Gujarati Warp Ikat Resist Method: A Practitioner's Record and Translation into Cloth

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ABSTRACT *Ikat is a traditional form of yarn preparation for weaving that is practiced in many Asian and Central Asian countries as well as Central and South America and North Africa. Artisans bind selected sections of warp or weft threads before dyeing, in order to form patterns in the cloth as it is woven on the loom. "Warp ikat" describes the process of binding the warp in a patterned way to prevent selected areas from receiving dye prior to placing the warp on the loom to weave. Similarly "weft ikat" is woven from resist-bound dyed weft threads, and "double ikat" is woven from both warp and weft-bound dyed threads. In 2009, a Fulbright senior research award enabled me to document warp resist binding in the village of Somasar, in the Surendranagar region of Gujarat, India. Master Weaver Vaghela Vitthalbhai allowed me to observe, photograph and video him at work, from winding the warp yarn, to folding it in preparation for binding, to transferring it to the binding frame and binding the warp*

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threads according to my paper design. Over a period of weeks and repeated visits, I developed a clear idea of the exacting process that only the master weaver fully comprehends. This paper describes in detail, from an artist's perspective, the Gujarati method for warp resist and discusses subsequent studio application. Video documents and photographic records have been a valuable asset in reconstructing the process.

KEYWORDS: Ikat, Gujarat, weaving, resist dye, warp binding

Introduction

Ikat is a method of dyeing warp and/or weft yarns, using binding of selected areas of the threads to resist dye the yarns in a patterned way, prior to placing them on the loom to weave. Strategies for ensuring the accurate placement of the resist binding typically require securing the threads tautly in a frame. Separate cultures have developed similar methods to achieve the desired results following the same basic concept, but with variations in procedure and equipment specific to their geography. Dye work is completed prior to weaving, and in double ikat both warp and weft are bound and dyed, then woven so the pattern emerges between the two sets of threads. Double ikat is the most complex and difficult to achieve with accuracy. Warp ikat, weft ikat and double ikat are used to describe both the process and the woven cloth that is a result of one of the processes. "Patola" is a double ikat fabric with distinctive stylistic identity historically woven in the town of Patan, Gujarat. In India, artisans in at least four different centers practice ikat resist in their unique way.

Rosemary Crill (1998) notes that the earliest evidence of ikat in India appears in pictorial form in the fifth to seventh-century wall paintings of Ajanta in the Deccan. The first possible literary reference appears in a text written in 959 CE; however, the reference is simply the use of a word that later became associated with patola. In the thirteenth century, she finds a direct reference to ikat as a process in the Manasollasa. Visual records of ikat are plentiful and a significant amount of research has been published about the historic, aesthetic, social, economic and cultural context of this Indian weaving tradition.

Scholarship on the actual process of preparing the warp for binding is limited to a handful of texts and several researchers report that practitioners maintain secrecy over a key step in the process. This paper is an initial effort to begin building a step-by-step record of the measuring, folding and grouping of threads to build the web of warp threads required for binding repeated pattern that ultimately results in ikat fabric according to the method practiced in Gujarat. I do not discuss weft binding here. The paper responds directly to the need expressed by Ashoke Chatterjee, former Executive Director of India's National Institute of Design, in his discussion regarding the Ministry

of Textiles in the context of India's 12th Five Year Plan (2012–17). According to Chatterjee (2012), "to ensure that design is recognized and supported … building foundations of knowledge through serious investments in craft research and documentation/publication" should be an essential part of the plan.

Background: A Master Weaver in Somasar, Gujarat, India

Weft ikat cloth hangs in the window of Master Weaver Vaghela G. Vitthalbhai's establishment in the village of Somasar, located in the Surendranagar district of Gujarat, India. For generations, Vitthalbhai's family wove cotton *khadi* (hand spun and hand woven) cloth. The master weaver learned how to weave from his parents and grandparents. They wove *dhoti* (a loosely wrapped fabric around the lower half of a man's body) cloth for area farmers and the Rabaris, an historically nomadic people, who reside in western Gujarat. In the early 1970s when Mr. Vitthalbhai was on an errand in Rajkot, the third largest city in the state of Gujarat, he discovered he could apprentice himself to a master weaver of patola fabric at Rashtriya Shala, an educational and civic institution. His experience there enabled him to transform the weaving life not only of his village, but also of surrounding ones, introducing the weft ikat process, using first cotton and then silk, replacing the production of khadi cloth. I met Mr. Vitthalbhai in February 2009 when I was searching for a master weaver who would permit me to document his process of warp preparation for resist dyeing.

