft 7 tied and shaft 8 not tied. This allows a treadling to be typed in and then moved from one set of treadles to the next. It can also create interesting designs in that you usually end up overlapping treadlings from one set to the next. The tie-down ends are not entered at this time.

The results were interesting with this particular design as 28 treadles were required there. This gave nice results with his treadling. However the last treadle tie-up was modified slightly to keep the one design element from being too blockish.

The next step was to add the tie downs to the treadles. All could have been done on 1 or all on 2 or alternated as a few of the choices. Different ones were tried before making a decision.

I next decided to play with the treadling. I returned to his original tie-up. Skip or advancing twills are a favorite. PCW has a feature that allows you to enter these easily by moving the cursor on the treadling bar. Several were tried including a couple from my treadling/tie-up list. The one chosen requires 24 treadles. After choosing the treadling, the tie-up was modified. You will notice that shaft three is never tied. The curves were more prominent without this shaft tied. One of the files with shaft 3 tied is attached. The added long lines inside the circles appear to be a distraction. To see the difference in the woven fabric would be interesting.

Since this is based on summer and winter, that treadling was the next choice. Looking this morning, I discovered an error in that treadling. An extra weft shot was added in one spot. The danger of copy and paste (which I love to use) is that an error is repeated. The corrected .wif file is attached. Here the starting point was the draft where the warp colors had been modified. None of my original tie-ups worked so played with that. The final design is ok but not exciting.

The only differences between 'different tie-ups' and 'pattern ends colored' are the colors in the warp and weft.

This is my basic procedure for tied weaves. I hope this makes sense. To hear how others approach design would be interesting. There have to be many ways to let the creative juices flow.

Wanda

labeling the samples so that we could be sure that the correct sample was pictured with its draft. Then we would decide on the next structure to work on, and off we would go," explained Carolyn. Together they wove over 2,000 samples, of which 850 were used as illustrations in the book. It was self-published, has had six printings and is still available for sale.

Wanda belonged to the Symmetry, Passementerie, Computer Aided Design and Early Weaving Books and Manuscripts CW study groups at various times, and she contributed her own study group articles for the *Newsletter* and *Journal*. In 2011 Wanda and Linda Davis started the Bateman Weaves Study Group, now in its fifth year. An example of Wanda's dedication is the sample sent for her study group exchange in October 2014. The study for 2014 was on *Monograph Thirty-Six: Bateman Blends*, and while Wanda had woven a lovely table runner during early 2014, she had not intended it to be her sample. However, when she was unable to weave her 'real' sample due to illness, she instructed Cheri to cut up the table runner, saying she had made a commitment and had to stick to it!

Bateman Study Group member Penny Peters said that if she had to use a word for her textiles it would be "elegant — always elegant." When she received the study group samples she always pulled Wanda's out and stared. Wanda also frequently helped study group members understand the sometimes confusing aspects of Bateman weaves, as exemplified by the explanation in the inset example, a message through the Yahoo study group.

In the past several years Wanda supported Cheri in her annual participation in two major annual rendezvous (historical re-enactments) held in the western United States. The two produced 'period' yardage, towels, coverlets, half blankets and other items for Cheri to take and sell at these events, and they gained quite a following of repeat customers. Wanda's husband was involved in wagon train re-enactments, and both Laurie Autio and Linda Davis remember humorous stories

Wanda told of having to rescue the wagon trains from various places where they had gotten stuck or ran into other problems. When she was not involved with some aspect of weaving, she enjoyed entertaining guests and helping out with various community events and activities.

While there may not be any hard data to correlate, most who have been with Complex Weavers for at least some time attribute the success of the organization to the growth and quality of the *Newsletter* and *Journal*, neither of which are matched in any other weaving-related publication. Wanda deserves considerable credit for the role she played in its success, as well as the tremendous service she gave to every aspect of CW with which she was involved.

Many thanks to several contributors for this article, in particular, appreciation goes to Cheri Shelp, Carolyn Wostenberg, Amy Buchan, Roxanne Zahller, Penny Peters and Laurie Autio.

Complex Weavers Seminars 2016

16 through 18 June 2016
Pheasant Run Resort—St. Charles, Illinois

Think you'd like to propose a Seminar?
There's still time!

Call for Teaching Proposals

Seminar teachers are invited to prepare proposals for the two-hour sessions that are the heart of Complex Weavers Seminars. Each teacher may offer one or two seminars. Teaching will be remunerated.

- **Deadline for submissions:** 15 July 2015
- **Full information** on teaching contracts and proposal requirements can be downloaded from the CW website — *www.complex-weavers.org*

If you have questions about the Seminars that aren't answered on the website, contact the Seminars committee: *CW2016Seminars@yahoo.com*

Call for Poster Session Proposals

Poster Sessions will be an exciting new feature at Complex Weavers Seminars 2016. They provide a way for members to share and discuss their current research. A presenter prepares a poster containing the information to be shared, and the poster will be on display during the conference. In addition, at a specific time and place, the member will present the poster in a formal ten-minute session. Poster sessions provide an agreeable 'mini-seminar' format for a meeting of minds. They are not remunerated.

Full information and proposal requirements are available on the CW website.

Mark your calendars.
Details will soon be revealed!

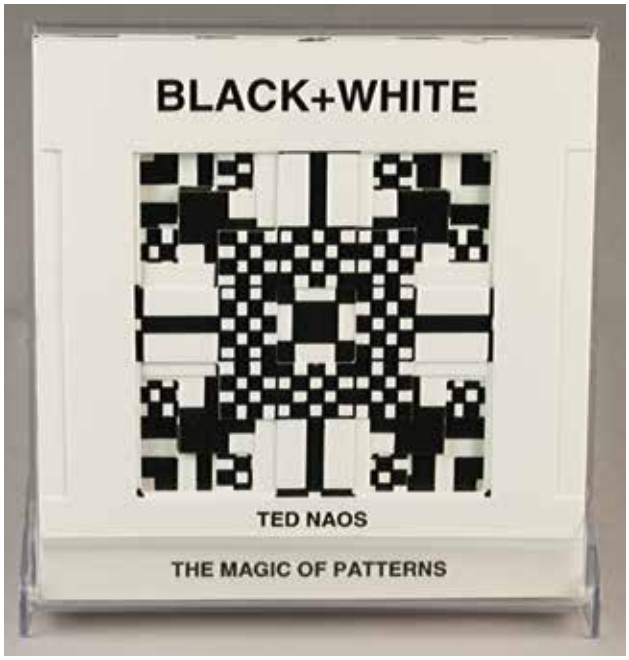
Tips & Tricks

This section spotlights tips and tricks shared *by* Complex Weavers, *for* Complex Weavers. Do you have a favorite tip or technique you'd like to share? Contact the *Journal* editor at *cwjournaleditorrm@gmail.com*

Black + White

A Profile Design Tool

Barbara J. Walker



The *Black + White* card set

Black + White: The Magic of Patterns is a set of 16 die-cut cards created by Ted Naos, Professor Emeritus, School of Architecture, Catholic University of America.

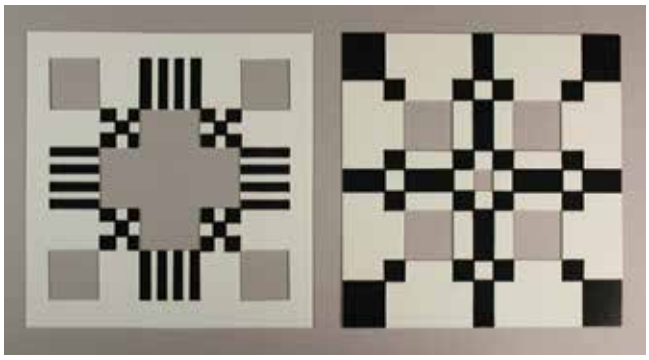
To quote information included with the set, "We are conditioned to organize visual elements in groups or patterns. The patterns in this monograph are an experiment in such a visual organization of how different designs integrate."

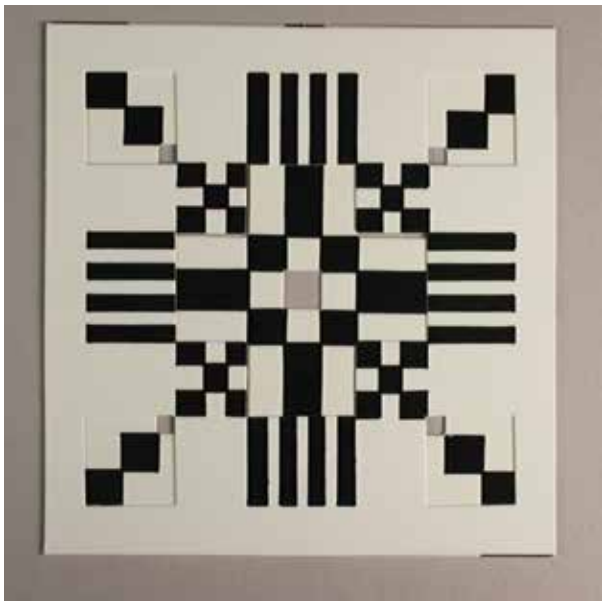
Perhaps Naos didn't realize *Black + White* also offers a unique approach to designing weaving profiles, if you want something out of the ordinary.

The shapes of the cards themselves evoke simple profile designs. Add in the images on each card, including both positive and negative spaces, and more opportunities emerge to help you start your design process. Stack cards in numerous ways to devise even more extremely complex profiles.

Black + White might be just the thing to help get those creative juices flowing.

For more information, visit *www.naosgraphics.com* (Go to 'Games', then choose 'Page 2').





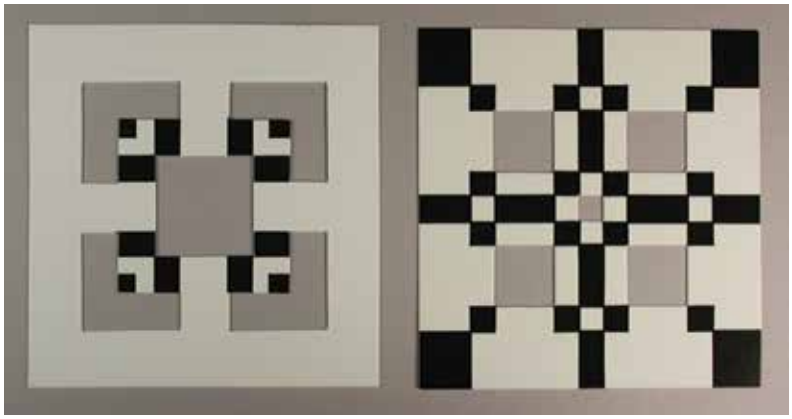
Using the *Black + White* card set. Choose a couple of interesting cards (*above*) and stack them to create beautiful, complex, unexpected profiles (*right*)

Using *Black + White* as a tool for working with blocks

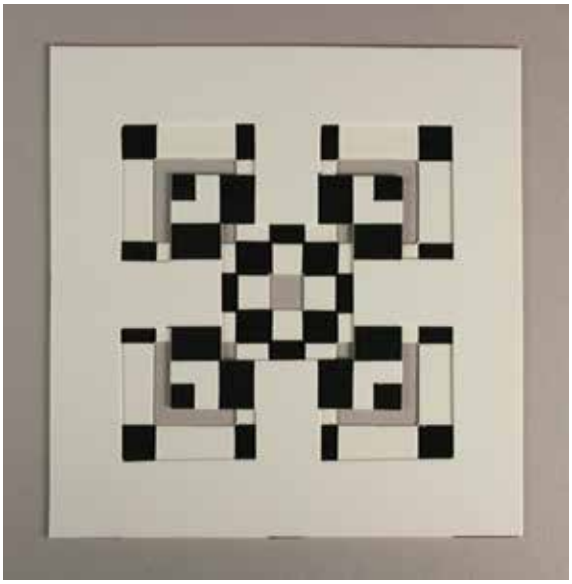
It's a design tool, a pattern maker, an inspiration for profile drafting and a tool for planning and playing with blocks.

It's also an excellent tool for waking up sleepy brain cells.

Just for fun, quiz yourself: How many blocks do you see in each of the images on this page?

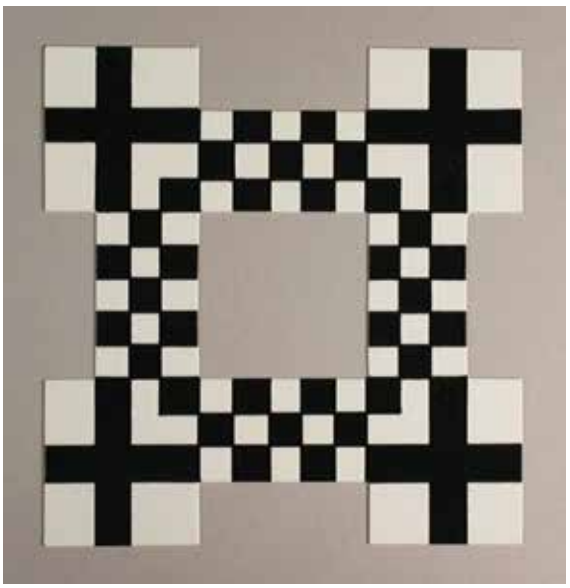


How many blocks? — Six and four, respectively

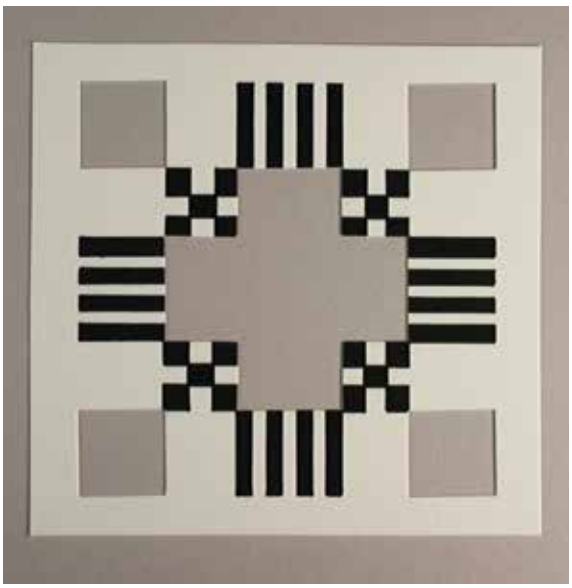


A combination of the two cards above, left on top of right. How many blocks? — Nine

A combination of the two cards above, right on top of left. How many blocks? — Seven



How many blocks? — Six



How many blocks? — Can you tell?

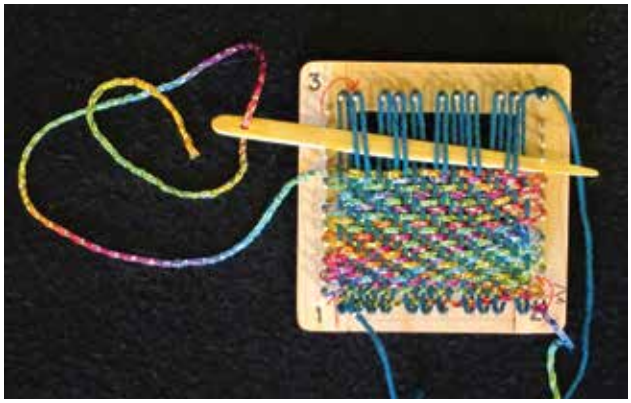
Pin Loom Takes Flight

Ruth MacGregor

Air travel isn't what it used to be. That said, inspectors have recently admitted that knitters are not as dangerous as originally thought, so restrictions have eased, and with a little planning we can again have something to do with our hands on long flights.

Knitting, however, is not the activity my hands naturally seek. Like many of us, I've long wished for a way to weave while confined in an airplane seat. That yearning has returned me to an old friend: the pin loom.

Be it an old Weave-It, a Weavette, a new Zoom Loom, or any of the other identities it's worn through the years, the pin loom (used according to standard instructions) gives you a quick way to weave squares of knitting-weight yarn with minimal fuss.



Small Weavette loom with a home-made bamboo needle

It's when you ignore the instructions, however, that the weaving truly blossoms: you can play with structures and use yarns beyond those in a knitter's stash.

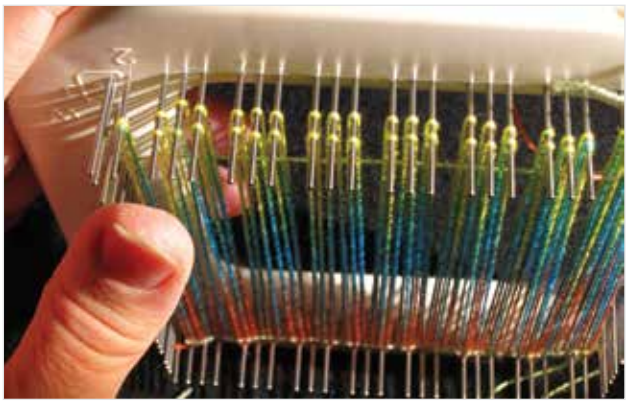
To weave on your travels, you'll need: a pin loom, yarns, a weaving needle, and a way to cut yarn (yarn-cutter pendants work well and seem to sail blithely through safety checks). If you want to work with finer yarns, you may also need a small crochet hook for twined headings. To beat the weft, you can use the point of the weaving needle — or even better, the tines of a small plastic fork.

Ignoring the Pin Loom's Instruction Sheet

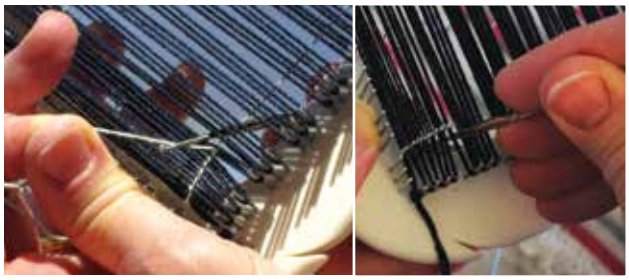
If, instead of following the layered approach of most instructions, you warp the pin loom as though it were a potholder loom — passing the warp from bottom to top to bottom to top, pivoting at each pin — you'll discover a warp density nicely suited to yarns such as 3/2 or 5/2 cotton. The spacing of the warps may look odd (see the photo above), but that effect will disappear when the woven square comes off the loom.

