Reviewed Article:

More Testing of Mesoamerican Lunate Artifacts as Possible Loom Weights, that also Functioned as Twining Tools

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In previous replication studies and experiments, a lunate jade artifact from the Pre-Classic/Formative period (1500 BC-AD 250) of Mesoamerica was analysed, researched, and tested for its similarities to the crescent weight, a specialized type of loom weight found in ancient Central and Southern Europe. These analyses successfully established that even a form of this artifact made of wood, shell, or other common, everyday materials would have served effectively as a loom weight that was comparable in form and function to the

European crescent weight for warp-weighted weaving looms; in addition, further experiments showed that this artifact, and the European crescent weights, can effectively and efficiently be used to create different types of sheds for weaving both basic and more complex textile patterns, greatly reducing the need to use a pick or batten to lift individual warp threads or the need for complex groups of heddles.

In this current project, further replication studies serve as a pragmatic method for testing the lunate artifacts as specialized weights for twining on warp-weighted looms. The efficacy of the artifacts for warp twining and for weft twining is tested using methodologies that were developed to test the function of the European crescent weights. Also explored are new possibilities for the practical applications of these types of weights as specialized twining tools.

> The lunate weights enable many different methods for twining that have not been explored in previous research, as these loom weights are simply and effectively used to create different types of sheds for both basic and more complex twining structures.

Review of the Research

Research conducted over the past century has conclusively demonstrated that textiles played an important role in Mesoamerica, particularly from the Classic period (AD 250-900) through contemporary cultures. Archaeological evidence preserved in the arid caves of northern Mexico confirm that textile production began in ancient times, with extant examples illustrating that netted, twined, and woven fabrics of yucca, cotton, and cotton blends were produced by 2500 BC (Johnson, 1971, pp.297-321; MacNeish, et al., 1967, pp.191-198, 211-223; Vaillant, 1930, pp.38, 188; Vaillant, 1939, p.170; Wilkerson, 1981, p.325). Analysis of these Pre-Columbian textiles has also revealed fabrics that were made on different types of looms—not only the iconic Mesoamerican backstrap weaving loom, but also on looms that allow elaborate warp manipulation techniques, such as the horizontal ground loom or the warp-weighted loom (Filloy Nadal, 2017, pp.7,15-17, 36; see also Follensbee, 2020).

While the scant preservation of textiles in most other regions of Mesoamerica have thwarted research, untapped sources of information have been recognised recently that enable more in-depth examination of very early textiles. For example, in the southern Gulf Coast region of Mesoamerica, where the Olmec culture flourished during the early and middle eras of the Pre-Classic/Formative period (1500 BC-AD 250), extant artifacts include a textile-impressed potsherd collected in the earliest excavations at the site of La Venta. The excavator Philip Drucker published a photograph of the potsherd and its positive putty impression (See Figure 1), and tentatively captioned the image as “Sherd with textile impression, apparently of closely woven twined basketry (?)” (Drucker, 1952, Plate 22e). As noted by Follensbee (2008) and Pohl et al. (2019), however, the smoothly woven stitches more closely resemble thin yarn, 1.5 mm in diameter, in a cloth of 22-23 stitches per square centimeter; this impression could therefore also be interpreted to illustrate tightly loom-woven, weft-faced 2/2 tabby weave cloth (See Figure 2). Further close examination, however, suggests that this potsherd could instead illustrate a tightly packed, warp-faced warp-twined cloth, as the impressed stitches appear to form both straight rows and straight columns, as in twining, rather than forming the staggered pattern of a tabby weave (See Figure 3).

The rich pictorial evidence of fibres and cloth in Olmec ceramic and stone sculpture also clearly attests to the making of a variety of elaborate fabrics by these early cultures. Some depictions illustrate what is likely a gauze fabric, also known as square netting or warp-twined openwork (Fig 4. La Venta Monument 13; Fig 5. La Venta Stela 5), that is incorporated into high-status clothing (Follensbee, 2000; 2008; see also MacNeish, et. al., 1967, p.211.[1] Such openwork fabrics, both warp-twined and weft-twined, were made throughout the Americas in Pre-Columbian times, with extant examples from caves in northern Mesoamerica dating to the Guerra culture of 1800-1400 BC and the Mesa de Guaje culture of 1400-400 BC (Johnson, 1971, p.307). Later preserved examples from both northern and southern Mexico illustrate that twined gauze fabric was sometimes further embellished with float yarns woven through the netting to create elaborately brocaded designs (MacNeish, et. al., 1967, pp.211-214; Domenici and Sánchez Valenzuela, 2017).

As with textiles, Gulf Coast Olmec artifacts made of wood, bone, shell, and unfired clay are preserved only in the rarest of circumstances, and thus traditional textile tools and equipment - which are typically made of these common, everyday materials - have not survived. Nevertheless, the re-analysis of a number of enigmatic small stone objects found in Gulf Coast Olmec graves and in “heirloom caches” of Formative period jade objects found throughout Mesoamerica has revealed that the Olmec produced elite versions of tools and equipment made of highly coveted, non-perishable materials such as jade - a practice also common among later Mesoamerican cultures (Follensbee, 2008, pp.87-88). While most of these surviving Olmec jade artifacts were initially identified simply as “ornaments,” “objects of unknown use,” “miscellaneous objects,” and “implements for mysterious unknown purposes,” the excavators postulated that the more mysterious of these objects may have served as some sort of tools (Coe and Diehl, 1980, pp.240–242; Drucker, 1952, pp.168–171; Drucker, 1955, pp.63–65; Drucker, et al., 1959, pp.191–194; Covarrubias, 1957, p.75). Re-analysis has, in fact, revealed a number of these items to be closely comparable to tools used in later Mesoamerican cultures for spinning and weaving. Replication studies have subsequently demonstrated their effectiveness as spindle whorls, weaving awls and picks, battens and half-battens, and netting gauges (Follensbee, 2008; 2015; 2017; 2018; 2019).