My research goal was to document the warp preparation process so that I could understand how such accuracy in the design is obtained as seen in the Guajarati ikats. As a weaver, my interest in ikat burgeoned when I began working on an electronic dobby loom in the 1990s, following a number of years of pseudo-ikat practice, that is, painting dye onto warps that were already on the loom. Computer-assisted weaving provides a wealth of design potential for the hand weaver; however, technology has a price. The danger of getting delicate electronic connections wet makes the high-tech loom a poor place for warp painting, dyeing and rinsing directly on the loom to obtain a painterly or simulated warp ikat effect. While satisfying and quick, this wet process is too risky for the circuits installed on many studio weavers' looms. The warp ikat process is an ideal method to alter warp yarn color as dye work is completed prior to weaving.

What Is Unique to the Warp Binding Process that Allows Such Accuracy?

The idea of making ikat is simple. One prepares the yarn so that the areas the artist wants to be a specific color are exposed to the dye while all the others are bound with a resist that prevents the dye from reaching those places. An elaborate manual process allows the

weaver to produce repeating patterns in the warp. Alfred Bühler and Eberhard Fischer provide a two-volume illustrated text with images, drawings and narrative to describe the entire process and design vocabulary (Bühler and Fischer 1979). Their work is key to the scholarly field of textile studies; however, it is not widely available to the artist. Photographs are difficult to read when trying to decipher this exacting procedure, which is dependent on skillful manipulation of fine threads, counting and interlacing groups in a repeating process until the final desired bundles are obtained.

In 1996, Lydia Van Gelder updated and republished her 1980 book *Ikat*, in which she includes valuable historic information, photographs, diagrams, equipment plans and project descriptions. She details the process from several different geographically located groups. This book is the most comprehensive one that I have seen for artists who want to make intricate ikat fabric in their studio and I have used that information in my own work. Another valuable book that describes ikat method with illustrations and photographs is *Japanese Ikat Weaving: the Techniques of Kasuri*, by Jun and Noriko Tomita (1982).

Seeking a Mentor

In 2009, a Fulbright senior research award (the Fulbright Program is administered by the Bureau of Educational and Cultural Affairs of the United States Department of State) enabled me to document warp resist binding in India. It took the first month there on the ground in Gujarat to establish contact with a potential mentor. I found that the structure of the Fulbright award's management was a tremendous asset in finding collaborators for my work. My institutional affiliation was with the Department of Clothing & Textiles at the Maharaja Sayajirao University of Baroda, in the state of Gujarat, about two hours drive from Ahmedabad, home of the famous Calico Museum of Textiles. Dr. Anjali Karolia, currently head of the department, served as my faculty liaison and introduced me to key individuals in the Crafts Cluster Initiative that the National Institute of Fashion Technology (NIFT) had been conducting in five states in India, including Gujarat. Vandita Seth, on the apparel design faculty of NIFT in Gandhinagar, and Rajesh Gupta, who at the time was the director of the Gandhinagar Center, welcomed me to their project in the rural area of Surendranagar, where several villages were participating in the weaving cluster project creating weft ikats. Their products ranged from saris and dupattas to cushion covers, stoles and scarves.

My family and I traveled to visit weaving families on February 6, 2009, where Mr. Gupta and several staff members from the crafts cluster based in the city Surendranagar brought us to visit two villages in the district where weft ikat was the primary occupation. At the second stop, I met Master Weaver Vaghela Vitthalbhai. In conversation, I discovered he had a patola loom (a loom specifically for weaving double ikat cloth in which the reed and shedding

mechanism is built around the warp and which tilts in relation to the seated weaver) on the second floor of his workshop, with a warp on it (Figure 1). It took several more visits to work out an agreement with him and make arrangements for me to observe and document his procedure. I am deeply grateful to all the staff of the crafts cluster who helped me get started and to Mr. Vitthalbhai's family for allowing me into their household workspace to make observations. When I worked with Mr. Vitthalbhai in 2009, he did not produce double ikat cloth regularly because the village production is centered on weft

Figure 1
The patola loom housed in the establishment of Mr. Vitthalbhai, with a weaving in progress in 2009. For this style loom, the master weaver builds the shedding mechanism and reed around the warp. When I visited again in December 2013, he had replaced this loom with one that had a permanent reed and beater system. He told me that the loom illustrated here is now in the Patola Museum in Patan.

ikat, but he retains the knowledge and skill for this complex craft. When I made a return visit in December 2013, he had resumed a small production of double ikat and had a new loom in place of the one I saw.