To use even finer yarns, wind two layers of warp, then twine headers top and bottom to organize and space the warps. For each header, use a strand of yarn at least three times the width of the loom. Warp and twine as follows:

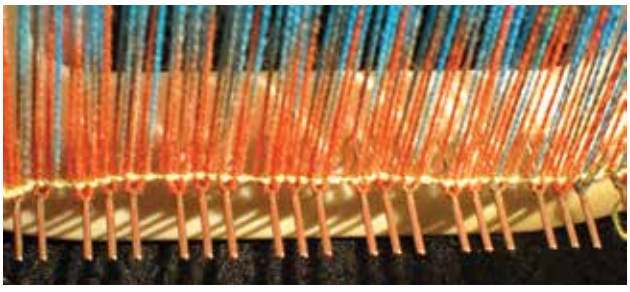
- Wind the warp, pin-to-pin, all the way across (once).
- Lay the two twining strands across the warp and gently anchor them in place (I tie them loosely to themselves at the back).
- Wind a second layer of warp, pin-to-pin, back to the start, trapping the twining threads between layers.
- To finish each header, anchor one end of its yarn to a pin, then twine the long end in a spiral that catches both the twining yarn and a warp end.



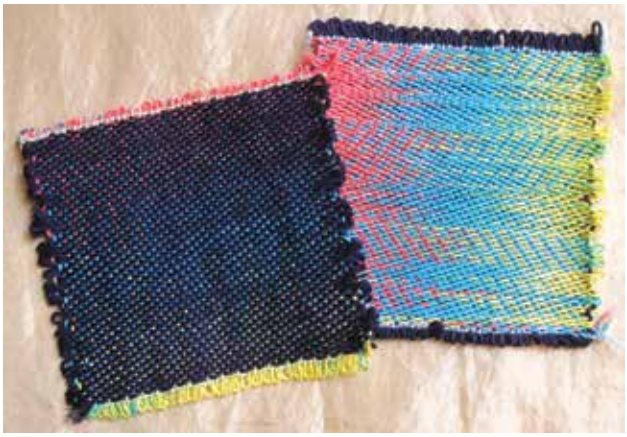
Header strand in position between warp layers, ready to start twining (shown on a Zoom Loom)



Twining in action: a crochet hook reaches up from below to pull the twining strand down, and down from the top to pull the twining strand up



Twining completed



Two needle-woven satin samples in 10/2 cotton, one with a painted warp, the other, a painted weft (actual size of samples: four inches)

When you set up your warp with twined headers and footers, a warp yarn the weight of 10/2 cotton becomes your playground. And now we're talking!

For meditative weaving, you can needleweave tabby, twill, satin, or a combination of the three. Hand-manipulated laces are also lovely (though the warp gets tight for the final picks). These basic structures require just the barest of concentration and are not only great for stream-of-consciousness weaving, but also remarkably satisfying.

If you feel adventurous, you can use a draft to needleweave even more structures, following the draw-down pick by pick. Advancing twills are stunning. Inlay is a joy. Even tied weaves are possible, if your tie-downs are in the weft.

A selection of two-inch samples woven without headers

A four-inch sample with twined headers, combining twill and satin structures

Weaving Needles and Airport Security

My travels have shown that regardless of the formal security regulations, 'permitted items' are very much subject to the individual inspectors and what kind of day they are having. Generally speaking, with the current rules a weaving needle that's four inches long *should* be acceptable in your carry-on bag — but if an inspector is feeling particularly zealous, it could be confiscated (a needle being, after all, a metallic pointy object).

Confiscation is the worst of it, though (no one will arrest you!); but because there's a chance of suddenly becoming needle-less, it's good to have a back-up plan. Mine is a wooden weaving needle made from a bamboo chopstick (apply a power sander to a chopstick, and you can make any thickness of needle you desire).

Weave On

So why would a Complex Weaver bother with a lowly pin loom? Because it's actually kind of fun. Because it lets you 'feel' every weft pick (which is a nice way to understand a new-to-you structure). And because after a while you'll start humming the music of Peter Paul & Mary: *Yes I'm weaving on a jet plane....*

A Comparison of Jacquard Looms

Tien Chiu

In July 2014, I was fortunate enough to spend ten days studying, and weaving on, the two major brands of Jacquard loom available to today's handweaver: the AVL Jacq3G and Digital Weaving Norway's TC-2 (Thread Controller-2) looms. While I've done my best to verify all technical information with the manufacturers, I can't guarantee its accuracy; but even if some loom features have changed since I gathered the information, this should provide a good background for weavers who are interested in making a Jacquard loom purchase.

Look and Feel

Both the TC-2 and the AVL Jacq3G have a decidedly high-tech feel. The Jacq3G has a wooden frame, but the modules are exposed to view, so the loom looks like this:

Figure 1. The AVL Jacq3G belonging to Sandra Rude, front

Figure 2. Sandra Rude's AVL Jacq3G, side view

The TC-2, on the other hand, is entirely gleaming metal, painted in white and green (the green has been described as "1950's retro"). All moving or electric parts are covered with enameled metal casings. While you can easily remove the panels if you need to tinker with the loom, by and large the 'guts' are not exposed to the degree they are on the AVL Jacq3G.

Figure 3. The TC-2 on display at Convergence 2014

Accessories

At the time of this writing, the AVL Jacq3G comes with many more optional weaving accessories than the TC-2 Jacquard loom. On the Jacq3G, you can have fly shuttles, sectional beams, an overhead beater, rolling temples, selvedge rollers, and the famous AVL sandpaper beam. Of these, none is available for the TC-2.

Sett

The Jacq3G and the TC-2 approach sett differently.

The Jacq3G uses modules mounted parallel to each other. The Dial-A-Sett system (unique to AVL) enables you to tilt the modules relative to the front of the loom, expanding or reducing the spacing between hooks (and hence the available setts). Setts available run from 8 to 80 epi.

The TC-2, on the other hand, uses modules set into the frame, each of a fixed width (14.5 inches), with 15 hooks per inch. The modules can be arranged in any configuration you like; for example, if you had 12 modules, you could arrange the modules four wide by three deep, for a 56-inch weaving width at 45 epi. Or you could arrange the modules one wide by twelve deep,

for a 14.5-inch weaving width at 180 epi. Or you could leave six modules out of the loom and weave three wide and two deep, 29 inches at 30 epi.

To reduce the sett from the TC-2's maximum for a given configuration, one can either thread only the desired number of hooks per inch, or (if the loom is already threaded) use the automatic 'thinning' function to leave some threads down continuously while weaving. This wastes a small amount of warp, but saves a great deal of time by avoiding rethreading and resleying.

The advantage of the Jacq3G's unique Dial-A-Sett function is that you can use all the hooks at any sett between 8 and 80 epi. On the TC-2, if you are weaving at a sett other than the maximum sett for a particular configuration, some hooks will go unused, requiring you to purchase more hooks than you will actually use. As an extreme example, if you are weaving a warp 15 inches wide at 18 epi on the TC-2, you will need a configuration two modules wide and two deep — a total of 880 hooks — in order to weave 270 threads. With the Jacq3G in that same situation, you would need only 270 hooks, and could simply adjust the sett up or down using the Dial-A-Sett.

The downside to the Dial-A-Sett mechanism is that far fewer hooks can be placed within a given weaving width. The 48-inch A-series frame, for example, allows a maximum of 12 modules — 1,440 hooks. This reduces the weaving width substantially on a fine-thread warp.

The maximum sett recommended for the Dial-A-Sett is 80 ends per inch, and the minimum is 8 epi. On the TC-2, there is no minimum sett and the maximum is 180 epi. AVL has indicated that higher setts would be feasible on the Jacq3G with a custom loom.

Setup

Both looms can be beamed normally for the type of warp beam. (The Jacq3G offers a choice of sectional or plain beams; the TC-2 currently offers only a flanged plain beam.)

A new warp can either be threaded normally or tied onto an old warp. On the Jacq3G, threading is quite laborious, but since the loom does not need to be reconfigured to change setts, threading really only needs to be done once — after that, one can simply tie on to the previous warp and pull through.

On the TC-2, threading is reputedly easier (I didn't get a chance to test it), but must be done every time the module configuration is changed. Of course, if you are not changing the configuration of the modules, you can simply tie on and pull through.

The TC-2 has a motorized warp beam advance, allowing you to wind on using a foot pedal to start and stop the motor. This can be quite handy, as it frees you from the warp beam crank and allows you to view the warp beam directly while warping.

Adjustments

In general, the Jacq3G requires more manual adjustments than the TC-2. While both looms can be equipped with an auto-advance system, the Jacq3G's auto-advance is a mechanical device that advances the cloth a tiny fraction of an inch every time the beater is brought forward. The amount of the auto-advance must match the desired number of picks per inch, so some fiddling in the first few inches of the warp is usually needed to get the auto-advance adjusted properly.

With the TC-2, the auto-advance system operates using a sensor that sits near the fell of the cloth and detects the beater as it reaches the fell. As the cloth builds up on the loom, the fell advances, and eventually the beater fails to pass the sensor. At this point, the sensor activates the auto-advance and the warp is advanced a little bit (the exact amount of the advance can be set using the computer).

Similarly, the warp tension is set using a mechanical weight on the Jacq3G, and is computer-controlled (using a sensor on the warp beam) on the TC-2.

Weaving Speed

Both the AVL Jacq3G and the TC-2 are easy to weave on, with a foot switch to change the sheds. I timed the TC-2 at about 960 picks per hour on a 14.5-inch warp with a single shuttle; that is probably close to the maximum speed for that loom. I did not time the Jacq3G, but I remember the speeds as roughly comparable.

Noise Level

Computer-driven looms in general are not terribly quiet, but both the TC-2 and the Jacq3G had acceptable noise levels. It was easy to talk while weaving on both looms.

Reliability

While the TC-2 is still too new to have much of a track record (at least among weavers I know), its predecessor, the TC-1, has a better reputation than the Jacq3G in the handweaving community. When I inquired on the WeaveTech discussion list, I got enthusiastic reviews from three happy TC-1 owners and recommendations from several others who knew happy TC-1 owners. I heard from one happy Jacq3G customer, but was told of at least two Jacq3G owners who had needed serious work to get their looms working or who were unable to get their looms working. While anecdotes are not the same as data, the anecdotes are suggestive.

Technical Support

Up until recently, AVL had the home-court advantage for buyers in the U.S., as AVL is based in California and Digital Weaving Norway is based in, well, Norway. However, Digital Weaving Norway has now founded an offshoot, Digital Weaving USA, and Cathryn Amidei

(located in Michigan) will be providing technical support for the TC-2 in the USA. Another offshoot, Digital Weaving UK, will offer support by Dawn Willey for TC-2 owners in the UK, and a third offshoot in Finland provides support from Katja Huhmarkangas.

Useful Links

Digital Weaving Norway TC-2
http://www.digitalweaving.no/en/thread-controller-tc-2

AVL Jacq3G
http://www.avlusa.com/catalog/looms/jacquard-loom/

Quick Comparison

The AVL Jacq3G at a Glance

- 120 heddles per module
- Setts of up to 80 epi (higher setts are feasible, but requires custom construction)
- Sett continuously adjustable using Dial-A-Sett mechanism to tilt the modules, bringing the hooks closer together
- 1, 2, or 3 warp beams; beams may be plain, ½-yard sectional, or 1-yard sectional. Beam revolution counter available for those who like to warp sectionally
- Warp tension controlled via live-weight tension equivalent; manually moving a weight up or down the lever sets the warp tension
- AVL auto-advance (available as an option) advances a small amount every time the beater comes forward; the exact amount is set manually. Generally some fiddling in the first few inches is required to get the auto-advance set correctly.
- Thread lifting mechanism: choice of electric or air-assisted
- Connection to computer: Ethernet, USB, serial
- Fly shuttle: 1-,2-, or 4-box fly shuttle
- Electrical requirements (max):
  - Per module: 3 amps at 110V, 1.5 amps at 220V
  - E-lift: 8 amps at 110V, or 4 amps at 220V
- A-lift pneumatic input: 5 CFM at 100 PSI
- Choice of bottom swing or overhead swing beater
- Can be used with AVL rotary temples and selvage rollers, as well as regular temples
- Uses standard 5" rounded-top weaving reeds

Dimensions and hooks for A-series frames:

Weaving Width	*Maximum # of modules recommended*	*Height*	*Width*	*Depth (front to back)*
30 inches	7 — *840 hooks*	90 inches	45 inches	84 inches
40 inches	10 — *1200 hooks*	90 inches	62 inches	84 inches
48 inches	12 — *1440 hooks*	90 inches	62 inches	84 inches
60 inches	15 — *1800 hooks*	90 inches	74 inches	84 inches
72 inches	18 — *2160 hooks*	90 inches	86 inches	84 inches

(The Professional Jacquard Rug Looms allow slightly more hooks for a given width, and allow up to 4800 hooks for the 15-foot weaving width frame.)

The TC-2 at a Glance

- 220 heddles per module
- Setts of up to 180 epi in units of 15 epi
- One or two flanged warp beams (sectional beam under development, but not available at the moment)
- Computer-controlled warp tension
- Sensor-controlled auto-advance with increments set by computer
- Vacuum pump as thread-lifting mechanism
- Wireless or ethernet connection to computer
- Electrical input for loom frame: 110-240V, 16A, single phase
- Electrical input for vacuum pump: 208-240 VAC 16A, single phase or 3-phase
- If the loom has more than 16 modules, either add a second pump, *i.e.,* 2 x 16A, *or*
- Or, use a bigger pump on 400 VAC 3-phase pump
- No fly shuttle available
- Sliding beater
- Can use regular temple; rolling temples not available
- Requires a reed with square top and bottom (available from Digital Weaving Norway)

TC-2 loom dimensions:

Weaving Width	*Maximum # of modules recommended*	*Height*	*Width*	*Depth (front to back)*
28 inches (2 modules wide)	24 modules (*5280 hooks)*	61 inches	48 inches	58.5 inches *(1 warp beam)* 67.5 inches *(2 warp beams)*
43 inches (3 modules wide	36 modules (*7920 hooks)*	61 inches	63 inches	58.5 inches *(1 warp beam)* 67.5 inches *(2 warp beams)*
56 inches (4 modules wide)	48 modules (*10,560 hooks)*	61 inches	78 inches	58.5 inches *(1 warp beam)* 67.5 inches *(2 warp beams)*

Editor's note *Information on pricing was omitted from this article on purpose. Although Jacquard looms are now more affordable than in the past, they are largely customized for each weaver and still involve a considerable investment. The exact amount of that investment varies significantly, to wit:*

- *The cost of the AVL Jacq3G depends greatly on the options and add-ons ordered with the loom.*
- *The price of the TC-2 fluctuates with changes in the very volatile international currency exchange.*

Consult the manufacturers for current pricing.

"I'm Just Curious. I'd Like to See How it Works. I'm Not Going to Buy a Jacquard."

Sandra Hutton

Those words were usually followed by, "Besides, I should go to Providence to see how *Complexity* looks at the Cohen."[1]

With those thoughts, I registered for Convergence 2014 and signed up for a four-day workshop on the Jacquard loom being taught at the Rhode Island School of Design. I soon got a call announcing that the workshop was full, and would I like to take something else? (No, I wouldn't.) Then, another call: "If Vibeke Vestby had a workshop on the TC-2, would you take it?" (Yes, I would.) There must have been a lot of us because the new workshop attracted 15 accomplished weavers.

The TC-2 is a second-generation Jacquard loom from Digital Weaving Norway. Its predecessor, the TC-1, arrived on the US scene in the 1990s. It was fairly slow to weave, had a lot of cables and cords coming out of the top, and was beyond the financial reach of most of us. The TC-2 weaves faster, is more streamlined in appearance, and is significantly less expensive than the original.

The TC-2 has a flat top with see-through cover so people can watch the action (*Figure 1*). This loom is known as a "hand" Jacquard and is excellent for a weaver who wants to explore weave structures, do limited-run art pieces or garments, or weave samples for industry.

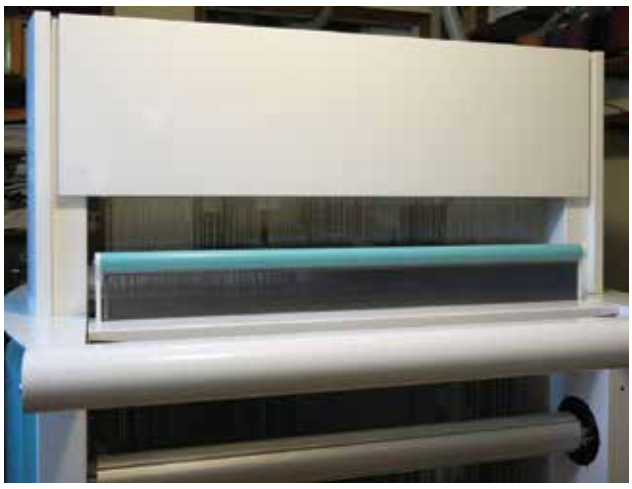


Figure 1. The TC-2

Manufactured by Tronrud Engineering in Norway, the Thread Controller (TC) controls each warp thread individually. It is different from a shaft loom, which operates by raising all heddles on a particular shaft whenever that shaft is raised. It is also different from traditional Jacquard looms because it is controlled digitally, rather than by punched cards or heavy fan-fold paper.

Older industrial Jacquard looms have a complicated mechanism sitting on top of the loom castle which requires a high ceiling. To make changes in a design on one of those older Jacquard looms, new cards or paper have to be punched. On the TC-1 and TC-2, changes in textile design are accomplished with a home computer.