Another ancient jade object also worthy of reconsideration is a small solid lunate or crescent-shaped artifact (Fig 6. Lunate jade artifact) that was found in a cache of Pre-Classic/Formative period jades at the Gulf Coast site of Cerro de las Mesas (Drucker, 1955, p.64, Plate 49l). A previous article (Follensbee, 2020) explored the reinterpretation of this lunate artifact as a possible loom weight for a warp-weighted loom, as it closely resembles a type of crescent loom weight that was developed and used throughout central and southern Europe during the late 4th and early 3rd millennia BC, when warp-weighted looms were widely used in this region (Lassen, 2015, p.127; Costeira and Mataloto, 2018, p.59; Grömer, 2018, p.118; Ergün, 2020, p.5). Multiple replication studies and experiments have illustrated that the European crescent weights function very effectively as loom weights (e.g., Lassen, 2015, pp.136-137; Grömer, 2018, pp.118-126; Ulanowska, 2018, p.170) and that warp-weighted looms are effective in the creation of plain tabby weaves, patterned textiles, and gauze weave fabric (Ulanowska, 2017, p.61). Replication studies and experiments conducted with a common form of the Mesoamerican lunate objects - that is, an everyday form made of common lightweight materials - establish that these artifacts, like the crescent weights, also provide stable tension while helping to disperse stress on the warp threads, balance well and shift smoothly with the movement of weaving, thus avoiding common problems prevalent with other shapes of weights by aligning in separated rows that stay in place and do not tangle easily. They also offer the advantage of enabling flexibility in weaving techniques, allowing quick changes of design within a textile (Follensbee, 2020). In addition, these experiments also successfully demonstrate that the lunate artifacts, and likely the crescent weights, are effectively used to create different types of sheds for weaving both basic and complex textile patterns, greatly reducing the need to lift individual warp threads with picks, battens, or heddles.

Another hypothesis raised for the European crescent weights is the possibility that these weights may have been used in the creation of warp-twined textiles, but this possibility has been explored only in a relatively cursory manner (Grömer, 2018, pp.123-126).[2] Some of the advantages provided by both the lunate and crescent weights in the previous experiments–particularly in facilitating appropriate tension and balance for warp threads, keeping the warps aligned in rows and untangled, and creating different sheds for basic and complex warp patterns--would be particularly effective in warp twining, which sometimes incorporates complex manipulations of the warp threads. Given that both warp-twined and weft-twined textiles are common in both ancient Pre-Columbian and European cultures, and with the emphasis on warp manipulation and warp patterning in Pre-Columbian Mesoamerican textiles (King, 1979, pp.274-275), this hypothesis merits further exploration.

Experimental Archaeology Project

Based on the above background research, this experimental archaeology project has been proposed to use replication studies to test several hypotheses:

1. In the previous research (Follensbee, 2020), the Mesoamerican lunate artifact replicas proved similarly very effective and efficient, as did the European crescent loom weights in providing stable warp thread tension, good balance, separation and stability of the warp

in rows, and reduction of warp tangling. Would the lunate artifacts provide similar effectiveness and efficiency in twining?

2. Given that past experiments establish that Mesoamerican lunate weights and the European crescent weights allow for good manipulation of warps and are effective in the creation of a natural shed and counter sheds of different types, would these loom weights efficiently facilitate and expedite the making of warp-twined and of diverted-warp weft-twined textile structures?
3. Would the lunate artifacts facilitate the creation of the warp-twined textile structures like those shown in Olmec textile impressions and illustrated in Gulf Coast Olmec sculpture—specifically, in making a tightly packed, warp-faced warp-twined fabric that would compare closely to the textile-impressed potsherd from the site of La Venta, and in making the warp-twined openwork/netted/gauze fabrics depicted in the sculpture?
4. As past experiments indicated that the lunate weights and the crescent weights allow for flexibility in changing among different patterns and techniques of weaving within the same textile, would these weights also allow for such flexibility in twining?

To begin these experiments, accurate replicas of the Mesoamerican lunate weights were produced for use as loom weights. Like later Mesoamerican everyday textile tools, common versions of these objects were likely made of lighter-weight, perishable materials such as shell, wood, or bone. Thirteen replicas of the lunate artifacts were therefore made of air-dry clay, because this material allows for accurate replicas of the artifacts to be made quickly and efficiently in the proper size and form, and because the result closely mimics the interpolated weight (two to five grams) of common lightweight versions of these objects in wood or bone (See Figure 7). Thirteen weights were created to accommodate single warp threads tied in each hole of the weights so that twining structure samplers of 26 warp threads could be produced.

A simple warp-weighted loom was constructed using the basic sidebars of two heavy, forked branches, each cut off at an angle on the bottom so that the loom would securely rest against a wall at an approximately 60-degree angle. A thinner branch that fit neatly into the forked tops was selected to serve as the top loom bar, and these three pieces were tied together using 1.5 mm cotton yarn cordage. Another thin branch was tied horizontally across the middle of the front of the loom to provide a shed bar, which would also serve as a neutral rest for the weights and perhaps as a wrist-rest while twining. Finally, a thin branch was suspended from each side of the top with cordage to create an adjustable floating back shed bar, which would provide a secondary neutral rest for the weights, if needed (See Figure 8).

The fibres prepared for these studies consist of commercially produced 8/4 un-mercerized natural cotton yarn, which closely matches the 1.5 mm cotton yarn that was used to create the textile impressed in the La Venta ceramic potsherd. These experiments would include textiles typically made with two-colour warps, so black-brown fur (another common

Mesoamerican fibre; see Follensbee 2020) was also hand-spun into yarns of 1.5-2 mm in diameter to provide the contrasting-colour weft that is desirable for making clearly visible float weave brocades and diverted warp designs.