Before beginning our work, I interviewed Mr. Vitthalbhai with the help of crafts cluster staff member Nidhi Chauhan, who translated between English and Gujarati. The Institutional Review Board of the University of Nebraska, my home institution, approved this project. My research protocol included both an informed consent form that described my intentions to exhibit, photograph, film and publish what I learned from him and a formal interview protocol for the initial interview. I reviewed the detailed consent form with him and he agreed to grant permission for the various forms of documentation and end uses I proposed and signed it. When I developed the form, I negotiated permission from the review board to publish each individual weaver's name. I wanted to be able to use their names in publications and exhibitions I developed as a result of my work with them as I believed it was important for their business and subsequently have sent the weavers copies of the material I have developed thus far.

Over a period of weeks and repeated visits in April 2009, I developed a clear idea of the process that only the master weaver fully comprehends. My primary interest as an artist was to learn the intricacies of preparing the warp for binding. I knew I would not replicate the patola loom in my own studio; however, I did also observe the master weaver set the warp onto the loom. I believe it is important to add this knowledge to the written and photographic record in a public way as a contribution to the effort to document traditional craft processes.

Documenting the Observation of Warp Ikat with Still and Video Images

Mr. Vitthalbhai invited me to design a double ikat. He allowed me to observe him working through the process of winding the warp yarn; folding the interlaced warp chains; securing the binding groups of the interlaced warp ends of the folded warp; lacing the design center fold end to a pole; transferring the warp to the binding frame; and binding off the warp threads according to my paper design. In addition, I documented him dyeing the warp; removing the bindings; and opening up the fine silk threads to prepare them for the loom. I also photographed him setting the warp onto the loom, an extraordinary process in itself, and part of the reason that very little shifting occurs with the warp threads, therefore contributing to accuracy of the design.

I watched, photographed, filmed, and took notes while he worked according to my plan. His two sons helped with different steps and occasionally a youth from the village would be enlisted to assist. It was clear that he was the only one who understood the finer details

of the process. As part of our agreement, I purchased the fabric he produced.

While Mr. Vitthalbhai had once studied English and even taught it in school briefly as a young man, he did not speak to me in English. On the first day of our work we had a translator from the crafts cluster group, but on all subsequent days we communicated primarily through gesture.

Preparing the Warp

Winding

I worked out a single unit of the design in yellow, blue and white on graph paper, intending the basic motif to repeat across the width and length of the finished cloth. Master Weaver Vitthalbhai calculated the size of the warp for the weaving to accommodate the design four times across and to make two complete lengths, with a reversal of the design at the center of each of the two fabrics. This design required four sets of warp chains of 488 warp threads. To wind each warp chain, he used thirty-two warp ends in a paddle, and wound a total of 1,952 threads for the body of the design. The actual binding unit was composed of eight warp threads. He wound an additional chain for the selvedge which he dyed solid blue.

With the help of his sons, on the first day of my observation, he wound the warp outside in the yard, using four metal rods; the two outside rods were pounded into the dirt for this purpose, marking the full length of the warp, and the other two were inserted into holes drilled into a heavy wooden base. The silk, which they had previously scoured, had already been wound onto small spools, with thirty-two spools set onto a creel, their threads inserted alternately through a warping paddle made of heddles in another, smaller wooden frame. To wind the warp, Mr. Vitthalbhai's son walked the creel with the threads on spools (Figure 2a) while Mr. Vitthalbhai guided the paddle (Figure 2b) along the rods posted in the yard. At the middle two rods he used the paddle to separate the warp to make the "cross" (literally an alternate stacking of the warp threads winding in a figure-of-eight around warp pegs to keep the threads in the order they are wound) (Figure 2c). He brought the warp around the outer rod and then brought the whole group of thirty-two threads back around to create the cross again and to the other end rod. His sons kept the spools of warp filled, replacing the spool as each one was depleted. Behind the scenes, women in the household wound the spools.

Master Weaver Vitthalbhai tied each warp section at the cross with cotton threads and identified them as first, second, third and fourth chains with the same number of knots tied into cotton cord to label them. He placed the four individual warp chains consecutively on a carefully polished wooden pole that was oval along its length. Mr. Vitthalbhai reused this pole throughout the warp preparation process as he went through all the steps required.

Figure 2

(a) Mr. Vitthalbhai's son held the warping creel with thirty-two spools of silk to wind the warp. During this break, he held the warping paddle against the creel so it is hardly visible in this photo. (b) Mr. Vitthalbhai paused, holding the warping paddle constructed with heddles and a wood frame. Silk threads fed off the warping creel pictured in part (a). (c) The metal poles were situated to maintain the cross that Mr. Vitthalbhai created with the warping paddle.

Interlacing the Chains to Produce a Widthwise Repeat

To create a repeating design across the width of the warp, the threads from each of the four sets of warp must be carefully organized and interlaced into sets of thirty-two threads, composed of eight threads from each of the four warp groups. This first step of interlacing the individual warp chains is crucial to the entire project.