The workshop at Convergence was co-led by Vibeke Vestby of Digital Weaving Norway and Cathryn Amidei of Eastern Michigan University. Vibeke had developed the loom, and Cathryn had just finished a one-year sabbatical in Norway extending her knowledge about weaving on a Jacquard loom.

To work with a modern Jacquard loom, a weaver must create designs on a computer, saving the design as a bitmap, TIFF, or JPEG. The design is then opened in a loom-controlling software package which actually makes the individual heddles rise to create the woven design. Someone along the way discovered that Photoshop could be used to create the initial designs. Either the full-blown Photoshop or Photoshop Elements can be used. In addition to these, I learned of two dedicated programs for Jacquard design: ArahWeave from Slovenia and JacqCad manufactured in the U.S. These two were developed for use with industrial looms, but have been modified to also run on the TC-1 and TC-2.

Many of the workshop participants had used Photoshop either at work or in an educational setting. I had only limited experience with Photoshop and could see that this was going to be a steep learning curve for me. Weaving on the TC-2 was not a great deal different from weaving on my 32-shaft Megado; but getting to the point where I could tell the loom to create my design was clearly going to be a lot different from using our familiar shaft-loom computer programs.

I guess I told my husband after the first day that the loom was beautifully engineered, but designing for it was sure making me dig into the deeper reaches. When I talked to him the next day, he had been on the Tronrud website and was impressed by both the loom and the engineering company. He urged me to get a TC-2, saying it would exercise my brain. For his part, he's an

1 Sandy Hutton was the Chair and organizer of *Complexity 2014*, which was exhibited in its final venue in Providence, Rhode Island, on dates specifically chosen to coincide with Convergence.

electrical engineer and has been a lifelong kit builder. In retrospect, I think he might have just wanted to put something that complicated together again.

I didn't really want one, but the seed had been planted. While at Convergence, I talked to other weavers. Agnes Hauptli said getting one was the best decision she'd ever made. I talked with Laurie Autio and asked, "What if I have only about 10 more years to weave?" Laurie thought a moment and then said, "If you bought a car for the same amount of money and it was worn out after 10 years, you wouldn't think anything about it."

At the end of the workshop I was really intrigued by what was happening in Photoshop. I liked what I observed about the loom and the people who had developed, manufactured, and represented it. I ordered one, but postponed delivery until the end of November. I had a heavy fall travel schedule and needed to catch up with weaving commitments delayed by my chairing *Complexity*.

Mental preparations

Two years prior, I had worked through Marg Coe's digital design books and done the exercises she prescribed. Now I worked through Alice Schlein's *The Liftplan Connection* and started on *The Woven Pixel* by Alice Schlein and Bhakti Ziek. I had been an early purchaser of Julie Holyoke's *Digital Jacquard Design* and had taken two one-day courses from her at Textile Society meetings. As the year progressed, I had a conference to attend in Charlotte, North Carolina, and discovered that Alice lived about 100 miles from there so arranged for her to tutor me for a day. This past January I attended a workshop led by Bhakti Ziek arranged by Penny Peters. The understanding of how to use the variety of complicated techniques of Photoshop to create designs for Jacquard weaving began to gel.

Logistics

The editor of *CWJ* asked if I would be willing to write an article about what it took to get the loom here and settled and incidental tasks and costs associated with getting it running.

The biggest issue, after arranging finances, was finding the best space to put the new loom and its vacuum pump.

The first step in addressing this was to sell my Glimakra with drawloom attachment. After finding a buyer, it took a full week to photograph, disassemble, write re-assembly notes, pack it for shipping, and arrange for a shipper to the East Coast.

I soon received an email from Vibeke that the TC-2 was on its way for a near-Christmas delivery. Thus began an interesting series of unexpected, additional, relatively small, essential costs.

The loom was shipped via DHL, who had bundled a lot of items headed to the U.S. and unloaded the bundle in Tacoma. I received notice that the loom could not be released from Tacoma until an "unbundling" fee was paid ($$). In addition, I would need to hire a customs broker ($$$) to get it through U.S. Customs in Denver. Happily, because the U.S. does not manufacture metal home weaving looms and it was for my personal use, there was no duty (U.S.) or 'use' tax (Colorado).

After Christmas, I finally learned where the loom was: on a loading dock in Denver. DHL was supposed to deliver it to my home, but it took about three days to discover which freight company handled shipments from Denver to Colorado Springs. As it turns out, that company is only about 12 miles from my house; but they couldn't seem to read my telephone number on the paperwork. It took some pretty stern words to get it delivered to my house quickly. Some of you might not know this, but freight companies want to deliver to a loading dock and won't take things inside an office or home. You can imagine where this led: we have a fairly short driveway, so two large crates took up residence where my car belonged. We moved everything possible into our house, but the two side pieces weighed approximately 250 pounds each. We enlisted a friend to help stand the two sides upright at the end of the garage so Abe (our Lincoln) could again be parked inside, protected from the January weather.

Finding the right spot

I had thought that the space previously occupied by the Glimakra might make a good spot for the TC-2. However, the TC-2 is powered by a vacuum pump which makes more noise than I really wanted to be in the same room with. The adjoining bathroom was too small to house a vacuum pump in addition to remaining a full bath, so the only alternative would be to drill a hole through an outside wall of my house and build a dog house or similar structure to contain the pump.

Alternatively, I thought I could put the loom in the sun room constructed when we extended our kitchen. Then, the pump could be in the crawl space under the addition. The problem with that was that I really didn't want people coming through my front door being greeted by the imposing presence of a metal machine. Also, the wall facing the street in that room is all glass. I like to weave before daybreak and don't want a crowd peering in. And finally, all the yarn and weaving tools were downstairs and would remain there. The sun room wasn't a good option.

I even considered turning our living room over to the loom. Or the room where we listen to music and watch TV. Both of those spaces would require piercing a hole through an outside wall for the vacuum hose. I'm a very proficient drywall finisher, but outside walls are a different matter.

The only solution seemed to be the office in our

walkout basement that I had used for over 20 years of employment. I realized I could make a hole in the ceiling of one of the closets without doing too much damage. The hose could then go through the rafters to the crawl space under the extended kitchen. (See *Figure 2.*)

We hired the company that had installed our furnace and air conditioner to cut the necessary holes to route the hose and place the pump on a pedestal ($$$). This charge included a noise insulating pad typically used under air conditioners. For electrical power, the loom itself can run on either a 110V line or a 220V line, but the pump requires a 220V line. To run the 220V line from the electrical box at one end of the house to the other took two men most of a day ($$$$).

Figure 2. The TC-2 vacuum hose. Note the cones of yarn that quickly moved in to fill available space

I had to get rid of about one-half of the contents in my office. Tossing still isn't finished in terms of books, but I really sorted and threw away a lot of paper — something I should have done eons ago. It was real work and involved major movements in most of the rooms in our house.

For non-weaving reasons, we bought a new bed for our guest room about this time, and the two delivery men were willing to haul the two loom sides downstairs to the lower level ($$). The loom sides are the same size, regardless of width of loom you've ordered.

There have been times when I almost wished I had bought the narrower two-module wide version for space considerations. However, I'm about to thread a 40" wide warp on my Megado to accommodate the back piece of a garment I'm going to make; so I think maybe the middle width was the best choice for me.

Physical set-up

Shortly after the loom sides were moved down to the office, I spent most of a day in Denver. When I returned about 4 pm, the loom had been completely put together, and it was running the next day. My husband had had two questions for Tronrud technicians, and both were answered in clear English via email within eight hours. The pump is German, made by a company with U.S. representatives. He had had a question about its vacuum capability at 7,300 ft. altitude — no problem.

In addition to the written manual, there is a series of videos providing clear illustrations of how to assemble the loom. The manual claims the loom can be connected directly to the Internet via our local wifi hub, but that feature isn't ready yet. The two principal ways to connect the control computer to the loom are:

1 A LAN cable (computer to loom), or
2 A LAN cable (wifi hub to loom) plus wifi connection (wifi to computer).

The heddles are mounted in modules holding 220 heddles each. Modules can be moved around for wider or narrower fabrics or varying yarn sizes. When activating modules, one has to activate the one with the highest number first. *I.e.*, if you have 12 modules, the twelfth one has to be activated first, then the eleventh, etc. In this case, the twelfth module must be placed in the column on the left and the furthest toward the back of the loom.

The reed that comes with the loom measures out to 30 dents per inch. My denting hooks were too thick. The webmaster in our local guild works in copper as well as fiber, so she made me a really neat skinny reed hook.

The Gowdey Reed company in Rhode Island can make reeds to fit the TC-2. Reeds for the TC looms have square tops and bottoms rather than the rounded, padded top and bottom on reeds used with most looms found in the U.S. Also, reeds for the TC-2 must be exactly the correct height because the top of the beater fits in only one position and can't be raised or lowered to accommodate reeds of different heights. Reeds produced by Gowdey cost about the same as those made in Europe, but transportation costs for U.S. customers are naturally lower than sending one across the Atlantic.

I'm about to warp the loom. I had trouble figuring out how to vary sett with heddles that don't move from side to side. Vibeke provided a simple way to find the correct heddle to start with by using the 'warp thinning' function on the loom control program and using the 'canvas size' function in Photoshop. When beginning to

thread, make sure the 'cast out' function is active. That way only the heddles to be threaded will rise and the appropriate heddles will be centered across the width of the loom.

Some weavers thread all the heddles on all the modules and 'cast out' threads to achieve a different sett. In that way the 'cast out' heddles aren't raised when weaving, so yarns threaded on them don't become part of the web, but instead float beneath the underside of the fabric. Once the fabric is off the loom, they can be cut away. I may be a little too frugal to do that very often.

Some weavers never change the warp or sett, but tie on new warp yarns when needed. Maybe I'll feel the same way after threading the loom; but I probably like variety in yarn and cloth function too much.

I think I will put on 10 to 12 yards of 20/2 mercerized cotton warp and work through the exercises in *The Woven Pixel*. At present, the exchange rate between the U.S. dollar and the Euro is about 1:1 so I ordered a copy of ArahWeave. I'll see how ArahWeave accomplishes the structures I'm trying out with *The Woven Pixel*. I think having both programs (ArahWeave and Photoshop) will be useful.

It's all pretty challenging and it *has* exercised my brain! I might sell a few handwoven items now and then at sales sponsored by Colorado guilds, but generally, I weave to learn, have new experiences, and work out how woven textiles have been made. I've noticed that most Jacquard loom owners name their looms, but I haven't come up with something that grabs me yet.

Resources

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Online

There are two helpful user sharing sites for Jacquard weavers. One is the CW Jacquard Study Group Newsletter posted on the Yahoo site. The second is a Jacquard user site on Facebook. Both sites are closed groups, so interested persons must be admitted by the moderator. Gaining admission to either group is not difficult and files are easy to access and have been useful to me.

Digital Weaving Norway: *www.digitalweaving.no/en/news*

Fabric Patterns Found in Minoan Frescoes from Crete

Nancy Arthur Hoskins

This is the second in a series of articles tracing the influence, evolution and spread of Minoan fabric patterns in the ancient Mediterranean. These patterns reveal trade and cultural movements in a world we know almost exclusively from myth. The first article in the series appeared in Complex Weavers Journal *Number 107, February 2015. It explored patterns from the island of Thera in the Aegean sea.*

Figure 1. The Palace of Knossos on the Mediterranean island of Crete

On a sunny September day in 2013 I wandered around the ruins of the ancient Palace of Knossos on the island of Crete. This was the legendary home of King Minos and the setting for the tales of the mythical Minotaur and labyrinth. The Bronze Age Minoans of Crete were a sea-faring people who spread "objects, technologies, and ideas far beyond their island." [1]

Archaeological excavations to unearth the history of the palace and the Minoan civilization began in 1900 with the work of Sir Arthur Evans.[2] The palace had been built, destroyed, re-built and changed over many centuries. The final destruction of the palace complex — though its date is still debated by scholars — probably happened in the 14th century BC during the Late Aegean Bronze Age (1650–1050 BC).[3] While the frescoes of Akrotiri on the island of Thera were buried under twenty feet of volcanic ash and somewhat preserved (see *CWJ* February 2015), the painted walls of the Palace of Knossos were shattered and the frescoes were — for the most part — found as fallen fragments.[4] Like pieces of a puzzle, the fragments were matched with whatever was left of the painting on the wall and patiently restored. The palace walls have some painted replicas of the Knossos frescoes, the originals of which are now preserved and protected in museums.

If Knossos is indeed "the birthplace of Aegean wall-painting,"[5] might it also have been the place where weavers discovered techniques that could create fabulous patterned textiles? Knossos was the location of an extensive textile industry that was closely monitored by the rulers. Records of sheepherders, spinners, weavers, and luxury textiles were recorded in the Minoan script called Linear B.[6] One part of the palace is even called "the loom-weight room."[7] Based on the type of loom weights found, Knossos "appears to have been specializing in … weft-faced fabrics."[8] Every museum I visited on my Aegean tour had a display of loom weights, and some displayed carefully crafted clay spools. Evidence for weaving with warp-weighted looms was found from Crete to the Cyclades and Mycenae, but — as mentioned in the earlier article on Akrotiri — a vertical or horizontal frame loom would leave no evidence and may also have been used.

Patterned fabrics on bodices with deep V-necks and border trimmings, a man's kilt, and a flounced skirt appear in three partial frescoes from Crete that were restored, recorded in paintings, and — in a few cases — re-imagined. These depict elegant fabrics created by highly skilled Bronze Age weavers. In my project, the recreations of the patterns were woven with a linen warp (40/2 doubled) sett at 8 epi and weft picks of two-ply wool. The samples in this set were woven as weft-faced, seven-shaft, point twill patterns, as were the Akrotiri samples (*CWJ* 107). Aegean scholars, who have written about these textiles, typically refer to the later New Kingdom Egyptian textiles as a source of actual examples of textile techniques from the Late Bronze Age. Handsome Tutankahmun tunic bands were woven as ten-, seven-, and five-shed, weft-faced point twills, so the skills required for those structures were known in the Late Bronze Age.[9] This type of fabric is thick, has an excessive amount of yarn floating on the reverse and — with multiple sheds or shafts — develops ridges between the pattern units.

The Ladies in Blue

Figure 2. *The Ladies in Blue*
(Tracing after Logiadou-Platonos, p. 60)

The Ladies in Blue from the Palace of Knossos fresco have reconstructed portraits with a fanciful interpretation of their dark hair entwined with beads (*Figure 2*). One long, curling lock escapes from the headbands worn by each. All wear earrings, necklaces, and bracelets. The fragmentary costumes of V-necks, shoulder and cuff-bands, were painted in a vivid complementary color scheme. The elaborate scallop pattern of blue-dotted blossoms outlined in a red-orange diamond grid on an orange field is used for the sleeve fabric. Luxury fabrics from Crete — perhaps like these — were exported to Egypt and Syria.[11] The blue, scroll-patterned bands have dark blue borders. Curvilinear motifs are much easier to paint than to weave, since woven motifs are essentially rectilinear. Peeking beneath the sleeves are wavy, dark squiggles of hair.

Figure 3. The first and last pattern in this sample is a version of the running scroll design on the shoulder, cuff and V-neck bands of *The Ladies in Blue*. The blossom motif in a diamond or scallop grid is woven in bright hues of red-orange and blue.
Sample dimensions: 9" x 4.25" — 19 cm x 10.8 cm
(Woven by Author. Photo by Alexis Garrett)

The Cup-Bearer

Figure 4. *The Cup-Bearer*
(Tracing after Marinatos 1960, p. 41 PL XV)

A fragmented figure from the Procession Fresco at the Palace of Knossos, known as *The Cup-Bearer*, is close to life-size (*Figure 4*). He has the characteristic darker complexion of a male: a convention common in both Egyptian and Minoan wall-painting. He wears a wrapped-kilt with an intricate interlocking, cruciform pattern. Arm-bands and bracelets complete his costume. A photograph of the figure from the fresco and a painting by Emile Gilliérion from the Ashmolean Museum were studied to develop the pattern draft.[13]

I could only *simulate* the half-drop, interlocking, cruciform pattern of the kilt on the warp threaded for

weft-faced patterning. The original pattern of staggered crosses, which may have been tapestry-woven or possibly embroidered, will be sampled later.