For all of these experiments, 26 warp threads were tied to the top bar of the loom, and then one warp thread was tied per hole in the weights (two warp threads per lunate weight), with the first thread tied in the proper right hole and the second tied in the proper left hole, so that all of the lunate weights were evenly lined up across the warp, and all lunate weights were initially facing to the artisan's left. The separation of the holes in the lunate weights creates a primary "natural shed," with the odd warp threads toward the back of the loom and the even warp threads toward the front of the loom (See Figure 7). Although the mass of the lunate reproductions is relatively light, the reproductions illustrated that they worked very well with the two cordage types in these studies, providing ample weight to provide stable tension for the warp, but not so much weight that they strained or threatened to break the cordage used.

Experiment #1: Twining with a One-Color Warp

The first pattern produced in these studies was plain warp twining, with warp threads of 1.5 mm natural cotton yarn that were placed tightly together; the initial weft thread was tied to the top loom bar, to the left of the warp threads. The first row of twining was created by placing the weft in the primary natural shed and then turning each of the crescent weights individually one-half turn counter clockwise so that all of the crescents faced to the right. (The crescent weights may be turned clockwise or counter clockwise, but for an even appearance, the weights should be turned consistently in the same direction.) The weights were turned one more half-turn counter clockwise, and then the weft was packed to the top with a small batten. Repeating these actions then efficiently created additional rows of twining. Packing the wefts tightly created a textile with a woven appearance, but with the stitches both in straight rows and in straight columns (See Figure 3), as appears to be illustrated on the potsherd from La Venta (See Figure 1).

The second pattern produced was also plain warp twining, but with warp threads of the natural cotton yarn that were evenly spaced to create an openwork fabric. The same technique was used, but after three initial rows of packed wefts to stabilize the warp and to regulate the width of the textile, the subsequent wefts were spaced 8 mm apart, creating an openwork twined textile structure also known as a gauze fabric or netted textile (See Figure 9. Top). A variation of this pattern is to turn each lunate weight individually one full turn for a double twist between each weft row; this places the wefts further apart and squares the spaces, creating a form of openwork/gauze/netted structure specifically known as square netting. A thicker yarn or unspun roving material may also be used as a weft (See Figure 9. Bottom), and when the weft is densely packed, this creates a thick, fluffy, warm textile.

This experiment confirmed that lunate weights greatly facilitate plain warp twining, making this technique much more simple, quick, and efficient than either warp twining or weft twining by hand. The lunate weights also facilitate a smooth twining action and the creation of very regular, even twists. In addition, the use of the lunate weights on the weighted loom provides an advantage in maintaining a balanced, soft tension of the warp, which allows horizontal weft rows to be easily straightened and adjusted for spacing with a weaving pick, batten, or comb.

In addition to the overall warp-twined construction of these fabrics, supplemental weft twining may be introduced to create different effects (see twining structures and terminology in Drooker 1990, 183).[3] While the lunate weights do not work to facilitate plain weft twining or alternate-pair diverted-warp twining structures--because these techniques do not involve turning or twisting the warp--the weights do allow for these types of weft twining to easily be introduced into an otherwise warp-twined textile. These types of weft twining are added simply by twining supplemental wefts around the warps in a manner that unites or separates the warps as desired (See Figure 10. Top)

The lunate weights facilitate types of diverted-warp weft twining that involve twisting the warp, such as transposed crossed diverted-warp twining structures and transposed interlinked-warp twining structures. For transposed crossed diverted-warp twining, the crescent weights are turned one half-turn clockwise (or counter clockwise) within the row, which transposes each pair of warp threads. For transposed interlinked-warp twining, the crescent weights are turned one full turn clockwise (or counter clockwise), which creates a complete twist in the warp but returns the warp threads to their original positions. In both of these weft-twining techniques, the weft thread is twined as usual around the warp while the warp threads are twisted, which is facilitated by the lunate weights that hold the warp threads in the proper positions. The lunate weights also assist in making the twisted diverted warp designs straight and even (See Figure 10. Bottom.)

Finally, both warp-twined openwork/gauze/netted fabric and diverted-warp weft-twined openwork/gauze/netted fabric may be left as plain openwork, or these types of structures may be used to facilitate added effects and decoration, such as float weft yarns that are woven through the openwork fabric to create an embroidered or brocaded effect (See Figure 11), as illustrated in later Mesoamerican textiles (MacNeish, et. al., 1967, pp.211-214; Domenici and Sánchez Valenzuela, 2017).[4]

Experiment #2: Diverted-Warp Weft Twining with a Two-Colour Warp of Paired Colours

For a diverted-warp twining structure with a two-colour warp of paired colours, the 26 warp threads were tied to the top bar of the loom in the same configuration as for the previous experiment. The colours were arranged in an alternating pattern of two warp threads of the hand-spun black-brown fur yarn and two warp threads of the natural cotton yarn, and each pair of warp threads was then tied to a lunate weight. An initial weft thread was tied to the loom bar, and then the warp was stabilized, and the width was regulated by creating several rows of plain warp twining at the top of the textile.

The first weft twining structure in this experiment is known as diverted-warp two-colour double-faced crossed-warp weft twining, and this structure involves displacing the warp threads in patterns and using horizontal weft twining to hold the diverted warps in place. The pairs of dark-colour warp threads were stretched into diamond shapes on the front of the textile, and these shapes were held in place by the twined wefts; the light-coloured warp threads were simultaneously stretched into diamond shapes on the back of the textile, and these are visible through the openwork of the textile (See Figure 12). While double-faced crossed-warp weft twining does not involve twisting the warp, the lunate loom weights still facilitate this type of twining by stabilizing the warp into a wide shed: The lunate weights may be placed flat, facing the front or back of the warp, which holds each pair of warp threads open wide horizontally; the weights may also be placed sideways, which holds the warp threads of each pair close together horizontally. Alternating these positions facilitates the weft twining of the diamond shapes.