Bühler and Fischer (1979) record in a footnote, “This highly complicated stage could not be observed completely. The weavers wanted to maintain secrecy” (Bühler and Fischer 1979, vol. 2: 294).

Mr. Vitthalbhai completed the first step of this process on the same day he wound the warp; however, he did the work after I left that evening. When I returned for my second day of observation, the warp had already been interlaced, consistent with other researchers’ experience. We reviewed the process in the morning to be sure I understood what he had done, as I describe below.

Mr. Vithalbhai used a soft cotton thread to bind every eight consecutive threads in each warp of the four warp chains. These groups of eight threads formed the smallest binding unit for the ikat work (Figure 3). Once he had bound the first set of thread groups, he looped around them with a continuous looping that resembled a back stitch in sequence to maintain their order for the next step.

With the entire length of the four warp chains stretched out straight in the yard, the first group of eight threads from each of the four chains were grouped together and bound with soft cotton thread.

Figure 3
The threads from each of the four sets of warp were carefully organized in sets of eight. These sets were then combined with the corresponding set of eight in each of the four warp groups, creating an interlinked network of warp.

The master weaver bound the next group of eight threads from each of the four warps. This procedure combines the corresponding set of eight threads in each of the four warp groups, creating an interlocking lace-like configuration, joining all four groups of warp into sets of thirty-two threads. Mr. Vitthalbhai bound each group of thirty-two threads with a short length of soft cotton thread to secure it temporarily. Once he had bound all the groups, the master weaver looped soft cotton thread around them in warp order, using the backstitch looping described above. He inserted another length of soft cotton around a cross he created to maintain the sequence of these interlaced bundles. Mr. Vitthalbhai inserted two aluminum rods into this cross to transfer the bundles of thirty-two threads to the other end of the warp before pushing the rods to the other end (Figure 4). He removed bindings around the units of eight threads.

This particular step in the process is vitally important to create the repeat design along the width of the fabric. The subsequent process of folding the warp allows the weaver to repeat the design along the length of the warp.

Figure 4
The master weaver inserted a loose cotton thread loop to maintain the order of the initial interlacing of the four warp chains. The rods allowed the weaver to move the cross easily down the length of the warp.

Folding the Warp in Half

For the first operation, the warp was extended to its full length out of doors. Next, the warp was folded in half. The master weaver set the ends of the four warp groups onto the polished wooden pole aligned so that the beginning or cross end of the first warp and the other end of the same warp were placed next to each other, doing the same for the remaining three groups of warp. He inserted a second wooden pole at the fold and loosely tensioned the warp for the following step. Before binding, Mr. Vitthalbhai walked the length of the warp with a cup of water; every few feet he would spit a spray of water onto the silk. The aluminum rods remained in place to transfer the binding groups from one layer to the other.

The wind grew too strong for the work to continue outside so Mr. Vitthalbhai moved the group inside the shop where he extended the folded warp the full length of the room and through the doorway so he could complete the binding and loop backstitch style around the folded warp groups. Using the binding and looping from the previous step, he selected and bound the top group of thirty-two threads to the bottom group in order from the cross (Figure 5a). First he bound the groups at the fold end; then he wrapped the backstitch loop around these in order (Figure 5b). With an assistant passing the binding groups down the length toward him, Mr. Vitthalbhai looped

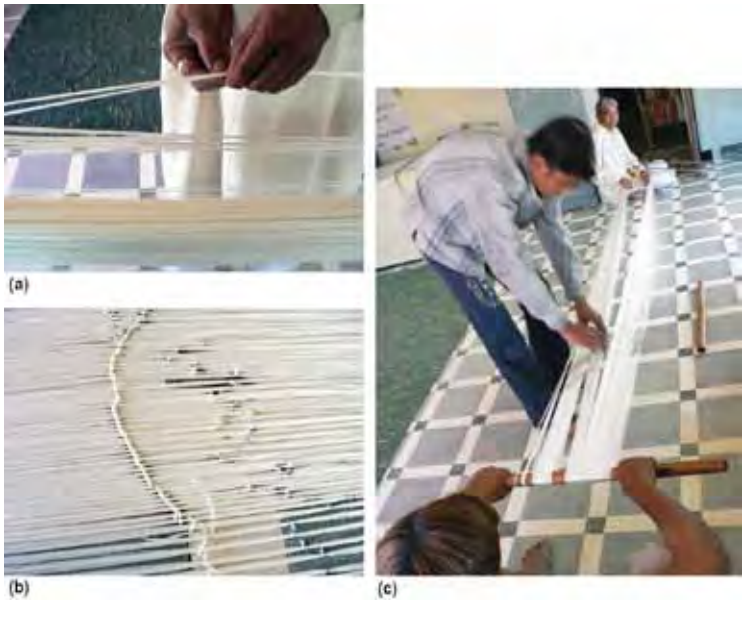

Figure 5

(a) Deftly, Mr. Vitthalbhai wrapped temporary binding threads around the warp groups. (b) The style of backstitch looping to preserve order is clearly visible. (c) Mr. Vitthalbhai guided his sons and male neighbors through the preparation of the warp because several people are needed to complete these steps and maintain tension on the warp during preparation.

around the top and bottom groups of threads at the ends of the warp on the other side of the room (Figure 5c). He then removed the first looping around the four individual warp chains.