Both of those techniques were familiar to New Kingdom Egyptian artisans. There were tabby-tapestry textiles from the tomb of the Egyptian Pharoah Thutmose IV (1401–1391 BC). From the tomb of Tutankhamun (1333–1323 BC) there are tapestries with a mix of motifs, others that have allover patterns, and embroidered fabrics. These techniques — and perhaps even the textiles — are considered imported.[14]

Each warm orange cross in the kilt pattern is outlined. There are floral motifs in the center of each cross and posies in each arm of the cross. Remnants of a light-colored, narrow panel and a darker, wide panel are below this patterned fabric in the fresco. A patterned panel and a belt are illustrated in the painting of *The Cup-Bearer* at the Ashmolean Museum, but do not show in the fresco photo.[15]

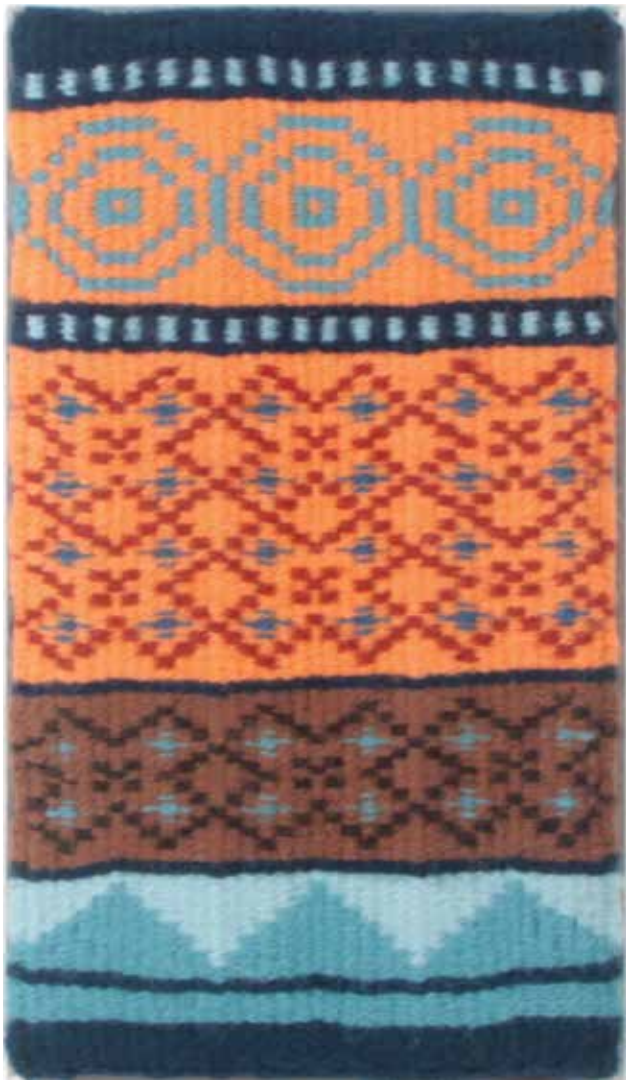

Figure 5. Other than the interlock pattern, there is little left of the belt or the pattern at the bottom edge of the kilt. I wove the re-imagined bar pattern from the painted replica and added a pattern of connected circular motifs. An orange, rust-brown, and blue palette, and a brown, dark brown, and aqua palette were woven with the kilt pattern. The blue triangular motif in the bottom row shows in the restorations and paintings of *The Cup-Bearer*.
Sample dimensions: 7.5" x 4.25" — 19 cm x 10.8 cm
(Woven by Author. Photo by Alexis Garrett)

The Hagia Triada Dancer

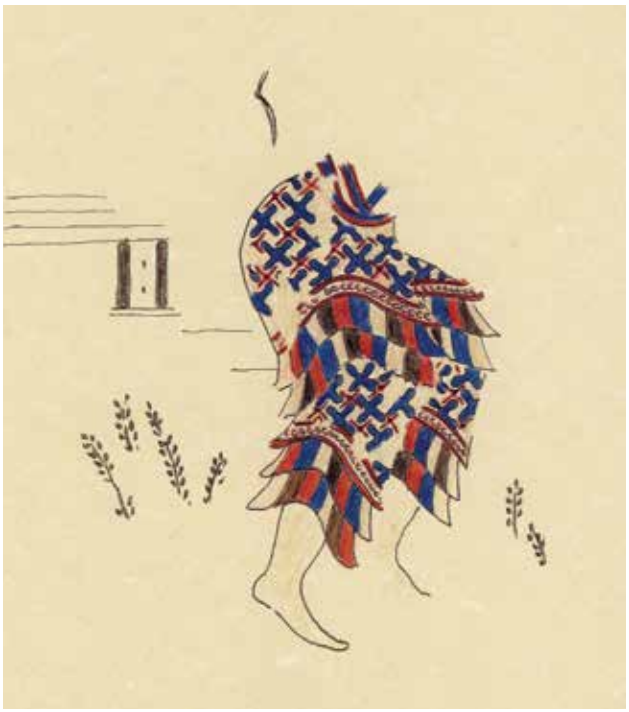

Figure 6. *The Hagia Triada Dancer*
(Tracing after a painting by Frederico Halbherr. Barber 1991, Color Plate 2)

Hagia Triada is the site of a Minoan settlement in southern Crete. This figure, from a villa fresco, seems to dance among plant fronds (*Figure 6*). *The Dancer from Hagia Triada* is also called *The Woman Rising from the Sea* or *The Woman Beside a Shrine*.[17] Paintings of the remnants of the Minoan fresco by Fredrico Halbherr and Emile Gilliéron were studied to draft the sample.[18]

Drafting patterns from a painting of a painting is challenging. An elaborate quatrefoil, interlock pattern of blue motifs and white motifs with red accents forms the fabric at the top of the skirt and another panel at the knees. The pattern has an op-art effect with the motif shifting from a dominant blue cross or floral motif to a dominant white and red motif. The patterned fabric is edged with a "snail-shell" or running spiral border.[19]

A divided skirt is implied in the painting. Two flaring panels of red, blue, white and black bars are at the middle and bottom of the skirt. These could have been woven as narrow strips with weft-faced bands of varied colors or even as a more balanced plain weave with changing weft colors. Illustrated in both paintings is a belt at the waist and the lower portion of a V-necked border band.

Figure 7. Sample for *The Hagia Triada Dancer*. The first and last pattern rows have a version of the red and white running scroll pattern on the skirt. The central pattern is of the white and blue interlocking motifs on a red diamond grid. A trial sample of a woven fringe was tested since it had been suggested in the literature.[20] However, I do not detect a fringe in the paintings. A sample of the red, white, blue and black skirt panel is immediately below the fringe. Sample dimensions: 9" x 4.25" — 23 cm x 10.8 cm
(Woven by Author. Photo by Alexis Garrett)

Band Patterns

The narrow trimming bands (*Figure 8*) replicating those of the *Ladies in Blue* and *The Hagia Triada Dancer* or *Woman Beside a Shrine* were woven as weft-faced, seven-shed patterns on a 10/2 pearl cotton warp (doubled) and a two-ply wool weft sett at 8 epi.

Figure 8. Band samples. The blue pattern is a sample of the shoulder, V-neck and cuff-band of *The Ladies in Blue*. The red and white pattern is the motif from the running scroll pattern on the female figure from *Hagia Triada*

Conclusion

The patterns depicted on the frescoes of *The Ladies in Blue*, *The Cup-Bearer*, and *The Dancer from Hagia Triada* from Minoan Crete are more sophisticated and complex than those found on the Akrotiri costumes: as befits the center of Minoan culture. Historical records indicate that the large-scale textile industry on Crete established the Minoans' wealth.[21] During the Late Bronze Age, "Cretan crafts reached a peak of production, refinement, and dexterity."[22]

The island in the "great green sea" was the ideal stepping stone to spread cultural influences in the ancient Mediterranean world."[23]

Weaving experimental samples of the beautiful Minoan fabrics found in the frescoes of Thera and Crete is part of a research project to trace the origin of Bronze Age pattern weaving. The focus of my work so far, has been on trying to identify one type of the patterned fabrics in the costumes. There are other types of patterned or — perhaps — embroidered fabrics that beg investigation. This is a rich topic for weavers interested in an *experimental archaeological* project.

The construction of the V-neck bodices and flounced skirts have been the subject of numerous scholarly publications. Examples of garments have been made with commercial cloth and some with handwoven fabrics.[24] If you have an interest in fashion, this is a fascinating topic to explore. Imagine handwovens made into recreations of Minoan costumes for the next Complex Weavers fashion show!

In the next article in this series, our quest will turn toward Egypt to examine the patterned kilts worn by the *Keftiu*. They were gift-bearing Minoan emissaries who visited Egypt in the 15th century BC.[25]

Endnotes

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15. Logiadou-Platonos. n.d. p. 51.

16. Barber. 1991. Color Plate 2.;
Halbherr, Fredrico. "Resti de 'Età Micenea: Scoperti ad Haaghia Triada presso Phaestos." *Monueto Antichi* 13: cols. 5-74. 1903.

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http://www.harvardartmuseums.org/art/288108

19. Barber. 1991. p. 319.

20. Jones. 2000. p. 40;
"The Clothes-Line: Imports and Exports of Aegean Cloth(es) and Iconography." *Emporia: Aegeans in the Central and Eastern Mediterranean*. eds. Laffineur, Robert and Emanuele Greco. Aegaeum 25: 2005. p. 709. See Pl. CLXXX for a reconstructed skirt and CLXXXIb-d for the quatrefoil skirt pattern woven with inlaid weft-floats.

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A Little-Known Complex Weavers Fund

Marjie Thompson

Prior to the advent of online courses, YouTube videos, Weavolution, WeaveTech and the like, weavers learned the trade by individual instruction, be it an apprenticeship or neighborly sharing. In any case, weaving drafts were needed to communicate structures.

Those necessary drafts were copied from existing sources as a weaver began to learn the process. In the centuries when weaving was a genuine trade, the first thing the apprentice did was copy his master's weaving pattern book. Said pattern book often became a family heirloom and many were brought by immigrants to the United States as valued possessions, even when the descendant bringing the book was not a weaver and could not understand it.

Figure 1. The damage oak-gall inks can wreak on old weaving drafts: a shower of bits of drafted pattern

Luckily for us, the paper used in these manuscript draft books was laid paper with a fiber source, not the wood-pulp paper of today that yellows and becomes brittle in just a few years. The laid paper has allowed many old drafts to survive. Unfortunately for us, the ink used for filling the dark parts of the drafts was made from oak galls (containing tannic acid) — a traditional ink that was great for writing on vellum in the 11th century but was unkind to the paper of the 18th and 19th centuries: it eats through it.

Opening a weaving manuscript with filled-in block designs can cause a shower of stars, roses, and block bits to descend upon the table (*Figure 1*). Even worse, a large hole through many pages can result (*Figure 2*).

These problems can be mitigated and the process of disintegration slowed, but it is an expensive task.

In the early 21st century, the Complex Weavers Manuscript Recovery Fund was established to nudge public institutions into preserving or acquiring early manuscript weaving pattern books. Such preservation is a very expensive task: costs can run into several thousands of dollars for an object, a weaver's draft book, that was frankly not high-priority for most museums and certainly not on any museum's list for spending their limited funds.

However, s the result of good salesmanship, Complex Weavers has helped fund the restoration of two complete manuscripts, contributing a maximum of a quarter of the final cost. One is the Philipp Peter Bayer manuscript in the Joseph Downs Library at the Winterthur Museum, Winterthur, Delaware; and the other is the John Long/John Bechtel manuscript in the library of the Clark Art Institute, Williamstown, Massachusetts. The third coup for the Fund is assisting the library of The

Figure 2. The acidity of old inks can eat a hole through many layered pages of a manuscript

American Textile History Museum, Lowell, Massachusetts by providing well over half the purchase price for the Joseph Capp manuscript.[1]

These saves are 19th-century manuscripts. There are far more problems with the documents of the early 20th-century weaving revival that are in danger of disappearing from disintegration because of the pulp-based

1 For more about these manuscripts, see *Complex Weavers Journal* Number 67, September 2001, and *Complex Weavers Journal* Number 81, June 2006.

paper used for writing the drafts, as well as the scrapbook pages to which they are glued (*Figure 3*).

Also in danger are the notes of the master weavers we all knew early in our weaving education, as their descendants and executors often do not know their value to the history of weaving.

Figure 3. Relatively recent manuscripts can suffer from acidity of the paper and chemicals in adhesives

Many may ask why any money should be spent preserving 'history' rather than on, for example, finding new ways to use Photoshop to design 'original weavings.' The response is simple: those new weavings often need structures beyond plain weave to make them interesting. Manuscripts written and used over the past 300 years are excellent sources for these structures and have withstood the test of time.

For those without unlimited shafts on their looms, manuscripts provide innumerable designs that may be adapted to 21st-century fibers and colors our weaving predecessors could only dream of having. However, if we don't slow the process of disintegration of the manuscripts, scrapbooks, and notebooks of our predecessors, these treasures will be gone.

Who knows what gem of information may be found in the pages of a manuscript:

- A scale drawing of 'the short loom' from the early 19th century
- Notes that a weave structure adaptation is "the new fashion" in 1794
- The correct way to set dimity to get ridges by a weaver late in the handweaving era
- Family histories
- The attempt to work out how to adapt a block design from Europe to the 'float work' (overshot) in vogue in the new United States
- The description of how to thread for 'carpet' (what is now known as 'summer and winter')

As you visit museums throughout the world looking at textiles and books, as you talk with other weavers, browse online, shop weavers' estate sales, and deal with guild bequests, keep the Complex Weavers Manuscript Recovery Fund in mind should you see any paper candidate for preservation — and let us know.

It is always good publicity for one 501c3 organization (Complex Weavers) to donate to another (many museums).

In addition, any donations we make as individuals to the Complex Weavers Manuscript Recovery fund are tax-deductible.

For more information or to make a donation, please contact Marjie Thompson: *marjie@maine.rr.com*

Are You a Linen Weaver?

This is a call for articles for the June 2016 issue of *Complex Weavers Journal*, which will focus on linen.

- Linen traditions
- History, culture and flax
- Handling fine linen yarns
- Favorite linen weave structures
- Special projects in linen

The deadline for this issue is March 15, 2016. To send a submission, or for more information, contact the CWJ Editor: *CWJEditorRM@gmail.com*

ERRATUM

February 2015 (Issue No. 107)

An editor's error appeared in the Beyond Plain Weave Garments study group section, *CWJ* February issue, page 32.

On that page, Alice Schlein's excellent book, *The Liftplan Connection*, was erroneously called by another name.

Sincere apologies to Alice, and to any who were confused by this error.

The Space between Randomness and Order

Miles Visman

The sheer magic of seeing a textile appear before my eyes enthralls me, in the same way as when a Polaroid photograph develops or an illusionist makes something appear from thin air. The weft passes back and forth and is beaten into place, and we have cloth, something tangible — perhaps even useful — constructed from a few lengths of yarns.

My wife taught me to knit a few years ago, and after we visited a couple of mills in Wales, I bought a small rigid heddle loom to try out weaving and to 'use up' the gradually growing stash of yarn. I started by using plain weave on very short warps in blocks of random colours. Then researching on the Internet and in books I began to realize there is so much more to weaving. I'm not sure my wife is entirely happy with the floor loom that has ended up in our tiny front room...

Designing with algorithms

As a computer programmer, I have long used algorithms and code to generate images and have recently been using the computer to generate designs to weave.

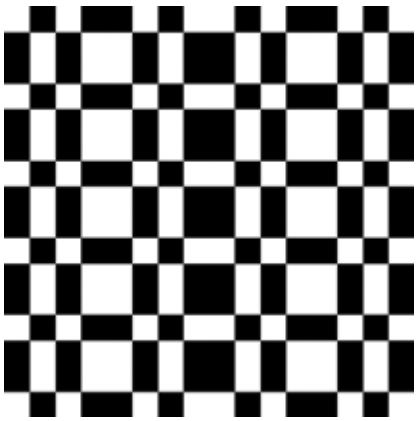


Figure 1. Algorithmic design

We can use algorithms, which are basically sets of rules, to construct designs. For example, the design in Figure 1 is generated by going horizontally, alternating black and white squares; then after each set of four squares the colours invert. Vertically, we repeat the pattern from that first row, but invert its colours every third row. In much the same way, weavers design a plaid or tartan using a set of rules to choose how often a colour will appear vertically and horizontally.

To add more interest, we can use something other than plain black and white squares. If, for example, we substitute a forward-sloping diagonal line for the white squares and a back-sloping line for the black ones (*Figure 2*), new possibilities emerge (see *Figure 4*). Or if we make the substitution with curves (*Figure 3*), something completely different appears (see *Figure 5*).

Figure 2. Diagonal slopes tile set

Figure 3. Curved tile set

These blocks we are using in the substitution are known as Truchet tiles, first described in 1704 by Sebastien Truchet, an eclectic French priest.

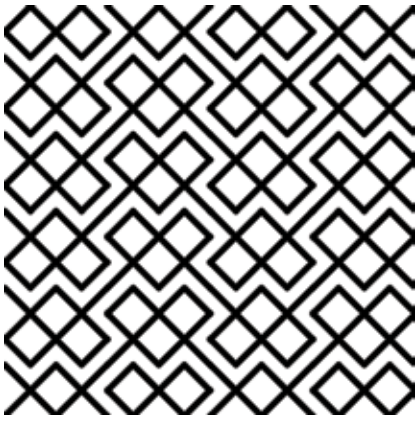


Figure 4. Design following the algorithmic pattern from Figure 1, filled with the 'Diagonal slopes' Truchet tile set

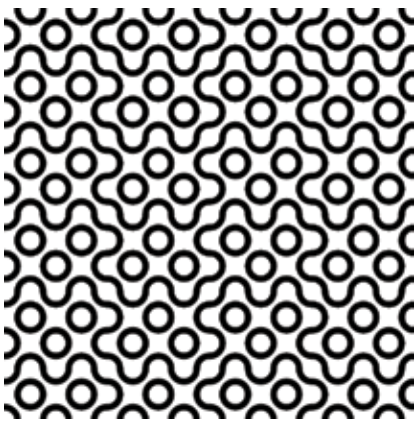


Figure 5. Design following the same algorithm, filled with the 'Curved' Truchet tile set

Figure 6. A four-tile set with triangles in each of the corners of a square

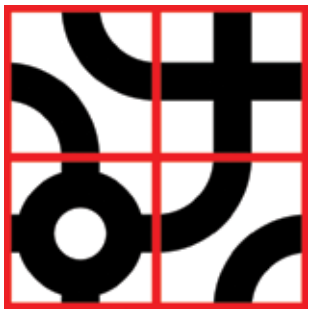


Figure 7. A four-tile set made of two curves and two crossroads

We can expand the algorithm to use a set of four tiles — triangles placed in each of the corners of a square (*Figure 6*), or two curves and two crossroads (*Figure 7*), or two curves and two lines (used to form the design shown in *Figure 10*).

The Truchet tiles match up on the sides, giving the impression of an interconnected pattern. Using them is exactly the same process as block substitution, and any set of tiles or images can be used.