The second structure in this experiment was plain weft twining with patterns of transposed crossed diverted warps, which involves displacing the warp threads over several rows of weft twining to form one large pattern. For example, a large diamond shape may be formed through first creating an inverted V by crossing successive groups of warp threads into X-shapes, running each warp element in an oblique path away from its original position, and weft-twining each row in place; this starts with one pair of transposed crossed diverted warps in the centre of the first row, then two pairs in the centre of the second row, three in the third, four in the fourth, five in the fifth, and six in the sixth row. Then, a ‘V’ is formed underneath this shape by reversing the process, which diverts the warps back to their original positions, resulting in the diamond shape (See Figure 13). The lunate weights provide the flexibility of the warp needed to allow for this pattern, and they also facilitate the creation of this pattern; after first crossing each pair of warp threads in the pattern one half-turn with the weight, the weight may then be placed flat in the front of the textile to hold the widening (and then narrowing) diverted warps in place during the rest of the process.

The third structure in this experiment is called oblique interlacing, which uses the same process used for the second structure. The primary difference between these two types of twining is that, in oblique interlacing, the warps are diverted several times before being weft-twined in place, which creates a relatively wide row of interlaced warps (See Figure 14).

As with transposed crossed diverted-warp weft twining, the lunate weights provide the necessary flexibility in the warp for this structure and placing the lunate weights flat in front of the textile facilitates this process by holding the progressively widening diverted warps in place.

Experiment #3: Warp Twining with a Two-Colour Warp of Alternating Colours

For warp twining with a two-colour warp of alternating colours, the 26 warp threads were tied to the top bar of the loom in the same configuration as for the previous experiments, but with the warp threads alternating with one warp thread of the hand-spun black-brown fur yarn and one warp thread of the natural cotton yarn. For each two-colour pair of warp threads, the natural colour warp was tied in the proper right hole of a lunate weight, and the black-brown warp was tied in the proper left hole of the lunate weight; the initial weft thread was tied to the top loom bar. Then the warp was stabilized, and the width was regulated by creating several rows of plain warp twining at the top of the textile.

The first structure in this experiment was two-colour alternate-paired warp twining. In this technique, each lunate weight is turned one half-turn clockwise in sequence (or one half-turn counter clockwise in sequence), twisting the two warp colours around the weft. This technique can be used to create horizontal lines and diagonal lines, and by reversing the turning direction of the weights, one can also create patterns such as chevrons, zigzags, and concentric diamonds (See Figure 15). This type of twining is greatly facilitated by the crescent weights, which not only organize and hold the warp threads in place during the warp-twining process but can be easily manipulated in sequence to create the different patterns.

The second structure in this experiment is two-colour, double-faced crossed-warp weft twining. This type of twining involves displacing each two-colour pair of warp threads into crossed warps (X-shapes) by turning the crescent weights one half-turn in the same direction and then weft-twining the warps in place. By crossing each successive pair of warp threads in the same direction for three rows, this displaces each of the warps successively along oblique paths, creating diagonal lines of colour, with one diagonal line of colour on the front and one on the back of the textile--but the openwork design of the textile allows both colours and patterns to be seen from one side (See Figure 16). Then the process may be reversed by turning the crescent weights one half-turn in the opposite direction for the next three rows, and this creates a zigzag or herringbone pattern. This twining structure is greatly facilitated by the crescent weights, which organize and hold the warp threads in place during the weft-twining process.

Concluding Remarks

The results of these replication studies successfully establish the possibility that Gulf Coast Olmec lunate artifacts could have served effectively and efficiently as loom weights for warp-weighted twining looms. Although the Mesoamerican lunate artifacts--whether made of jade or common materials such as bone, wood, or shell--were relatively light in weight, these experiments show that they would have provided stable warp thread tension and good balance for twining on a warp-weighted loom, without overly straining the warp threads. In addition, the lunate shape allows for smooth shifting of the weights during twining and for easy separation of the warp threads in rows that stay in place; these weights therefore greatly reduce the tangling that is a problem with other forms of warp-weighted loom weights. Perhaps most importantly for the purposes of this study, the lunate artifacts also proved fully effective in the twining of fibres commonly used in ancient Mesoamerica that have been spun in the size illustrated in a preserved Gulf Coast Olmec textile impression, as well as in the making of a tightly packed, warp-faced warp-twined fabric that closely compares to the fabric illustrated in this textile impression. The lunate artifacts likewise proved effective and efficient in the making of warp-twined textiles with an openwork/netted/gauze structure like those illustrated in clothing that is depicted in Olmec sculpture.

Further, these experiments successfully demonstrate several new hypotheses. The lunate weights enable many different methods for twining that have not been explored in previous research, as these loom weights are simply and effectively used to create different types of sheds for both basic and more complex twining structures. The weights are also flexible in allowing for the use of different twining techniques and effects within the same textile. Moreover, using the lunate weights greatly facilitates warp twining and the making of crossed or twisted diverted-warp weft twining structures by providing great control in manipulating the warp. The weights enable the artisan to turn, cross, and twist the warp threads smoothly and evenly, and they provide stable but gentle tension and control that allows the artisan to produce finely twined textiles much more efficiently—and much more proficiently--than making these fabrics completely by hand.

Overall, these studies offer possible insights into ancient Mesoamerican experimentation with twining looms, with tools used to facilitate twining, and in the creation of loom-made textiles during the Pre-Classic/Formative period. In addition, because past analyses illustrate that the Mesoamerican lunate artifacts also compare closely in form and function with European crescent loom weights, these studies also offer new possibilities for understanding European loom weights and twining techniques.