Folding the Warp in Quarters so the Pattern Repeats Four Times Lengthwise

At this stage, the warp was ready to fold a final time before being set under tension for binding the resist pattern in a room upstairs, underneath the patola loom. At the centerfold, Mr. Vitthalbhai divided the interlaced groups of sixty-four warp threads into four equal sets. He found the beginning or cross end for the first warp and slid it onto his wrist. Then he found the cross end for the second warp. After determining the cross end for each warp he positioned them onto a third wooden pole. He used the original end ties of the four separate warps to place them in numerical order. He took equal sections of the warp from the fold end and interlaced the first cross end with the first group of ends from the fold (Figure 6) and placed them alternately on the third wooden pole, in essence forming the length of the warp into a folded and layered loop. Mr. Vitthalbhai inserted a heavy cotton cord through the eight groups of the warp in the same order as the wooden pole was inserted. This cord remained throughout the binding and dyeing process so that the weaver was

Figure 6
Still working on the first floor of his shop, Mr. Vitthalbhai calculated the relative position of the three wooden poles, based on where the warp design would be placed on the loom.

able to remount the warp onto the pole and onto the binding station after each dyeing.

Mr. Vitthalbhai carefully calculated the relative positioning of the three wooden poles because their placement determined where the binding design would land on the warp and consequently where it would fall on the loom. He allowed enough for waste at both the front and back of the loom and he calculated where the two separate designs would land. Each design would be symmetrical along the warp length—a point I did not plan for in my design work—as will be seen later. Situated to the master weaver's left side was the central design axis line of the resist binding. One pole was to his right side. None of the thread between the center pole and the pole to his right would be bound with resist because this section divided the two weavings.

Mr. Vitthalbhai transferred the warp from the pole on his left side to a thin steel rod. He had already inserted a loop of soft cotton through this end. By this time, the eight original threads for the pattern unit had in effect been multiplied to 128, a result of the four warp chains that the weaver interlaced at the onset, creating groups of thirty-two, and the number of times the warp was folded, in this case four times, thus creating sixty-one groups of 128 threads for each segment of binding. Mr. Vitthalbhai lashed the steel rod tightly against the wooden pole separating each warp group of 128 threads with a durable, plied nylon cord (Figure 7).

Figure 7
The thin steel rod allowed the weaver to produce a fabric with the design reversing symmetrically along the length at this point. Nylon cord lashed around the pole both secured the warp and marked the sixty-one warp binding groups.

Setting the Warp on the Binding Frame

The actual resist binding of the warp took place in a second-floor room equipped with floor-to-ceiling rigid beams set into the concrete floor. Once the warp had been configured for binding, the team brought it upstairs. Father and sons tensioned the warp, setting it perpendicular to the floor about ten inches (254 mm) above it. Mr. Vitthalbhai took the wooden pole with the warp lashed to it and secured it to a beam on the left side of the room. The beam had two screw-eye bolts, each containing an oval steel ring large enough to hold the wooden pole, permanently attached about fifteen inches (381 mm) apart from each other. Strips of rubber inner-tube held the wooden pole from slipping. One son held the warp under tension during this procedure (Figure 8). After Mr. Vitthalbhai used metal

Figure 8
A hand-hewn beam supported the carefully smoothed wooden pole on which the warp was lashed. Pieces of rubber kept the pole from slipping.

Figure 9
The dyed warp overhead formed a canopy over the binding area. Heavy cords anchored the warp to beams set directly into the concrete floor.

rings to secure the pole with the lashed and folded end to the beam, he began the process of securing the other end of the warp. He and his sons used heavy cords to put the warp under enough tension for it to remain rigid and square during the binding process, tying it to the second interior beam across the room (Figure 9).

Once the warp was securely in place and the cords were taut, Mr. Vitthalbhai checked for level along the wooden poles with a heavy nail tied to a string. Not satisfied with the alignment, he pulled on the cords and then, to tighten the top section of the warp, he used an extra rope to bind around the top cords to shorten them slightly and tighten them. He stopped only when the warp was level.