Figure 8. Design following the algorithmic pattern from Figure 1, filled with the Truchet triangle tile set

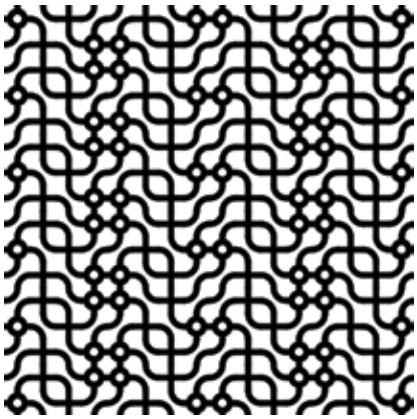


Figure 9. Design using the algorithm from Figure 1, filled with the Truchet Curves and crossroads tile set

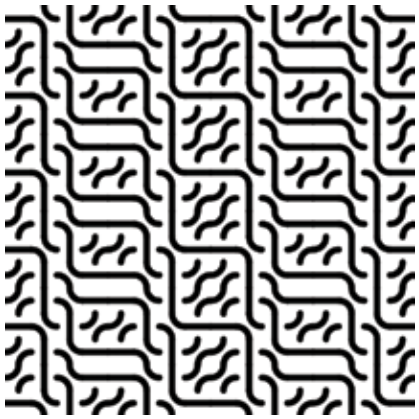


Figure 10. Design using the algorithm from Figure 1, filled with a Truchet tile set made of two curves and two lines

Randomness

Natural structures, such as water ripples, dried mud, rock formations, leaves, flowers, and animal skins, to name but a very few, whilst beautiful in themselves, display repeated patterns. The random variations across these surfaces excite the eye and hint at a more complex beauty.

In weaving, every piece of yarn has random variations along its length, each beat has a slightly different force which distinguishes the hand-woven cloth from the manufactured perfection of machine-made.

Natural phenomena also trigger other interpretations as our brains respond to certain arrangements of structures and seek patterns, as when we see faces and animals in the clouds, scary things in the shadows at night, or shapes in the flickering flames of a fire.

Our brains respond similarly to the seemingly chaotic randomness of abstract art, jazz and asemic writing[1], where the forms and structures of the piece of art suggest, rather than prescribe, meanings and invite the viewer to fill in and interpret.

Randomness brings not only chaos and disorder but also serendipity, luck and chance to the design process.

Designing using randomness

With just random black and white squares, the design looks like an untuned analogue TV or a QR code (*Figure 11*). But when its black and white squares are replaced with the sets of Truchet tiles as described before, sequenced according to the original random design, intricate mazes are produced (see *Figures 12* and *13*, and also *Figures 14* through *16*). Randomness on a

1 *Asemic writing* is a wordless open semantic form of writing. The word *asemic* means "having no specific semantic content". With the nonspecificity of asemic writing there comes a vacuum of meaning which is left for the reader to fill in and interpret. (*Definition by Wikipedia*)

computer is itself generated by an algorithm that provides a pretty good approximation to true randomness, even though it has been generated according to a set of rules.

Figure 11. A random design of black and white squares, to serve as the foundation for the next examples

Figure 12. Design from Figure 11, filled with the 'Diagonal lines' two-tile set

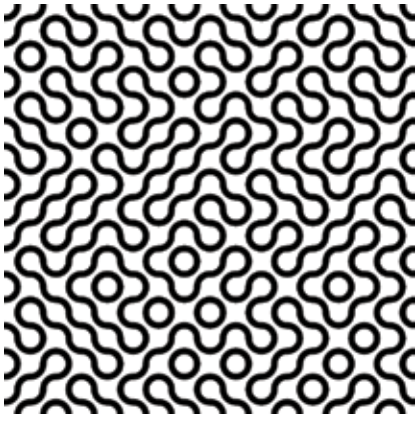


Figure 13. Design from Figure 11, filled with the 'Curves' two-tile set

Figure 14. Design from Figure 11, filled with the 'Triangles' four-tile set

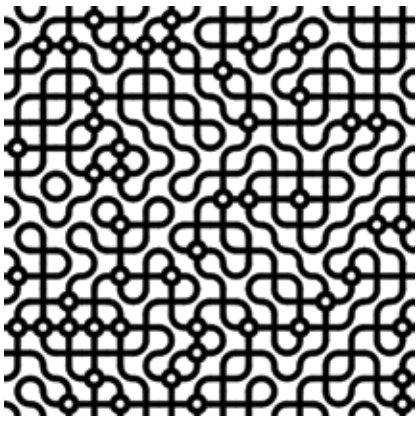


Figure 15. Design from Figure 11, filled with the 'Curves and crossroads' four-tile set

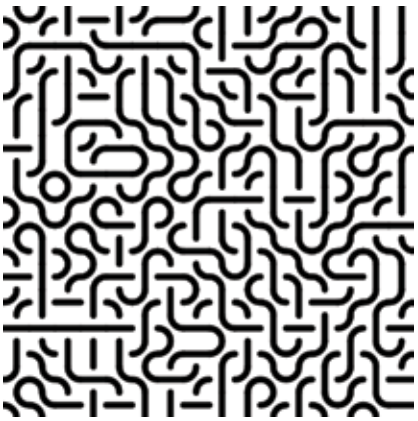


Figure 16. Design from Figure 11, filled with the 'Two curves and two lines' four-tile set

Applying contextual rules

The algorithm can be changed to look at the squares around the one it's processing. For example: let's say that if the preceding horizontal square is white, then the next one is black. But if the preceding square is black, the next one will have a 50% chance of being either black or white. If the square before the preceding one is also black, then the chances of white being chosen can be increased to 60%, and so on, with increased chances of white for every preceding black square.

Similarly, by looking at the vertical pattern with slightly different rules, the resulting designs can look much like writing (*Figures 17* and *18*).

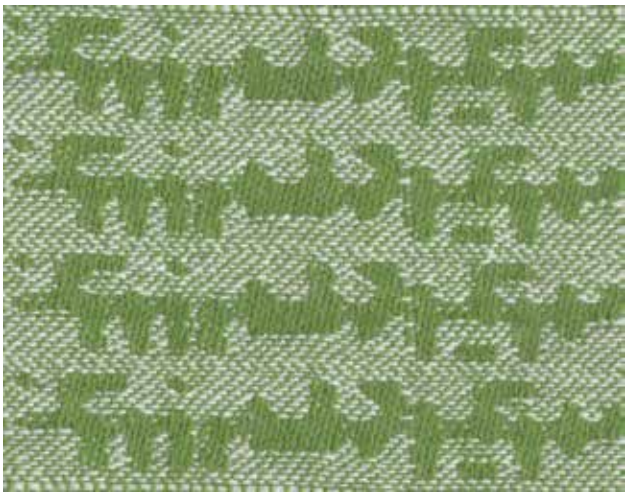


Figure 17. Detail of handwoven asemic writing design

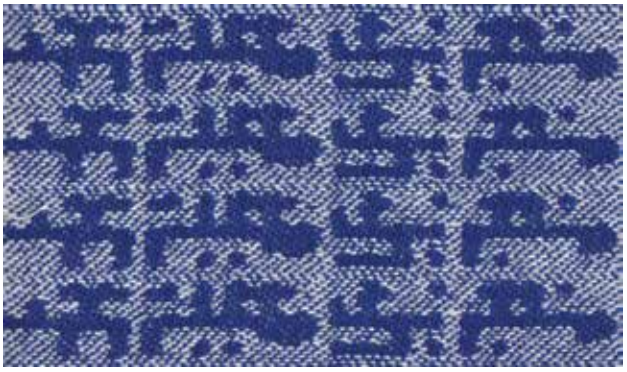


Figure 18. Another handwoven asemic writing design

By expanding the algorithm further and breaking the boundaries of the square tiles by using a larger vocabulary of shapes and parameters, including scaling and rotation, complex shapes can be created from simple geometry. For example, we might say Row 1 has three different-sized triangles, Row 2 has one box, Row 3 has two small triangles, and so on. Two results of this random geometric approach are shown in Figures 19 and 20.

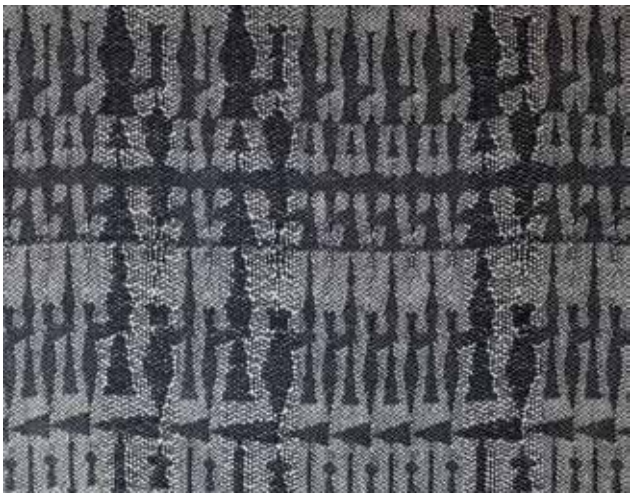


Figure 19. Complex shapes created by increasing the parameters and geometric elements of the algorithm

Figure 20. Another handwoven sample showing complex shapes created with this design approach

These algorithms can be run repeatedly until we are happy with the complete generated design. Or combine elements by hand from separate runs. Or even tinker further with the algorithm to pursue the interesting designs that emerge.

I've made a number of interactive pages showing some of the processes in action which you can try for yourself by visiting *www.milesvisman.com*

Weaving the designs

The imposing volume of patterns and weave structures available to try with these algorithms is somewhat daunting, and this where my weaving inexperience will show. I am lucky enough to have a 24-shaft dobby loom, but this still imposes a limit on the complexity of the design across the width of the warp.

The generated designs can be spread across this width in interesting ways using combinations of repeats,

mirrored repeats, doubling, enlarging and shrinking (*Figure 21*). This process can likewise be part of the design algorithm, whereby similar types of rules are used to determine the arrangement.

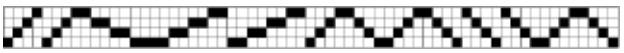


Figure 21. Example arrangement, showing use of repeats, mirroring and doubling

These designs can be turned into usable weaving drafts in a number of different ways. For example:

- Using diversified plain weave with its thin bindings (*Figure 22*)
- Block substitution of the squares with suitable weave structures
- Or by directly filling the different coloured areas with weave patterns

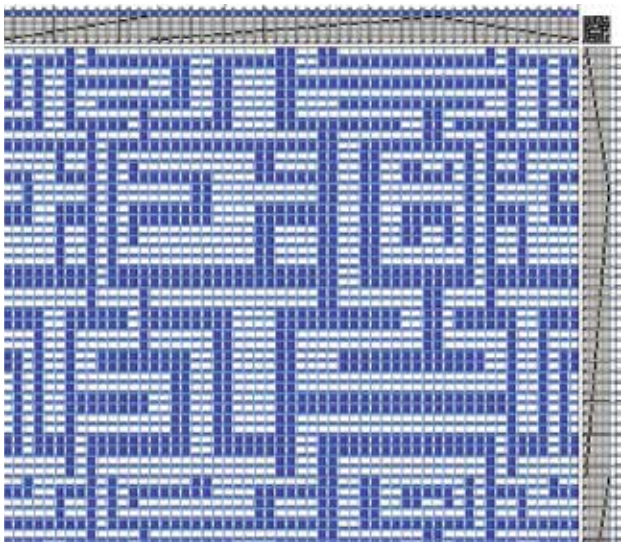


Figure 22. Design interpreted in diversified plain weave
A WIF is available on the Complex Weavers website

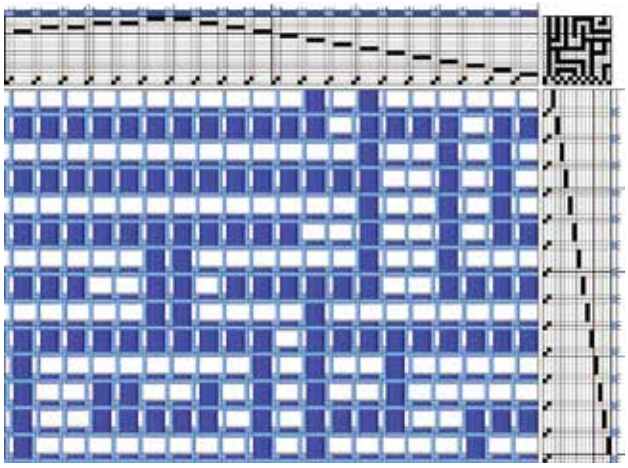


Figure 22a. Diversified plain weave draft detail

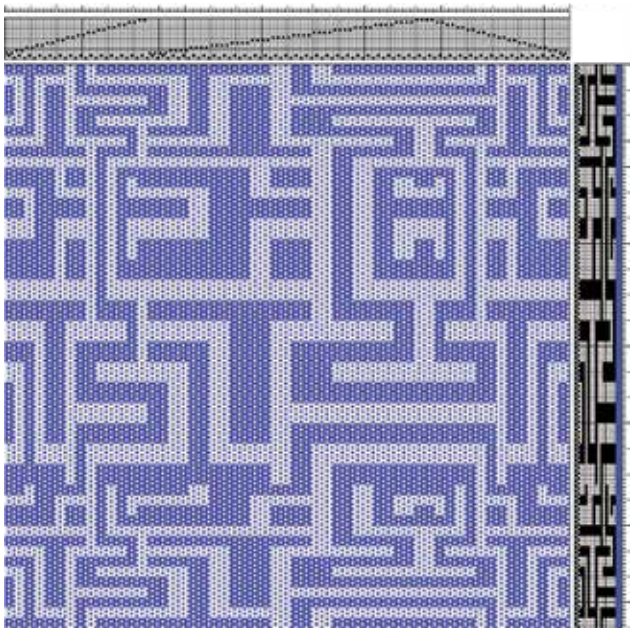


Figure 23. Design interpreted in summer and winter
A WIF is available on the Complex Weavers website

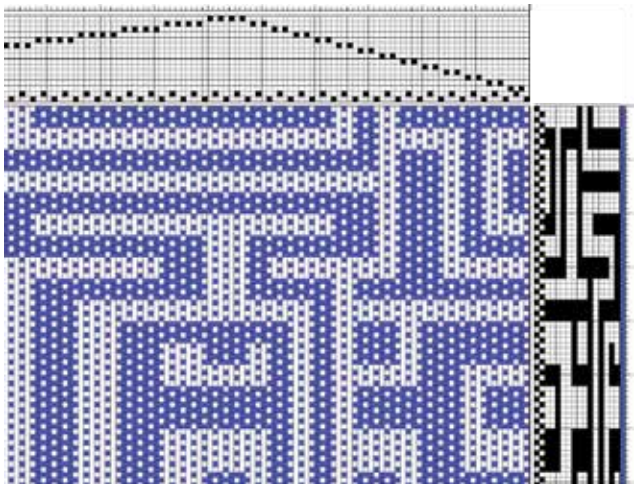


Figure 23a. Summer and winter draft detail

While the number of shafts on the loom restricts the way the warp is set up, there is no limit to what happens over the length of the warp on a dobby loom. However lots of changing of pegs on the dobby can be fiddly and prone to errors.

To eliminate some of the errors and fiddliness, I built myself an Arduino (a very small computer) dobby control mechanism to allow complete variation over the whole length of the woven designs.[2]

2 A program on the PC loads a WIF or bitmap image of the weaving pattern, then transmits picks via Bluetooth to the Arduino, an easy-to-use small device for controlling electronics. A keypad connected to the Arduino advances the pattern and triggers a set of solenoids to push the required shafts onto the knife before it's raised.

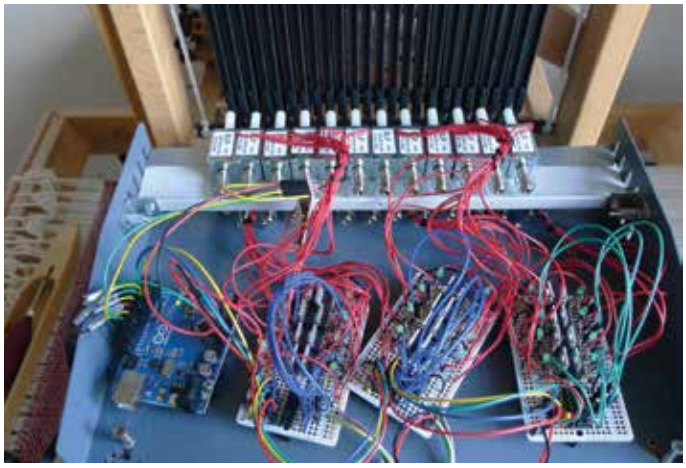


Figure 24. Arduino dobby loom control

I'm thinking this could be expanded to control more shafts to become a pixel-perfect loom.

Online Resources

Interactive pages showing these design processes in action, along with more images:
http://www.milesvisman.com

An interesting article about Truchet:
https://www.tug.org/TUGboat/Articles/tb20-1/tb62andr.pdf

Pictures and information about asemic writing:
http://thenewpostliterate.blogspot.co.uk

Information about Arduino:
http://www.arduino.co

My Method of Sectional Warping a Small Two-Color Sample Warp on an AVL Loom with the AVL Tension Box

Cynthia Broughton

Figure 1. AVL Tension Box

The AVL tension box allows a cross to be made and is designed specifically for the full-sized AVL looms. The tension box sits on the track and mounting system on AVL looms. On other looms, the tension box is mounted on the back beam.

If a cross is not available, masking tape can hold the yarns in order.

The Preliminaries

Always leave a leader on spools to allow full tension for all the sections.

- Calculate the amount on each spool by counting how many sections times warp length and adding extra to account for attachment knots and build-up on the beam. According to *Sectional Warping Made Easy* by Russell Groff, allow five yards extra per hundred on each spool for yarns 10/2 or finer, and eight yards per hundred for heavier yarns. Allow for variations in looms and extreme yarn sizes.
- Take yarns from the spool rack working from bottom to top on each column, then moving to the next column.
- The circumference of the beam matters. The circumferences of the full-sized AVL Production, Technical and A series beams are either one yard or a half yard. The sectional beams on other looms vary. Measure yours to get the proper yardage for your project.
- A trip counter works to count yards, or yarns can be measured with a yardage counter as they are being beamed.