1 A similar structure is leno weave or cross weave fabric, which is produced on a fixed loom (such as a backstrap loom or a frame loom) using a doup tool to twist the warps around the weft. Leno fabric structure is highly identifiable, however, because the warps must be twisted in alternate directions for each row to secure the weft. While twined fabrics may be made in this alternating twist pattern, plain twining is generally twisted consistently in the same direction to create a smooth, even fabric; the individual twists in warp-

twining and in weft-twining may also be varied and made in any direction, to create a variety of different effects and patterns.

2 Warp-twined fabrics made with two-hole loom weights such as these have the same twined structure as those created using two-hole weaving tablets (which is at its essence a warp-twining process), with the main difference in the function of the objects being determined by their forms. The lunate and crescent weights, with their elongated forms and the wide positioning of the holes, function well as weights for warp-weighted looms, while tablet weaving requires flat tablets in flatter, more compact, solid shapes with rounded corners that can be turned easily and not catch on the warps of a fixed tension loom. Interestingly, found in close association with European crescent weights and other warp-weighted loom weights are relatively lightweight and flat, rectangular and oval ceramic objects with two to six evenly distributed holes; while some scholars have postulated that these may also be loom weights, others have noted their close similarity in form to early weaving tablets, postulating that these artefacts were experimental tools and may have served as early precursors to European weaving tablets (e.g., Costeira and Mataloto 2018, 62-64). Clear examples of European weaving tablets, tablet-weaving looms, and tablet-woven fabrics otherwise date to 1000 BC, with archaeologically recovered weaving tablets of wood, horn and bone that take the flat shapes of rectangles, triangles, squares, pentagons, and hexagons with rounded corners (Snow and Snow 1973, 4-12).

3 The terminology for and illustrations of the different weft twining structures referenced in this essay follow Drooker (1990).

4 The ancient Mesoamerican gauze textiles analyzed by Domenici and Sánchez Valenzuela were found with child burials, in which two children wore necklaces with distinctive shell pendants that compare closely with the forms of semicircular types of European crescent weights (2017, 77-78). As with many earlier Mesoamerican objects that were worn as part of jewelry and regalia, these could also have served as functional objects; preliminary replication studies suggest that these pendants could have served as warp-weighted loom weights for twining, similar to these experiments with the Mesoamerican lunate artefact. Both of these pendants show wear between the top two holes, and experiments with stringing them in the relevant manner for loom weights illustrates that stringing the warp in this manner, between the two holes, works well in using these as loom weights. One of the two pendants, however, also has a third hole at the bottom, creating a triangular formation of holes, but with no corresponding wear between this hole and the other two holes; this third hole also serves no purpose for this object’s use as a pendant or as a warp-twining tool. One tentative explanation for the configuration of holes in this artefact is that, not only may it have been used as a loom weight, but its flat form, rounded corners, and the equidistant, triangular arrangement of the holes and differential wear suggest that this could additionally have been used as a three-hole tablet for tablet weaving—a function that requires further replication studies testing (Snow and Snow 1973, 10 and 77-78).