At this point, Mr. Vitthalbhai made a secure binding of each of the four warp divisions about ten inches (254 mm) to the left of the centerfold of the warp, the ends of which were interlaced with the cross end of the warp on the center wooden pole. These large bindings stayed in place for the duration of the binding and dyeing and ensured that the warp threads did not shift during the preparation for resisting the warp, dyeing, rebinding and the successive dyeing. Next, the master weaver secured two sticks about twenty

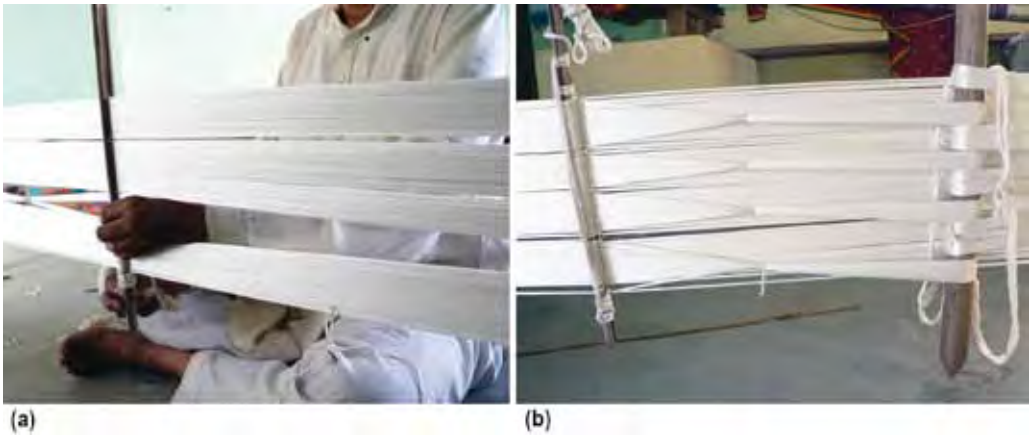

Figure 10
(a) Mr. Vitthalbhai positioned two smooth sticks with flat-length sides facing each other over the warp. (b) The warp is securely tensioned on the binding frame. Mr. Vitthalbhai has lashed a set of two smooth sticks to secure the order of the binding groups on the right side of the binding area. He has also carefully bound the warp into four groups.

inches (508 mm) long and about three-eighths of an inch (9.5 mm) in diameter on either side of the warp between the lashing pole and the center pole, about seven inches (178 mm) to the left of the binding of the four warp groups. He lashed together the two slender wooden poles, set on either side of the warp, wrapping around each binding group as he lashed the two small poles together (Figure 10).

The warp was in position for binding, but first had to be marked in increments corresponding with the graph paper (Figure 11). Mr. Vitthalbhai used a handmade eight-inch (203 mm) ruler, an awl and charcoal slurry to mark the top and bottom of the warp. He checked for level accuracy with a nail on string. Then he dipped a length of string into the slurry and transferred a line to the stretched warp in one-inch (25 mm) increments (Figure 12).

To bind the actual resist design, Mr. Vitthalbhai placed the binding thread around the group of warp, allowed the warp to relax back into place to check his placement, then continued binding, wrapping the binding threads around the warp group six to eight times, pulling tightly after each twist. At the beginning, he inserted the binding thread into the body of the warp he was wrapping to hold it, and on the final twist slipped the thread under the previous rotation to secure it. A bowl of water sat at his side so he could moisten the silk and cotton.

The tools that Mr. Vitthalbhai used were crafted locally and of readily available material for the most part. He had a nearby carpenter make some of the painstakingly sanded wooden tools. One key piece of equipment was the hardwood pole that was flawlessly smooth and shaped with an oval cross-section rather than round. This held the warp in position at various points in the preparation. On

Figure 11
A metal stylus dipped into charcoal slurry served to mark intervals on the warp.

the binding station it was tensioned to maintain the warp placement so that the design retained its integrity throughout.

Once the weaver completed the binding to preserve all areas that were to remain white, Mr. Vitthalbhai removed the warp from the tensioning system. He removed the poles and steel rod as well. The cotton cords that marked the warp divisions remained in place. A youngster from the village helped prepare the dye bath for the first color. Mr. Vitthalbhai used synthetic dye, most likely an acid dye, and began with the yellow color. After the yellow dye was applied and the warp dry, he returned it to the binding station, following the previous steps. The master weaver left the initial resist bindings for the white on the warp and he bound new sections that were to remain yellow. Following this operation, he again removed the warp and set the silk

Figure 12
Mr. Vitthalbhai dipped a thread into the charcoal slurry and stretched it over the warp to apply a measuring grid.

into a discharge bath to remove the yellow from any exposed warp threads. He then dyed the exposed warp blue. I was not present for these two procedures. For a third time, he returned the warp to the binding station to remove all the binding. Although I documented the subsequent unfolding of the warp and separating the silk threads, and mounting the warp onto the loom, these steps are beyond the scope of the present paper.