Beaming

I leave the tension box threaded with 80 ends, the maximum I will put in a one-inch section on this loom (see *Figure 1*, left). As sett changes for each project, the yarns are resleyed in the second reed (not visible in

the photo). Any excess yarns are tied off with slip knots and weighted lightly with a large S-hook to keep them out of the way (as was done with the black yarns visible in the photo).

For each new warp, a cross is made and held with cord, and the new warps are tied on. All is pulled forward until the new warps are in place, the old warps cut off and an overhand knot is made. This knot lashes to the cords on the beam. Be sure to tuck that to the back as the first turn goes over it. Wind up to a half yard from the end of the warp and make a cross that can be held with a heavy cord.

Figure 2 shows three sections beamed. The yarns should lie flat and even across the section. Small hair bands, thanks to a hint from Robyn Spady, are placed both under and over the ends of each section to hold it in place and ensure that all yarns will be picked up when removed from the beam.

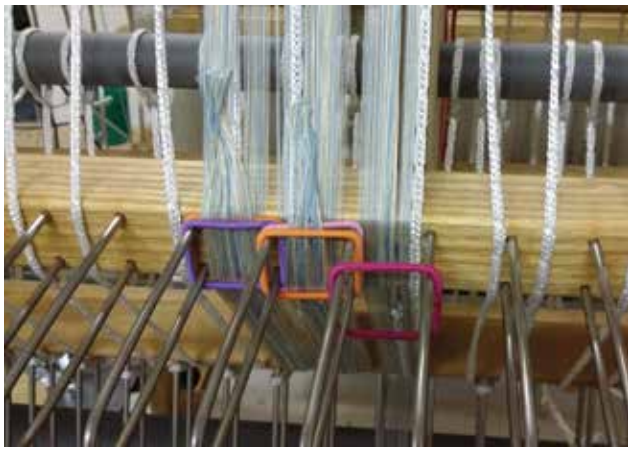


Figure 2. Three sections beamed and secured in place

Be sure to tie a slip knot to secure the cord that holds the cross.

The sections are removed from the loom and secured with a slip knot at the end. This prevents any problems if a yarn catches on a section divider (see *Figure 3*).

Figure 3. Secure the sections with slip knots

In Figure 4, enough yarn is pulled off to show the cross held by the cord.

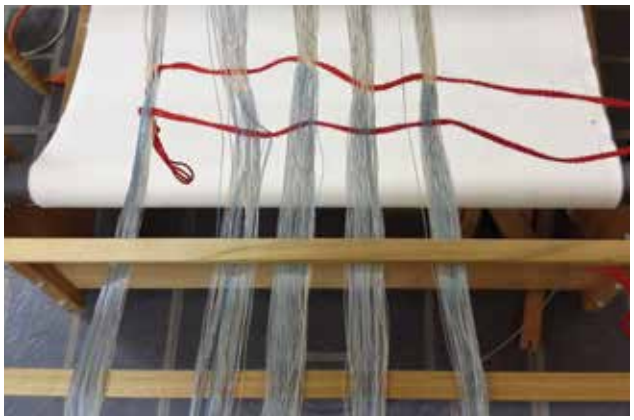


Figure 4. The cross on the cord

Lease sticks are now ready to be placed in the cross (*Figure 5*).

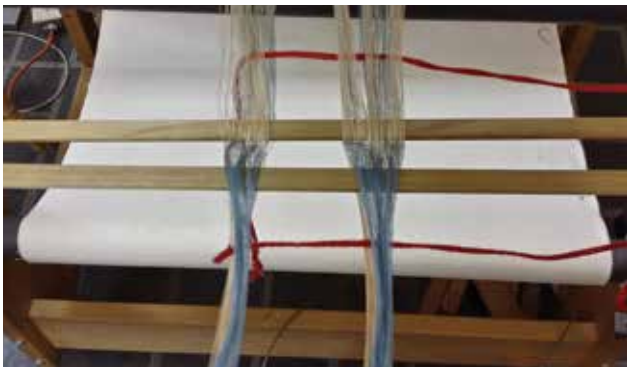


Figure 5. Lease sticks being placed in the cross

The ends of the lease sticks will rest on long support sticks mounted outside the heddles (visible in *Figures 6* and *7*). Once the lease sticks are inserted, secure their ends with cord (*Figure 6*) and release enough warp to bring under the back beam (or over on other looms).

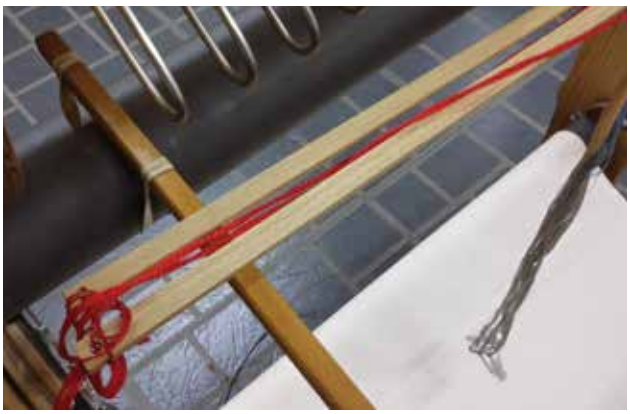


Figure 6. Secure the ends of the lease sticks. The lease sticks rest on support sticks that extend back-to-front on the loom and are themselves anchored with rubber bands

Figure 7 shows the lease sticks brought forward and resting on the support sticks mounted outside the heddles. These support sticks extend from the back to the front of the loom. Enough warp is let off for the ends to reach the front of the loom. The cord holding the cross can now be removed and the lease sticks attached to the support sticks with rubber bands, as shown in the photo.

Figure 7. Lease sticks resting behind heddles on the support sticks

Threading

To thread, I take a one-inch section at a time, bring it up over the tops of the shafts, separate the two halves and keep the yarn under tension as I am threading (*Figure 8*). I am left-handed so I hold the threading hook and warp bout in my left hand and select the proper yarn with my right. If you always make your cross the same way you will always know which side of the lease stick your next warp will be. The yarns can almost be selected by feel rather than sight. This is very useful for two-color warps. It also helps you to notice if the wrong warp comes up. There may be a mistake in threading or a thread may have missed the cross.

If threading the treadling, I sit on a lower bench than usual. If the threading is simple the shafts are raised. Of course the sandpaper beam and reed are removed before threading for an easier reach.

Figure 8. Ready to thread

Figure 9. Ready to thread, close-up view

Complex Weavers Friendship Fund

This is a small notice about an important fund. The Complex Weavers Friendship Fund is for members new or old who for some reason can't manage the annual CW dues. If you or someone you know needs this assistance, contact a Board member or your Area Liaison (formerly called 'Area Rep'). All aspects of the Friendship Fund are handled with the utmost discretion.
If you wish to contribute to the Friendship Fund, contact a Board member or your Area Liaison.

Sixteens Study Group

Samples 2014 – Four-Color Double Weave

Mary Doherty, Chair

In 1978 when Marian Hoskinson contacted friends and acquaintances in the weaving community with the idea of a sample exchange for "16-harness weavers," she "harnessed" a talented group of weavers ready to explore the limits of 16-shaft weaving. This group of weavers contributed to a wave of enthusiasm for multi-shaft weaving that was very well-received.

The Sixteens soon had a membership of 30 with a long waiting list. Some of the original Sixteens were instrumental in founding a new organization that became known as Complex Weavers.

The Sixteens group requirements, established by Marian so long ago, are still adhered to. Weavers are required to research an annually-chosen topic, usually a weave structure, and design and weave samples that demonstrate each weaver's individual creativity. Currently, Sixteens has twenty members with a waiting list. The group shares ideas and selects the year's challenge each January. Samples (6"x6") are mailed to participants in October.

For 2014, the topic chosen was Four-Color Double Weave (4cDW), and we selected it with enthusiasm. Afterwards we shared many questions such as, "What is the difference between 4cDW and double weave with four colors?"

The results of our challenge are a number of unique designs that have left many of us with "what if's" for future explorations. Here are a few of our results.

'Poppies' in Four-Colour Double Weave

Brenda Gibson

The Sixteens

I received a very warm welcome to the Sixteens study group after signing up at Seminars in Tacoma, and I was looking forward to my first sample exchange with this group on the subject of four-colour double weave, a structure I really like.

The 'poppies' inspiration for these samples and subsequent projects links with the theme '1914' and represents the remembrance poppies for those fallen in the two World Wars and more recent conflicts. I was planning to enter a piece in the London (UK) Guild competition for the Gwen Shaw Cup, based on the 1914 inspiration.

I like to work within constraints, and whenever possible to produce different pieces on any particular warp. The constraints this time were working on (and needing) exactly 16 shafts (the basis of the Sixteens, even though I have 24 available on my loom) and using four-colour double weave as the structure. The other self-imposed constraints were to weave the full 24-inch width of my loom, to use 60/2 nm silk (of which I have a good stock in a variety of colours), and to achieve some iridescence whilst representing the red of the poppies, green of the leaves and brown of the earth in both positive and negative colourways.

I began by intending to use single ends of silk rather than the doubled ends I finally used. But as I also wanted to weave the full 24-inch width, I would have needed several hundred more heddles than I currently have. Recalculating for the doubled 60/2 at a sett of 48 working epi meant that I had enough heddles as well as a wider effective choice of colours, as the two strands of working ends could be different. I felt it might be too busy to mix colours across the board, but I took advantage of modifying the green in the warp and the red in the weft as I did not have the precise colours I would have preferred to use.

Four-colour double weave is a fascinating weave. I first encountered it at an inspirational workshop with Bonnie Inouye called 'Opposites Attract' held at Devon Weavers Workshop (UK) in 2009. It is based on a parallel threading and parallel treadling, alternating two colours in the warp and two different colours in the weft. Each design line alternates odd and even shafts, and the distance between the two parallel threading lines is typically half the number of shafts. The cloth contains four colour blends in the pocket double-cloth areas: warp A with weft a, warp B with weft a, warp A with weft b and warp B with weft b. As well as pocket

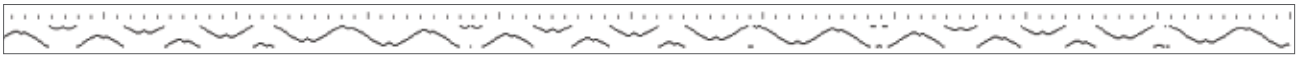


Figure 2. Poppy design line, sixteen segments, repeat advancing by three shafts

areas, there are areas of integrated cloth.

My design process started with a small segment of poppy design line (*Figure 1, right*) that would join up correctly in a repeat advanced by three shafts each time (*Figure 2, above*). As 3 is not a factor of 16, this means that I got sixteen different segments in one full repeat. But instead of a gradual transition between neighbouring segments, there are significant differences in appearance. I checked that the shapes worked correctly by viewing the pattern line 'as drawn in' on an 8/8 tie-up (*Figures 3 and 3a*).

Satisfied with this, the next stage was to translate the design lines into odd/even alternation, insert a parallel threading line eight shafts above (extended

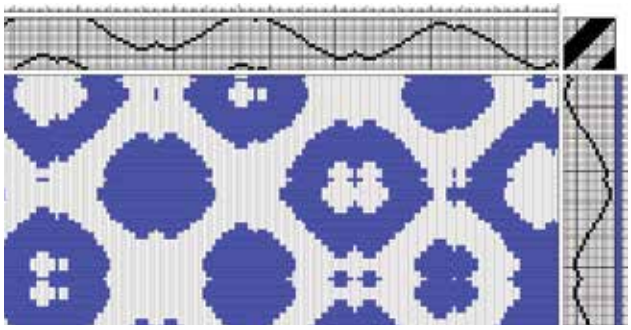


Figure 3a. Detail of draft below showing tie-up block

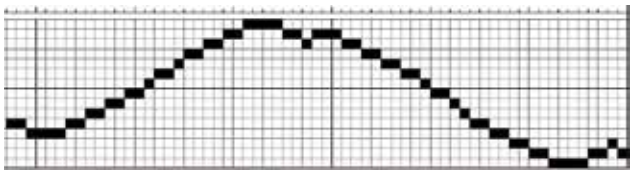


Figure 1. Poppy design line, single segment

parallel) and a treadling line 16 shafts apart by adding a further 16 (notional) treadles and to add the alternating colours. Starting with the first treadle of the left-hand 16x16 tie-up block, shafts 1 to 8 weave plain weave and shafts 9 to 16 control the proportions of the colours on each face of the cloth. I chose a 5:3 ratio so that the two sides of the cloth would have a different colour emphasis. The tie-up proceeds in twill order for the first 16 shafts. The second block of the tie-up is the negative (opposite face) of the first half and, because the threading lines are eight shafts apart, the tie-up block is also moved up by eight shafts (*Figures 4 and 4a*).

This warp was planned before I had bought a copy of Marian Stubenitsky's excellent book *Weaving with Echo and Iris*, and there are a number of other structures I should like to try on parallel threadings. At some point I plan to try a version with a 2:1 ratio in the treadling. This will mean doubling one version of the treadling pattern line before redrawing it on the initial 2 network

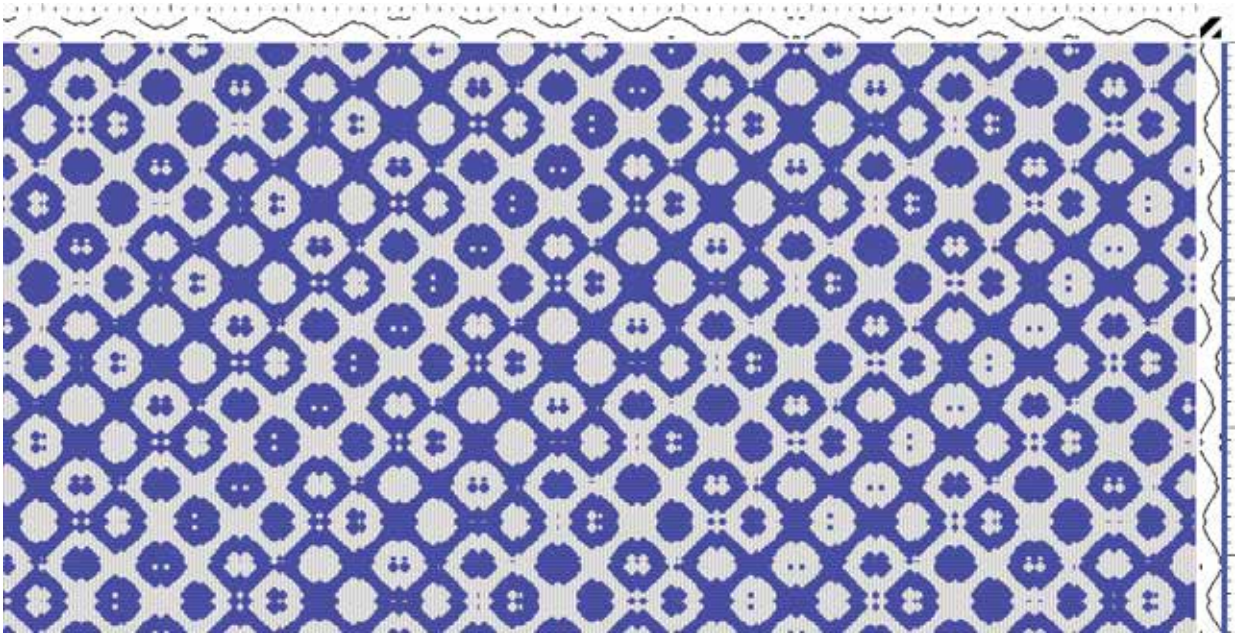


Figure 3. Draft as-drawn-in

A WIF is available on the Complex Weavers website

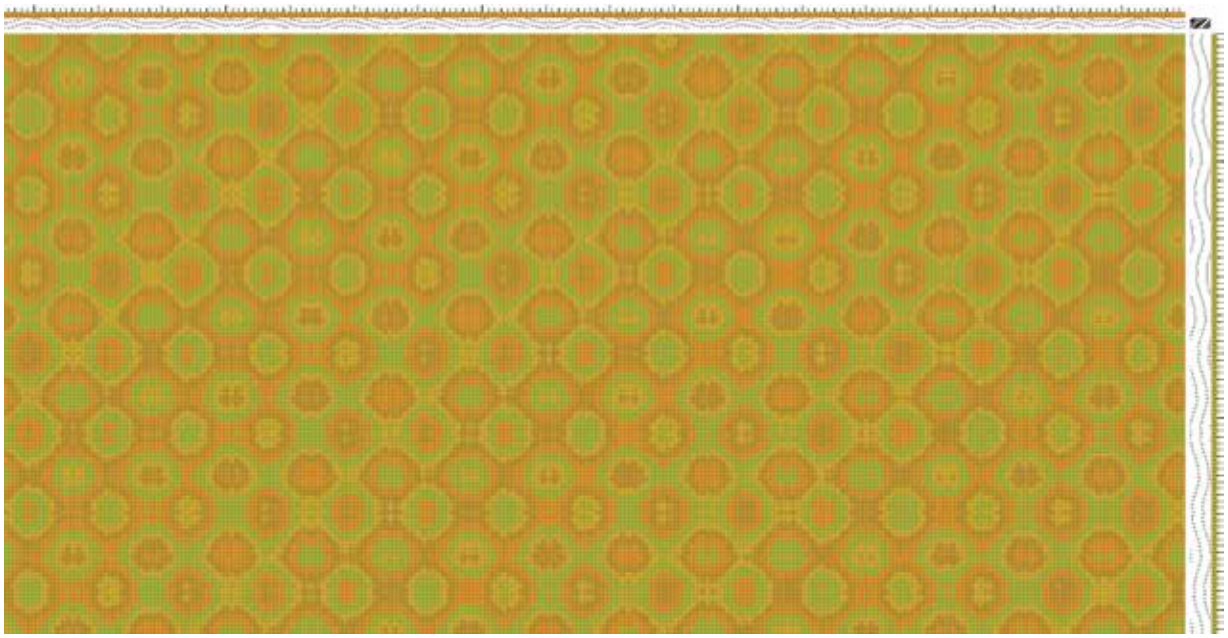


Figure 4. Draft with new threading and tie-up *A WIF is available on the Complex Weavers website*

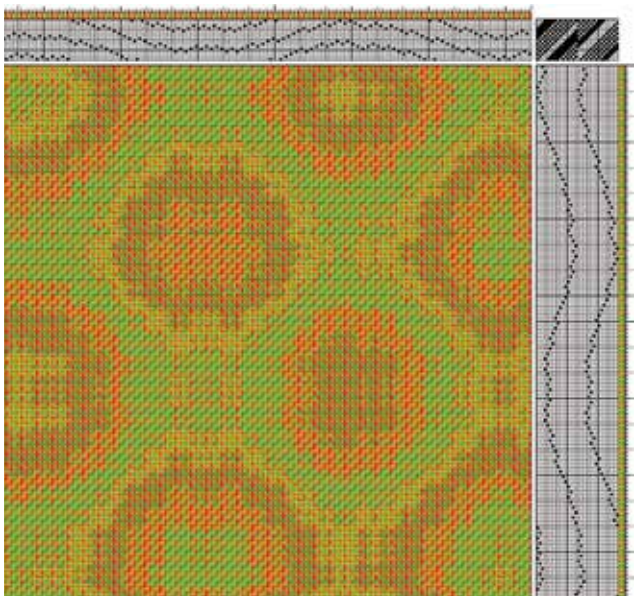


Figure 4a. Detail of altered draft

and interleaving the two networked treadling lines at 2:1 ratio. I went to the bother of beaming the two warp colours separately thinking I could also experiment with differential tension — a sort of seersucker effect — but for a couple of reasons I now don't think that would have worked in this case, and it would have been so much more efficient to thread from a single cross.