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loom

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Pre-Columbian Research

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Gallery Image

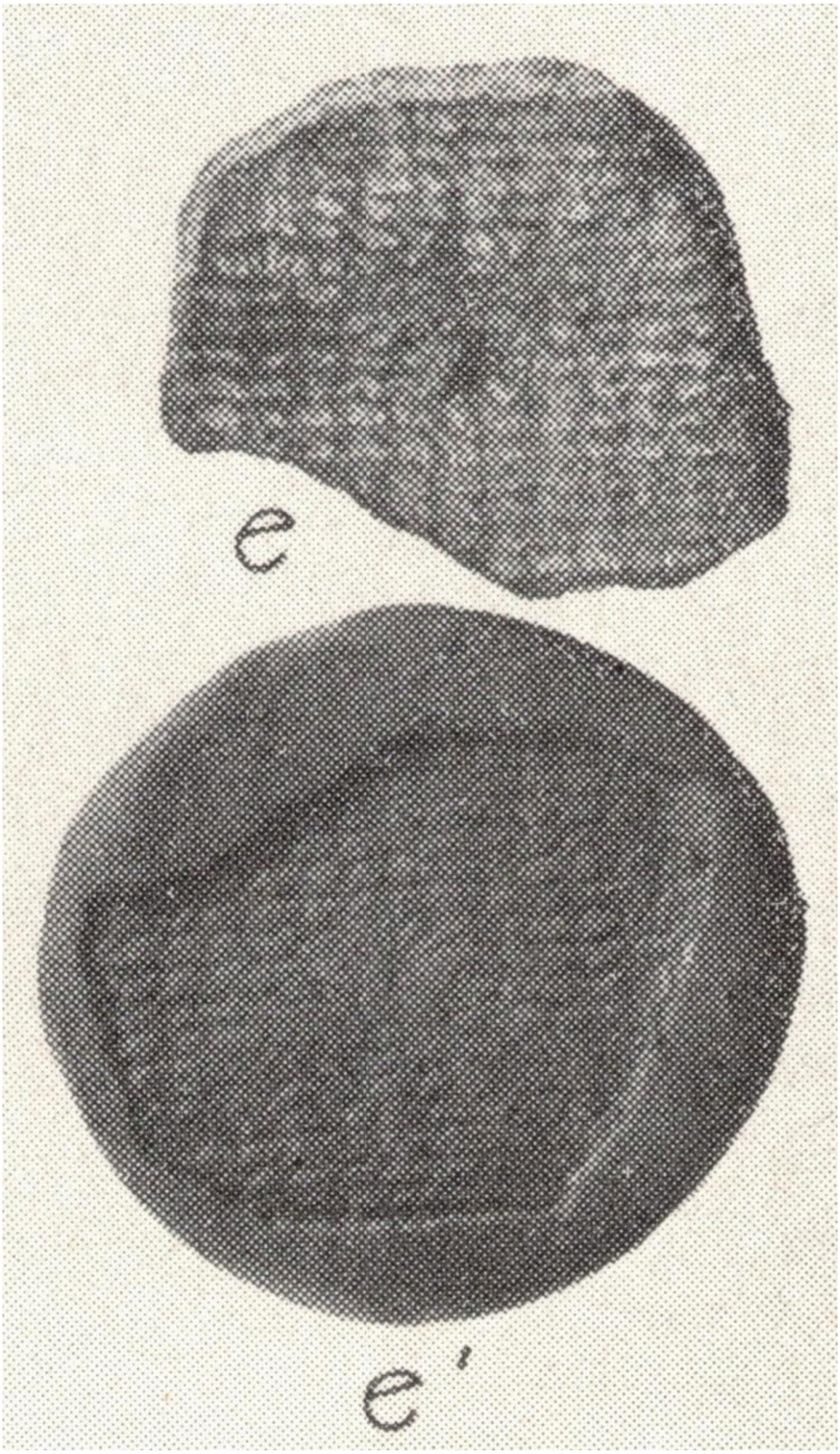

FIG 1. TEXTILE IMPRESSION ON A MIDDLE PRE-CLASSIC POTSHERD FROM THE SITE OF LA VENTA, AND ITS PUTTY IMPRESSION (DRUCKER 1952, PLATE 22E). COURTESY OF THE SMITHSONIAN LIBRARIES: HTTPS://LIBRARY.SI.EDU/DIGITAL-LIBRARY/BOOK/BULLETIN1531952SMIT

FIG 2. LOOM-WOVEN, WEFT-FACED 2/2 TABBY WEAVE PRODUCED USING THE LUNATE ARTIFACTS USING 1.5 MM COTTON YARN CORDAGE (FOLLENSBEE 2020). PHOTO BY BILLIE J. A. FOLLENSBEE