Translating the Gujarati Warp Binding Method into a Studio Practice

Documentation of Master Weaver Vitthalbhai's work folding and lacing the warp together on a flip video was extremely helpful in my efforts to recreate the procedure months later in my studio. When I duplicated this process, I chose not to create a repeating design across the width of the warp; instead I made duplicate warps of different weights of wool, which I interlaced in the same fashion described above, so that I would have the possibility of weaving the design more than once with variations possible in weft or loom setup. Therefore, in principle I duplicated the interlacing and folding of the warp on several weavings, but to less symmetrical ends.

I developed a technique of sectioning and folding the binding groups, using my own figure-of-eight system to maintain order. I opted not to bind the warp as frequently throughout the process as did the master weaver. My biggest challenge was to determine how to create an adequately tensioned system for setting up the warp for binding and allowing enough room for my desired warp length.

While in the Gujarati binding method, the weaver sits cross-legged on the floor and works with the warp perpendicular to the floor, I decided to set the warp at table height, parallel to the floor. I installed two sturdy, metal handles into which I could slip a wooden rod to hold the warp. I attached the handles to the framing on the house around two windows to hold one end of the warp and I used the weight of my loom to anchor the other end. This combination provided stability and flexibility in the length of the warp to be bound (Figure 13). For smaller operations, a more portable system can be developed.

Figure 13
I stretched the warp out from the window framing to my loom. The red of the binding threads from a previous warp resist, dyed red were reused here. The fold line is in the foreground and used for hem.

In the example of the Indian design work that Mr. Vitthalbhai prepared, the pattern was symmetrical lengthwise, so the weaver must be able to bind and dye the warp at the fold line and the design must take this symmetrical reversal axis into account (Figure 14). It is crucial to understand this point to orient the graph paper design to the warp precisely where one would want a reversal in the design. In the weaving the master weaver completed according to my graph paper design, the yellow "sun" motif looked more like a dividing egg yolk at the center line because of the way I had positioned it in the design unit on the graph paper drawing (Figure 15).

In my studio work, I chose to use the fold area variously in my weavings. After a small test weaving to review the technique, I designed a larger project where I used text, largely to see if I could keep the letters legible. On this first weaving I incorporated the fold of the warp into the design. This time I was able to build the reversal into the design work and space the binding of the letters in relationship

Figure 14

The warp was placed on the binding frame one last time to remove the last sets of resist that preserve the white thread. The warp was later washed to remove the charcoal marks before being set on the loom. The yellow met the yellow on the fold at the steel rod, making an awkward transition on this axis.

Figure 15
The completed weaving was presented in an exhibition titled *Color and Pattern: Tribal and Contemporary Ikats of India and Laos*, September 20 to October 15, 2010, in conjunction with the Textile Society of America 12th Biennial Symposium, Lincoln, NE. See: http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1073&context=tsaconf

to the spacing throughout the text (Figure 16). For subsequent weavings I used the fold as a dividing point between two individual weavings that used the same binding design work, but I allowed space to cut the weaving in half and hem them at the fold.

The technique I used for binding was similar to that of the master weaver's. Because I did not have a big supply of the soft cotton multi-strand threads that Mr. Vitthalbhai used, I tested binding with

Figure 16
This warp is bound with cotton thread resist. The fold line is close to the binding area and is worked into the design.

cotton, wool and hemp. While many weavers have switched to plastic for binding, I like neither recycled plastic bags nor the commercially available and expensive ikat tape. I found that if I wrapped tape on my fingers before several hours of binding, I could protect the skin from getting cut and I like the quality of the resist. I also use natural dye and needed to work out when I would mordant my yarn—before or after binding. I decided to mordant the yarn after I wound the warp chains, but before I set up the warp for the binding so that when I was finished with the binding I would be able to dye the warp immediately.

The first weavings I made using warp ikat were based on the following text:

Shady
loans
doom
oddly
bland
hoods
blood
on my
hands

The text has a limited number of letters. The design became a word game, making a phrase that consisted only of the letters used in "blood on my hands." Each word had to be five letters so that I could create a separate warp for each of the five letters in each text column. In contrast to the typical yarn used in the warp in India—cotton or silk—I used two different weights of wool to create three full sets of warp with this same text. In this fashion, I was able to practice lacing together the three warp chains, bind them as one design and obtain three dyed sets of warp with duplicate bindings (Figure 17).

Figure 17
Blood on My Hands. 2010. Wendy Weiss. Binding units of two threads create the incremental shift for the text in this weaving in wool and monofilament, dyed with madder root and cosmos flowers.