What of the final use of this warp beyond my Sixteens samples? I began by thinking of a wrap, and though the fabric is slightly heavier than I would normally have chosen, I thought the drape would still make it suitable. At the sample stage, I was slightly disappointed that there seemed to be relatively little lustre. I also thought the fabric weight might be good for a garment such as a jacket or maybe a dress, though I had reservations about the huge pattern repeat probably giving problems in matching seams.

In the end, I wove the wrap (*Figures 5 and 5a*) and was really pleased with the outcome. There is a reasonable amount of lustre, the drape works really well and the iridescence was successful too.

Figure 5a. Detail of final 'Poppies' fabric demonstrates the advancing pattern and appealing drape

Figure 5. Award-winning 'Poppies' wrap on mannequin

I entered the wrap into the Guild competition and it was very rewarding that it won the Gwen Shaw Cup. I still had more warp, so I wove two further pieces of yardage that are not yet made up. One has a very extended treadling and gave me 'feathers', the other shorter and more pointed one gave me 'lipsticks' (*Figure 6*).

Figure 6. 'Lipsticks'

But *Je ne regrette rien!* There were lots of things to learn from this whole experience and I have some woven pieces that I am very happy with. Finally, the Sixteens is a lovely group.

Resources

Website for Bonnie Inouye: *www.bonnieinouye.com*

Stubenitsky, Marian. *Weaving with Echo and Iris*. Randwijk, Netherlands: Weefschool de Hoeve, 2014

Upcoming Study Group Sections

CW Study groups are at the heart of Complex Weavers, and one or more are featured in every issue of *CW Journal*. Coming soon:

October 2015

Bateman Weaves study group
Early Weaving Books and Manuscripts study group

February 2016

Damask study group
Jacquard study group

Your Tips & Tricks are Welcome!

This issue again features CW Tips & Tricks. Curious weavers always find good tricks for weaving, drafting, loom modifications and documentation–would you like to share some of yours? It could be an article, a series of articles, or even a simple quick tip. You will, of course, be given credit for your contribution.

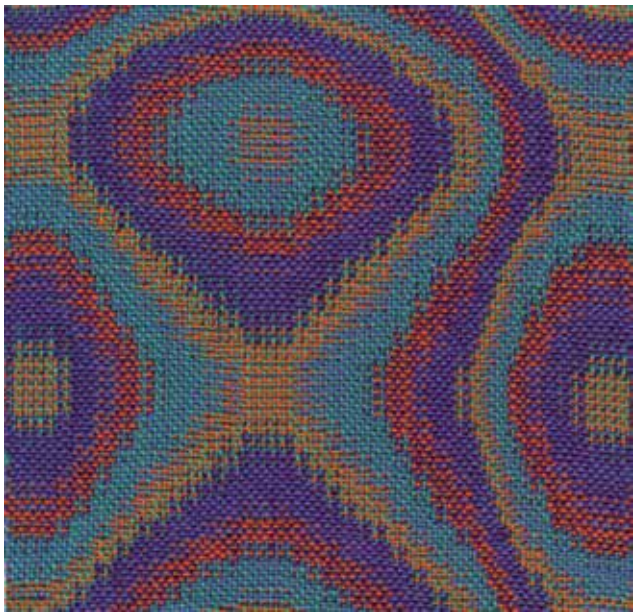
July 31, 2015 is the deadline for the October issue.

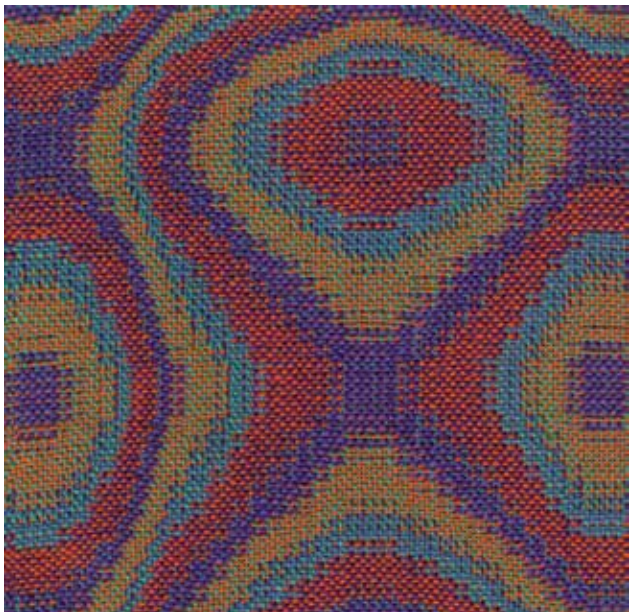
Contact your *Journal* Editor for more information: *CWJournalEditorRM@gmail.com*

Four-Color Double Weave

Linda Madden

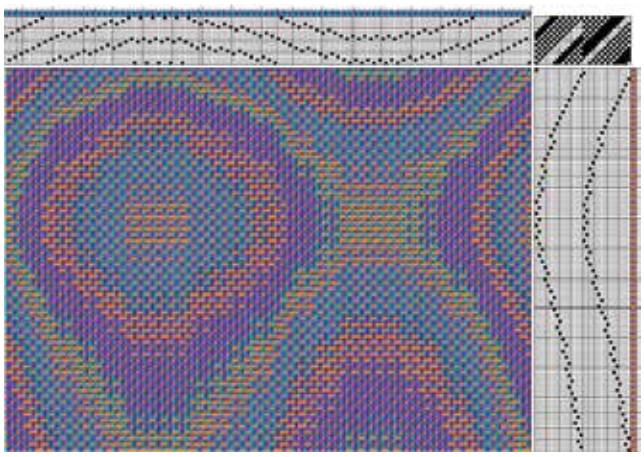
The Sixteens





My favorite aspect of using four-color double weave is the surprising colors you get when one color passes another. In my sample a green crossed a purple and resulted in an area that appeared to be turquoise. Choosing colors is a real challenge because you need to find four colors with enough value contrast for the patterns to stand out against each other.

Bonnie Inouye shared her class handout "Designing Four Color Double Weave," January 19, 2014, with the group and it was very helpful. Initially I started with the step-by-step tutorials in Margaret Coe's *4-8 . . . Weave!* Late in our study the beautiful *Weaving with Echo and Iris* by Marian Stubenitsky came out with its full exploration of four-color double weave. I used one of her profile lines as the starting point for my design.



A WIF is available on the Complex Weavers website

In this structure the yarns pass from top to bottom very frequently so the sett needs to be spread out to make room for all these intersections. I used 10/2 mercerized cotton yarns in a first tiny sample for a color test sett at 48 ends per inch and it was very stiff. Stubenitsky suggests using 150% of the plain weave sett. This formula, which yielded a sett of 36 ends per inch, gave room for all the intersections and made a fabric with a nicer hand.

Learning to draft this structure was challenging for me due to limited computer skills. Using the systems for drafting from Bonnie Inouye and Margaret Coe gave me a new understanding of my weaving software. Experimenting with different color combinations was fun because of the way different color blends produced new colors. This structure is not quick and easy to work with, but it has definitely been worth the effort in knowledge gained, and I really like the cloth that I have made. Now if someone could just come up with a more definitive name for it.

Resources

Coe, Margaret. *4-8 . . . Weave!* Tucson, Arizona: Coe Produced, 2013. pp.59-63.

Inouye, Bonnie. "Designing Four Color Double Weave", Class Handout. January 19, 2014.

Stubenitsky, Marian. *Weaving With Echo and Iris*. Randwijk, Netherlands: Weefschool de Hoeve, 2014. *www.weefschool.nl*

My Fascination with Four Colors

Donna Jean Barker

The Sixteens

Figure 1. Original sample

For the 2014 samples for Complex Weavers Sixteens, I was inspired by the book, *Weaving with Echo and Iris*. The book contains very colorful designs with how-to information on many types of weaves, including four-color double weave. The book became available in the U.S. just in time to be an inspiration for the CW Sixteens 2014 project on four-color double weave.

By definition, in a four-color double weave design each weft will cross both warps. Four different blended color weaves will be seen in the woven fabric. The colors blend based on the underlying weave structure.

Starting with a design line, I developed a threading for that design line for 16 shafts on a 1/3 twill network. Then the threading was modified by adding a parallel threading with an interval of 8 for the second layer. The design does have an interesting jagged area that I decided to keep. The warp colors are red and green, one for each parallel layer (*Figure 1*).

The treadling also was developed from the initial threading for a 1/3 network following the method from Marian's book. This treadling alternates each layer/weft. I used a tie-up that weaves top and bottom layer as plain weave — the base weave. The remaining shafts were split in a 4:4 ratio that gives an even balance of warp threads in the top/bottom faces.

I was so excited to weave this project on a new AVL dobby loom that I somehow only programmed two-thirds of the treadling. After the samples were in the mail, I wove a sample with the whole treadling and another with the treadling doubled (*Figure 2*). When the warp ran out, I re-warped this design with a teal/tannish warp. An assortment of weft colors were tried on this second warp with some pictured in Figure 3.

Figure 2. Doubling of whole design

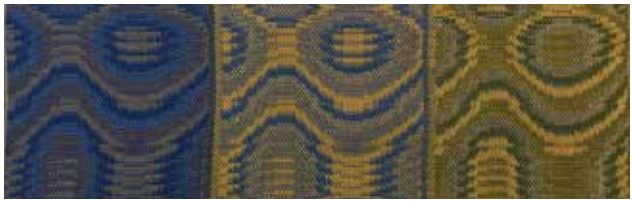


Figure 3. Sampling a variety of wefts *(warp shown sideways)*

Four-color double weave would be fascinating to anyone who loves to mix colors.

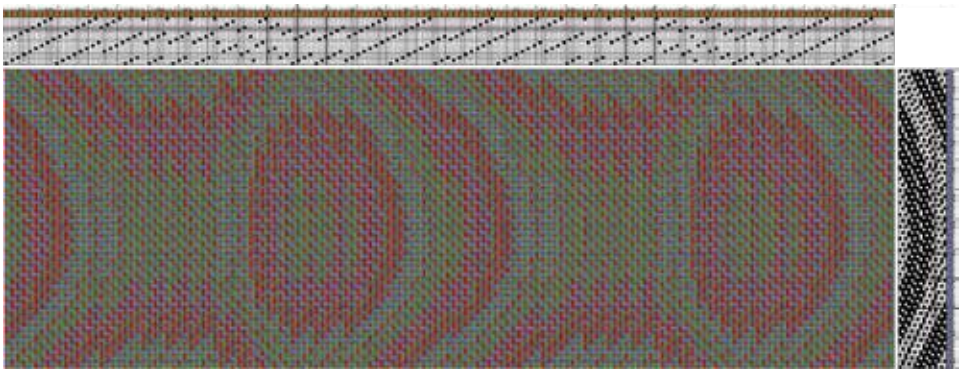


Figure 4. Sample draft

A WIF is available on the Complex Weavers website

Resources

Stubenitsky, Marian, *Weaving with Echo and Iris*, Drukwerk der Kinderen, Uden, Netherlands, 2013-2014

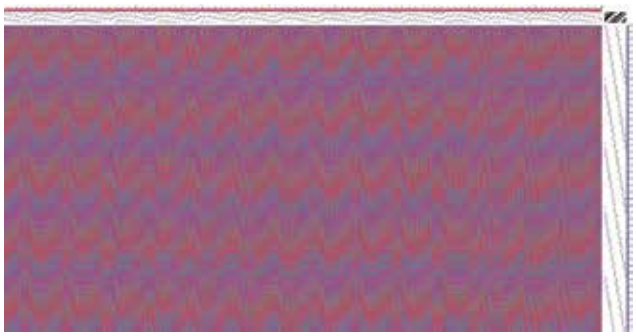
Eureka! A Gold Mine of Color Blends

Frances Osten

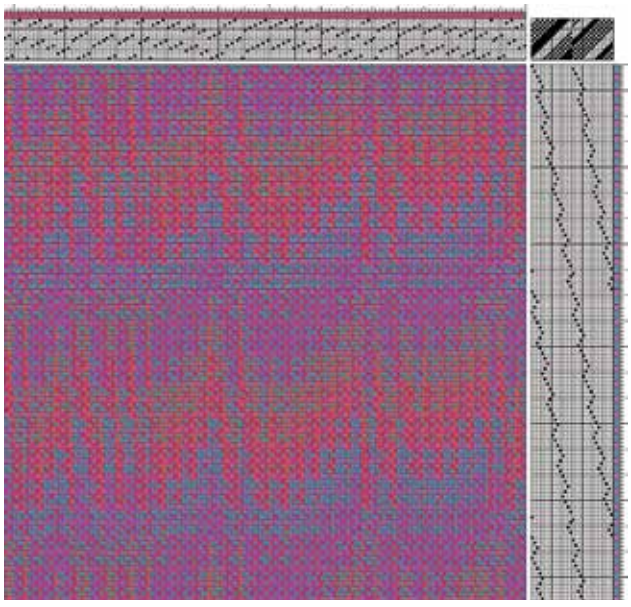
The Sixteens

I am a color junkie. My weaving world expanded exponentially once I began exploring interleaved threadings and echoes back in 2006 after taking a workshop at WEBS with Bonnie Inouye. I did one project with four-color double weave (4cDW) at that time on an eight-shaft table loom, using extra warp from the workshop and a drawdown Bonnie gave me. I was intrigued and remained eager to explore the weave further. I was particularly interested in learning how to devise my own designs, and gain an understanding of the use of tie-up and treadling in the process.

In that first 4cDW project, I tried to use a design originally from Bonnie and modify it by reversing the direction of the twill; and it was not a success. Not knowing how the weave was constructed, I always had a pick at the turning point that was obviously not part of the sequence. Color choices also seemed non-intuitive in that initial piece. I remember the difficulty I had without Bonnie's help in finding weft colors that created the color blends and contrasts that make four-color double weave such an enticing structure.



A WIF is available on the Complex Weavers website



Detail from draft, showing side-by-side tie-ups

By the time I took a second workshop with Bonnie in 2010 at the Weaver's Guild of Boston, I had been doing a great deal of echo weave and was very comfortable with interleaving multiple network twill lines in a threading. In the Boston workshop, Bonnie explained her method of designing 4cDW with side-by-side twill tie-ups (inverting and cycling up the first to obtain the second) and an interleaved treadling with alternating picks in each twill (see draft). I now had an inkling of the basics of a method for designing 4cDW, but at the time I was still weaving on a treadle loom; and even with 22 treadles, I was severely constrained in designing for this structure. (I tend to use my table loom only as a last resort and for workshops.) A great deal of time passed.

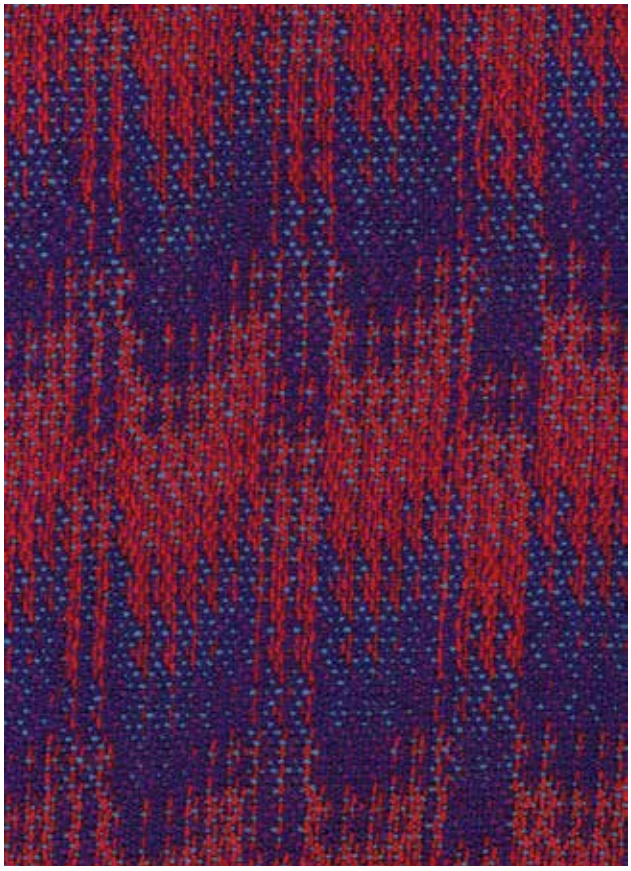
Happily, the Sixteens choice of 4cDW as their topic for 2014 coincided with my purchase of a computer-assisted loom. Now there were no longer any excuses and, in fact, I had a mandate to explore further! As an extra incentive, Marian Stubenitsky's new book came out serendipitously at just this time, giving further inspiration, and was particularly helpful in the process of making color choices. Her method of designing 4cDW is complex and will require more thought and time than I had in order to finish the project before the study group's deadline; but it will get renewed attention from me in the near future.