FIG 3. TIGHTLY PACKED, WARP-FACED WARP-TWINED FABRIC AS PRODUCED IN THIS EXPERIMENT. PHOTO BY BILLIE J. A. FOLLENSBEE

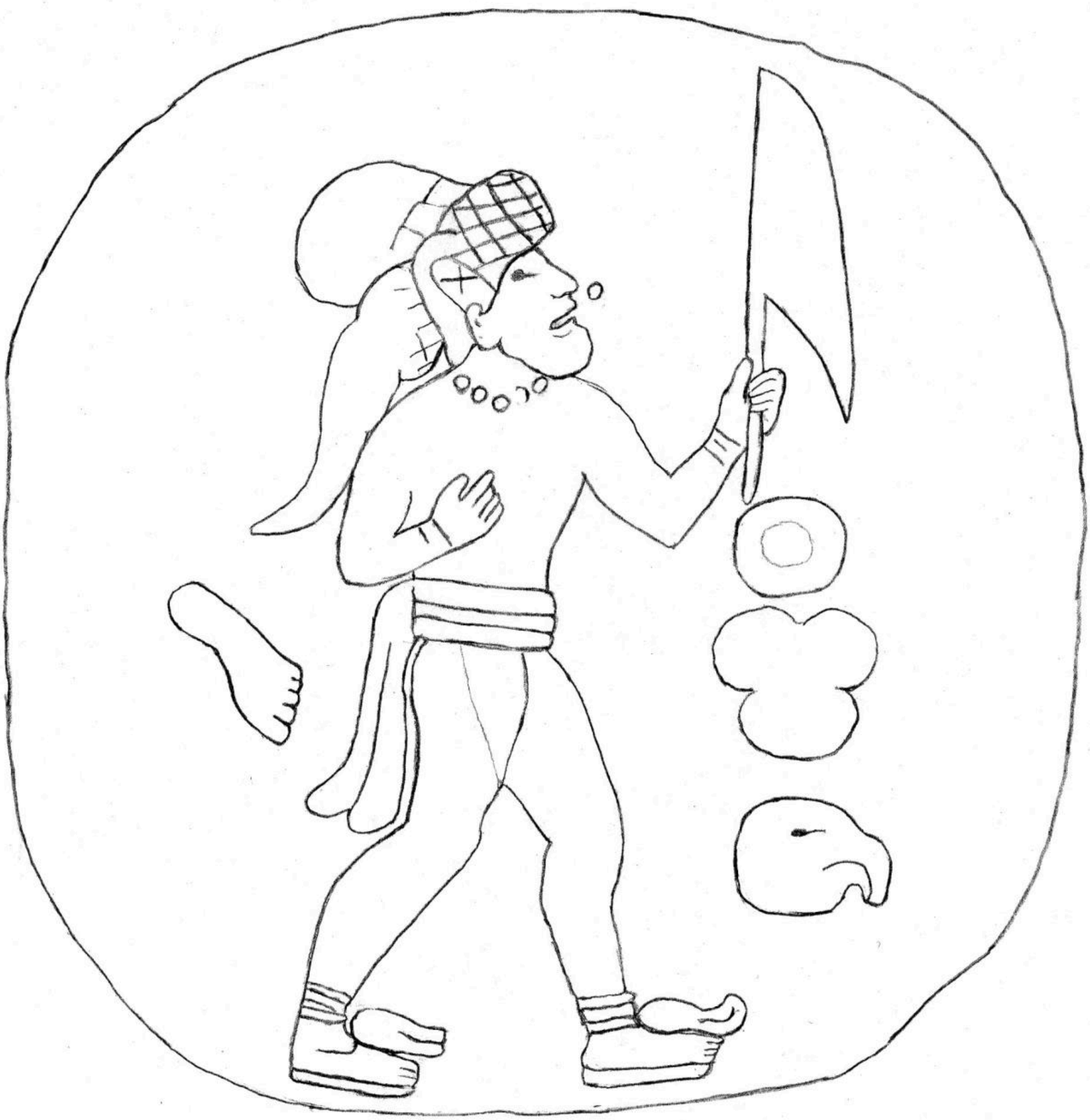

FIG 4. LA VENTA MONUMENT 13 ILLUSTRATES WHAT IS LIKELY A HEADDRESS OF WARP-TWINED NETTING, ALSO KNOWN AS GAUZE WEAVE FABRIC OR LENO WEAVE FABRIC. DRAWING BY BILLIE J. A. FOLLENSBEE

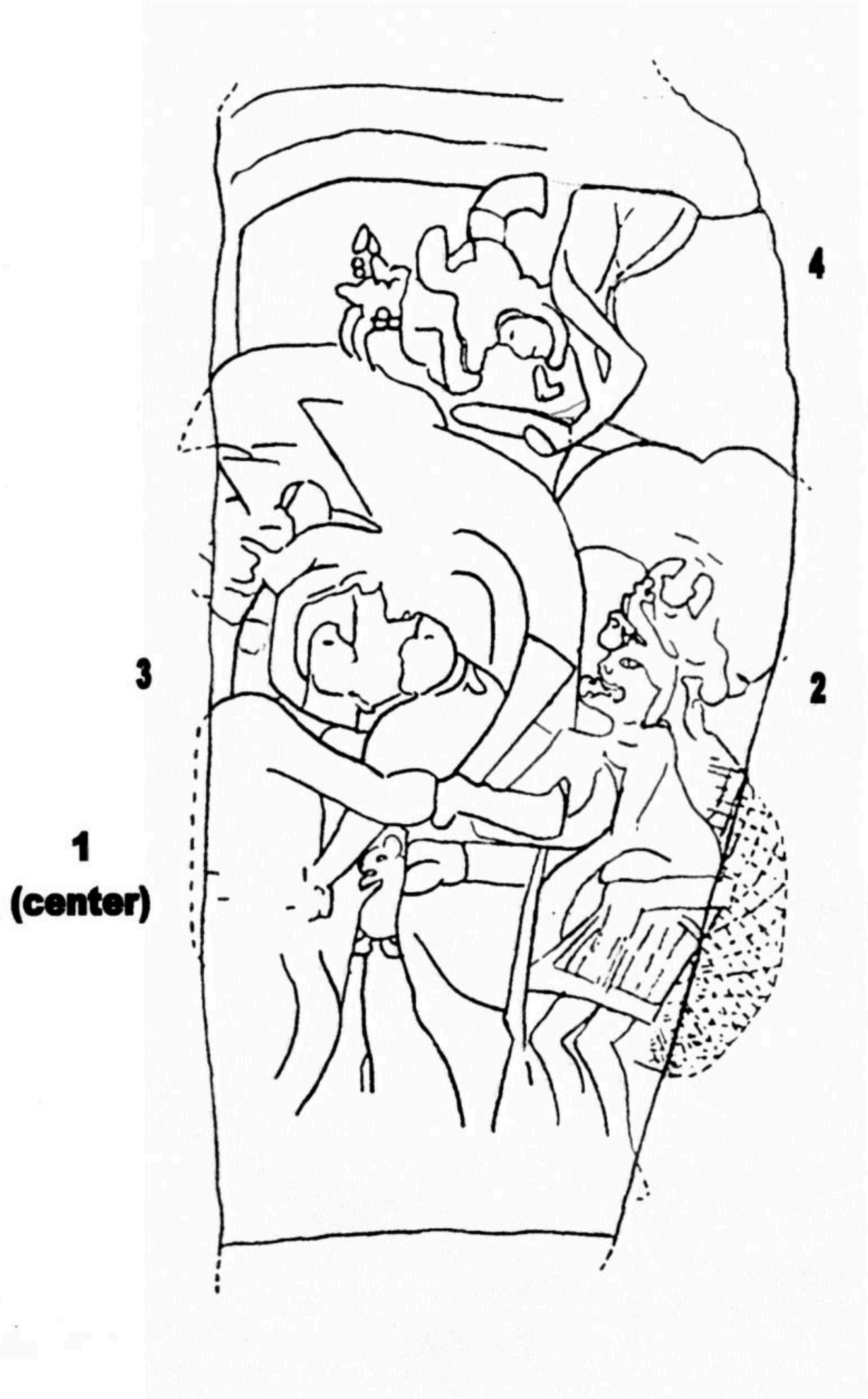

FIG 5. LA VENTA STELA 5 ILLUSTRATES WHAT IS LIKELY A CAPE OF WARP-TWINED NETTING, ALSO KNOWN AS GAUZE WEAVE FABRIC OR LENO WEAVE FABRIC. DRAWING BY BILLIE J. A. FOLLENSBEE

FIG 6A. LUNATE JADE ARTIFACT FROM A CACHE OF PRE-CLASSIC/FORMATIVE PERIOD JADES FOUND AT THE GULF COAST SITE OF CERRO DE LAS MESAS: 6A. FRONT (DRUCKER 1955, 64 AND PLATE 49, WITH OUTLINES TO CLARIFY EDGES ADDED BY THE AUTHOR). COURTESY OF THE SMITHSONIAN LIBRARIES: HTTPS://LIBRARY.SI.EDU/DIGITAL-LIBRARY/BOOK/BULLETIN1571955SMIT