To develop the designs for the weaving, I worked on graph paper between hand drawings and drawings in Photoshop. Just as in any weaving, it is important to calculate the relationship of the thread count to the design. Hence I needed to establish how many threads in the warp were the equivalent of one square on the graph paper. For the finer-weight wool, I used five threads in the binding unit and for heavier plied wool I used only two threads per binding unit. I used a figure-of-eight to wrap around the binding groups. I used the raddle group as both a counting device for threading from the back of the loom and as a preliminary count for the binding groups.

As I worked on the next project, called "Against the Sky" (Figure 18), I decided to fold the warp once and make a pictorial image of a tree silhouette. I used the spacing at the fold to cut the two fabrics in half and create hems for the weavings. I wound the warp in sections so it would be more manageable to dye, give me flexibility in the dye pot for controlling color, and help to keep the warp chains from getting too cumbersome to handle. In the future, it will be possible to generate more weavings from the multiple bindings of the warp and alter the sequence that they are dressed on the loom, vary the threading and weft design. To some degree, the color can be changed from each set of warp, but the initial dye phases of the bound resist dye work require all of the warp that is bound together

Figure 18
Against the Sky. 2012. Wendy Weiss and Jay Kreimer. Installed at the Museum of Nebraska Art.

to be dyed in the same bath. Once the binding is removed and the warp groups are separated, successive baths can further distinguish the warp color.

Conclusion

Historically, the patola weavers of Gujarat maintained a structure of secrecy surrounding the production of their exquisite fabrics. My experience in conversation with master weavers in three different towns in Gujarat has led me to believe that this tenacious hold on the process is slowly breaking down. The Salvi weavers of Patan are the subject of a rare two-volume illustrated text that includes, in addition to extensive documentation of historical textiles and motifs, a detailed description of the ikat process (Bühler and Fischer 1979). The Salvi's participation in that project is a source of honor and pride to the family, who actively maintain their workshop in Patan today. Adult sons who have advanced educational degrees have returned to work with their senior family members in the weaving workshop. Wait times for orders for a sari can be up to three years. This family indicated to me that I would be welcome to work with them documenting the ikat process. Ultimately, I worked with Master Weaver Vitthalbhai because he was able to dedicate an entire project to me for observation and had more flexibility in his production schedule.

How does the global crafts community respond to the dual need of preserving the livelihood of specialized crafts producers and addressing the challenge of preserving a tacit form of knowledge that has traditionally been taught to a limited group of people through oral tradition and apprenticeship? Ritu Sethi, Chairperson, Craft Revival Trust, and advocate for the preservation of craft, argues:

> there is an urgent need to research, analyse, categorise, and document craft traditions and developments as there is a very real danger of technologies and processes, motifs, designs and traditions dying out due to change, under use, or even the death of a specialised artisan or craft family/group. (Sethi 2010)

Some might consider Master Weaver Vitthalbhai a maverick in the traditional world of patola weaving; however, I believe he understands the need for perpetuating the craft. He himself learned from a master weaver as an apprentice, outside of the family structure. He knowingly allowed me to document his work. He told my colleague, Dr. Anajali Karolia, that at the outset he was not convinced I would be able to understand the process. But over time I gained his trust and he understood that I did comprehend what he was doing. He became vested in the project and valued my interest in his work (Figure 19). The Textile Society of America invited him to demonstrate the ikat method at the 2010 international conference in Lincoln, Nebraska, but he was unable to secure a travel visa to

Figure 19
Master Weaver Vitthalbhai setting the warp he created for me onto the loom. It was the last day of our work together and he was eager to complete the loom so he could show me the beginning of the weaving.

the United States. The complications that arose in attempting to obtain a visa could be the subject of another article and highlight the prejudicial status of the craftsperson in the eyes of officialdom.

At the same time, growing international awareness about the value of the artisanal cultural heritage, both in monetary terms and as critical tacit knowledge, invites consideration of important questions such as how a living craft tradition changes in a globalized economic culture; how the attitudes of the craftspeople working in historically guarded craft practices have changed regarding the transmission of technical knowledge; and the role of documenting specialized craft practices in the preservation of the craft.

In recent communications with Master Weaver Vitthalbhai's younger son, who has earned a post-secondary degree, I have learned that the family is eager for me to return to the village to work with them in design development. It is my intention to provide training in basic design and the use of an inexpensive design software program to work with weavers in Somasar with the goal of showing how the weavers can employ their implicit knowledge in developing their own new designs. While I have translated the skills I learned from Master Weaver Vitthalbhai into my own work, I hope that I will able to give back to the weaving community by providing conceptual tools and guidance in design development.

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