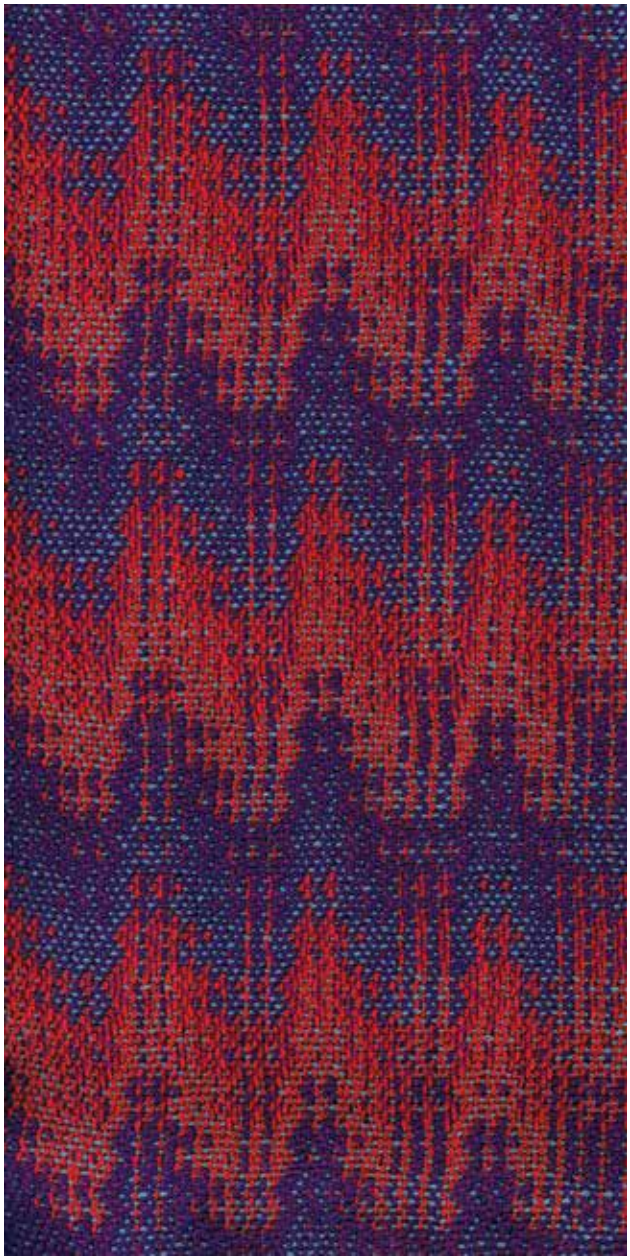
Although I did spend some time drafting potential designs on the computer, coming up with both intriguing designs and color schemes, time on the loom for exploration and sampling for this project before the deadline was more limited than I would have liked, partly because I needed to wait until I had my new (to me) Megado up and running.

The design I eventually chose for this project was based on an earlier eight-shaft network twill pattern I devised and have woven several times, which I refer to as "advancing waves." It was interesting to see it become more abstract with the echoed design.

As an end product, I wanted a drapable fabric for possible use as clothing and so chose a sett of 36 epi. I had previously woven a scarf in 4cDW at this sett, so I had confidence in the choice. This was confirmed in the discussion of sett in Stubenitsky's book. I think the pattern would also make handsome table runners. I liked the boldness of the result.

Choosing such vibrant colors for the warp constrained my color choices for weft. There were samples





in which I tried and rejected colors on the loom that looked much better off the loom, after washing; wet-finishing enhanced the blending of colors. Certain colors popped in unexpected ways. In particular, the greyed teal used in the weft in the final samples is usually, as the name suggests, a subtle color that tones down my overall designs. In this case, the iridescence when combined with the reds of the warp, caused it to glow and sparkle!

Future projects I envision will be to interleave a 16- (or more) shaft pattern and to play with the effects of changing the intervals. I also want to explore how 4cDW might possibly work with a non-parallel interleaved threading.

Yarn: 8/2 Tencel from Webs
Warp Colors: 8/2 Tencel, Ruby, New Red (blended), Amethyst
Weft Colors: 8/2 Tencel, Greyed Teal, Red purple
Sett: 36 epi (3 ends/dent in a 12-dent reed)
Threading: Advancing network twill waves, echoed in interval of 8
Finishing: Hand-washed, spun in machine, line-dried, pressed
Shrinkage: 8% in warp, 3% in weft
Loom: 32-shaft Megado (computer-assisted loom), using 16 shafts for this project
Software: Fiberworks PCW

Resources

Inouye, Bonnie. (2006) *Advance*, written handouts from workshop given at Webs, Northampton, MA.

Inouye, Bonnie. (March, 2010) *Opposites Attract: an Exploration of Parallel Threadings*, written handouts from workshop given at Weaver's Guild Boston.

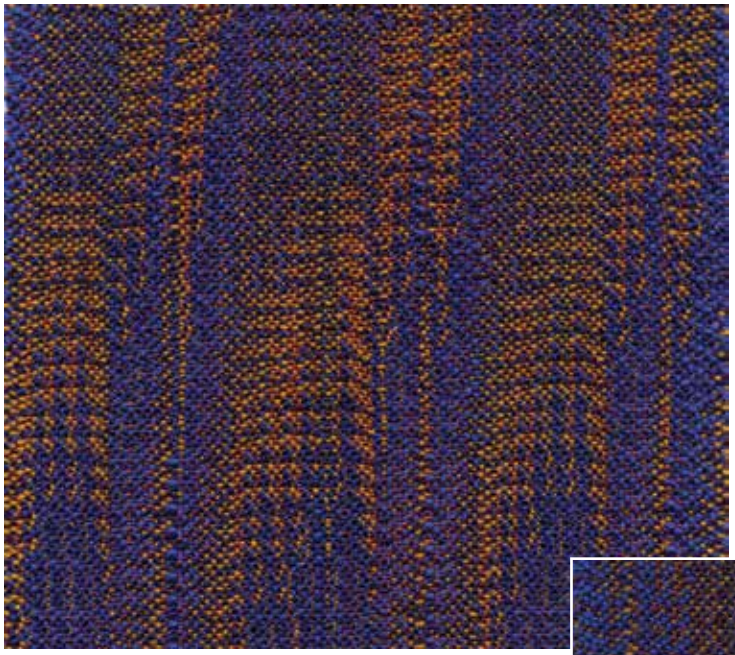
Inouye, Bonnie. (January 19, 2014). "Designing Four Color Double Weave", written for CW Sixteens Study Group.

Stubenitsky, Marian. *Weaving with Echo and Iris*. Drukwerk der Kinderen, Uden, Netherlands. 2014.

Four-Color Double Weave

Judith T. Yamamoto

The Sixteens



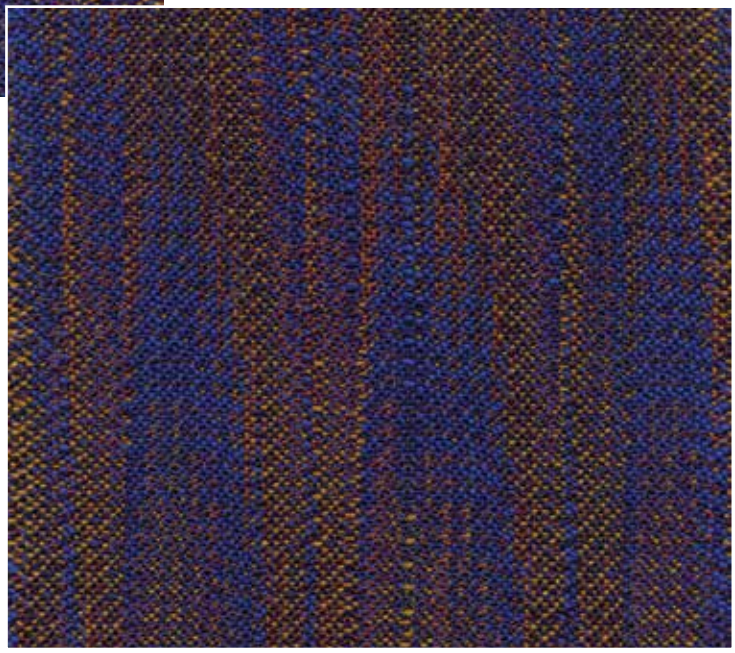
Warp: 8/2 Tencel (Webs Valley Yarns), Tashkent and Navy

Weft: 10/2 Tencel (Textura), Gold, and 2/8 Tencel (Halcyon) Royal

Reed: 8-dent, sleyed 4x

Sett: 40 epi; about 40 ppi

Finishing: Hand wash, warm water/mild detergent. Machine dry.



Because I had not yet acquired my copy of *Weaving with Echo and Iris* when we started this year's project, my starting point for four-color double weave was a pre-publication version of an article by Bonnie Inouye that she generously shared with us. I arrived at the design line by using the drawing tool in WeavePoint, then followed Bonnie's instructions for expanding and developing the tie-up.

Unfortunately, my color choice didn't show up all four color combinations as clearly as I might have wished. This may have been due in part to the fact that the Tashkent is a variegated yarn and the other warp color is the same navy that is one of the variegated colors. I do like the result, though. And the opportunities for color blending are clearly dramatic and worthy of further exploration.

From time to time while weaving, I spotted characteristic double-weave lifts, but I'm still not sure this technique can really be classed as 'double weave.' However... I really, really *do not like* structures that require two shuttles, so echo weave or shadow weave will probably be my choices in the future. Good to have Stubenitsky for inspiration and reference.

Resources

Most useful was the Bonnie Inouye paper on 4CDW, released to the Sixteens in January 2014.

Gingras, Marguerite and Bonnie Inouye. Articles in *Complex Weavers Journal*: Number 70, September 2002; and Number 97, October 2011.

Stubenitsky, Marian. *Weaving with Echo and Iris*. Drukwerk der Kinderen, Uden, Netherlands. 2014.

Waves and Reflections

Mary G Doherty

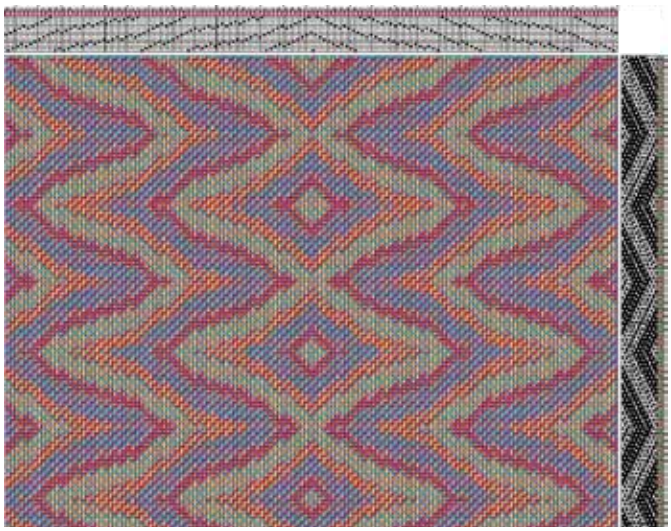
The Sixteens

The 2014 challenge to create four-color double weave samples was my first sample exchange with The Sixteens. Starting with the study group guidelines to design a draft that reflects each weaver's personal creativity, I thought that would be my biggest challenge — but soon realized that to attain that objective I had a lot to learn about 4cDW. Bonnie Inouye's paper *Designing Four-Color Double Weave* helped me through my stumbling blocks. Many drafts later I had a draft that I thought was 4cDW rather than double weave with four colors.

My next challenge was to select yarns. Working strictly from my stash I chose 8/2 Tencel colors straw and red purple for warp.

Selecting the weft was more difficult, as I discovered that colors which had looked good on paper and on the computer did not inspire at the loom. Further sampling of weft yarns in the blues that I love so well produced a washed-out appearance, and other 'from my stash' yarns created an undesirable muddy look. At this point I came close to abandoning my self-limiting restriction of selecting yarns 'from my stash' — but after more trials selected burgundy and iris for weft yarns.

The resulting fabric has a firm hand and the pattern is busy. If I were to use it for a garment I would limit its use to a panel or a decorative element. I think it would make fun fabric for a pillow showing one side on the front and the reverse side on the back.



A WIF is available on the Complex Weavers website

Warp: 8/2 Tencel: Straw and Red Purple
Weft: 8/2 Tencel: Burgundy and Iris
EPI/Reed: 40/10-dent reed
Loom: Louet Megado
Software: Fiberworks; PixeLoom
Finishing: Hand washed; line dried; steam pressed

Resources

Inouye, Bonnie. "Designing Four-Color Double Weave." Paper dated January 19, 2014.

Gingras, Marguerite with assistance from Inouye, Bonnie. "Four Color Double Weave." *Complex Weavers Journal*, September 2002.

Where to Find the WIFs

In recent *Complex Weavers Journals*, you may have seen small notes reading, "WIFs are available on the Complex Weavers website." Not all drafts that appear here on paper have a corresponding WIF online, but most do. Go to *www.complex-weavers.org* and click on the Galleries page. One section of Galleries is devoted to images and WIFs from the *CW Journal*. Click what you need, and happy weaving!

CW Journal Online

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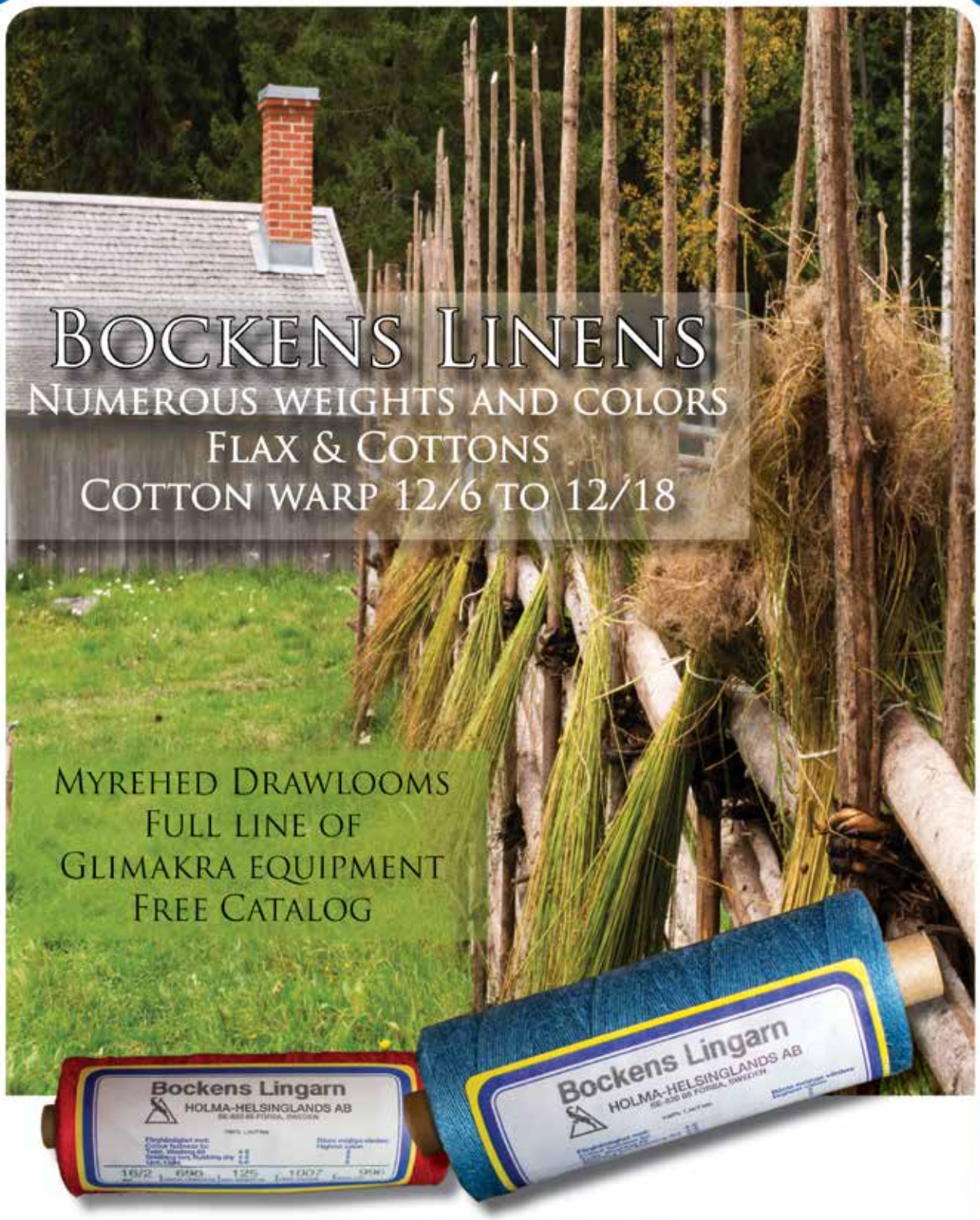

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