FIG 6B. LUNATE JADE ARTIFACT FROM A CACHE OF PRE-CLASSIC/FORMATIVE PERIOD JADES FOUND AT THE GULF COAST SITE OF CERRO DE LAS MESAS: 6B. BACK (DRUCKER 1955, 64 AND PLATE 49, WITH OUTLINES TO CLARIFY EDGES ADDED BY THE AUTHOR). COURTESY OF THE SMITHSONIAN LIBRARIES: HTTPS://LIBRARY.SI.EDU/DIGITAL-LIBRARY/BOOK/BULLETIN1571955SMIT

FIG 7. THE THIRTEEN REPLICAS OF THE LUNATE ARTIFACT THAT WERE USED IN THESE EXPERIMENTS, TIED WITH NATURAL COTTON WARP THREADS. PHOTO BY BILLIE J. A. FOLLENSBEE

FIG 8. THE WARP-WEIGHTED LOOM CONSTRUCTED FOR THESE EXPERIMENTS. PHOTO BY BILLIE J. A. FOLLENSBEE

FIG 9. TOP: THE OPENWORK WARP-TWINED TEXTILE, ALSO KNOWN AS GAUZE WEAVE, LENO WEAVE, OR NETTING FABRIC, THAT WAS PRODUCED IN THIS EXPERIMENT. BOTTOM: OPENWORK TWINED TEXTILE USING THICKER YARN AS A WEFT. PHOTO BY BILLIE J. A. FOLLENSBEE

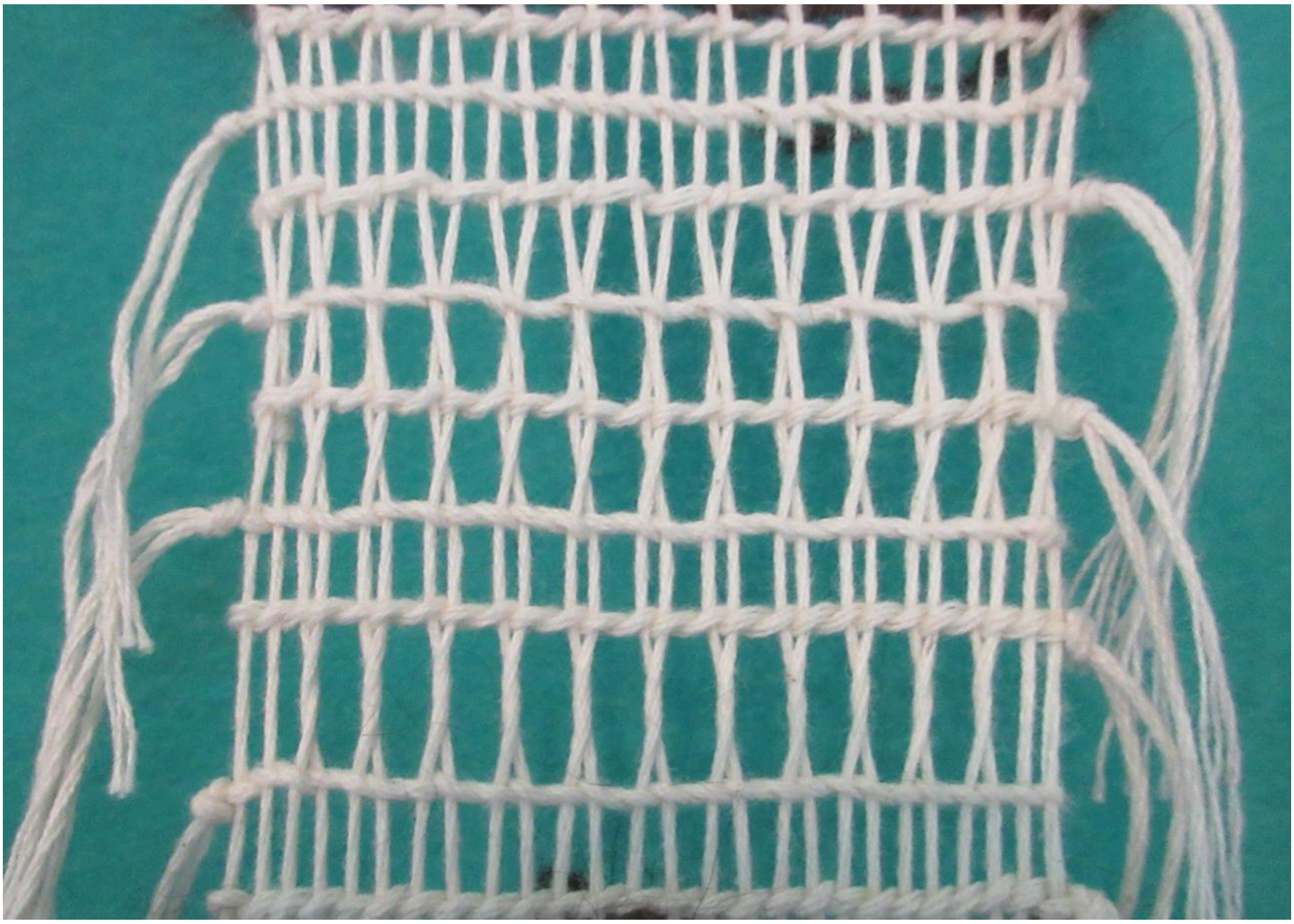

FIG 10. WEFT-TWINED, DIVERTED-WARP PATTERNS PRODUCED IN THIS EXPERIMENT. TOP: PLAIN WEFT TWINING AND ALTERNATE-PAIR DIVERTED-WARP TWINING. BOTTOM: TRANSPOSED CROSSED DIVERTED-WARP TWINING AND TRANSPOSED INTERLINKED-WARP TWINING. PHOTO BY BILLIE J. A. FOLLENSBEE

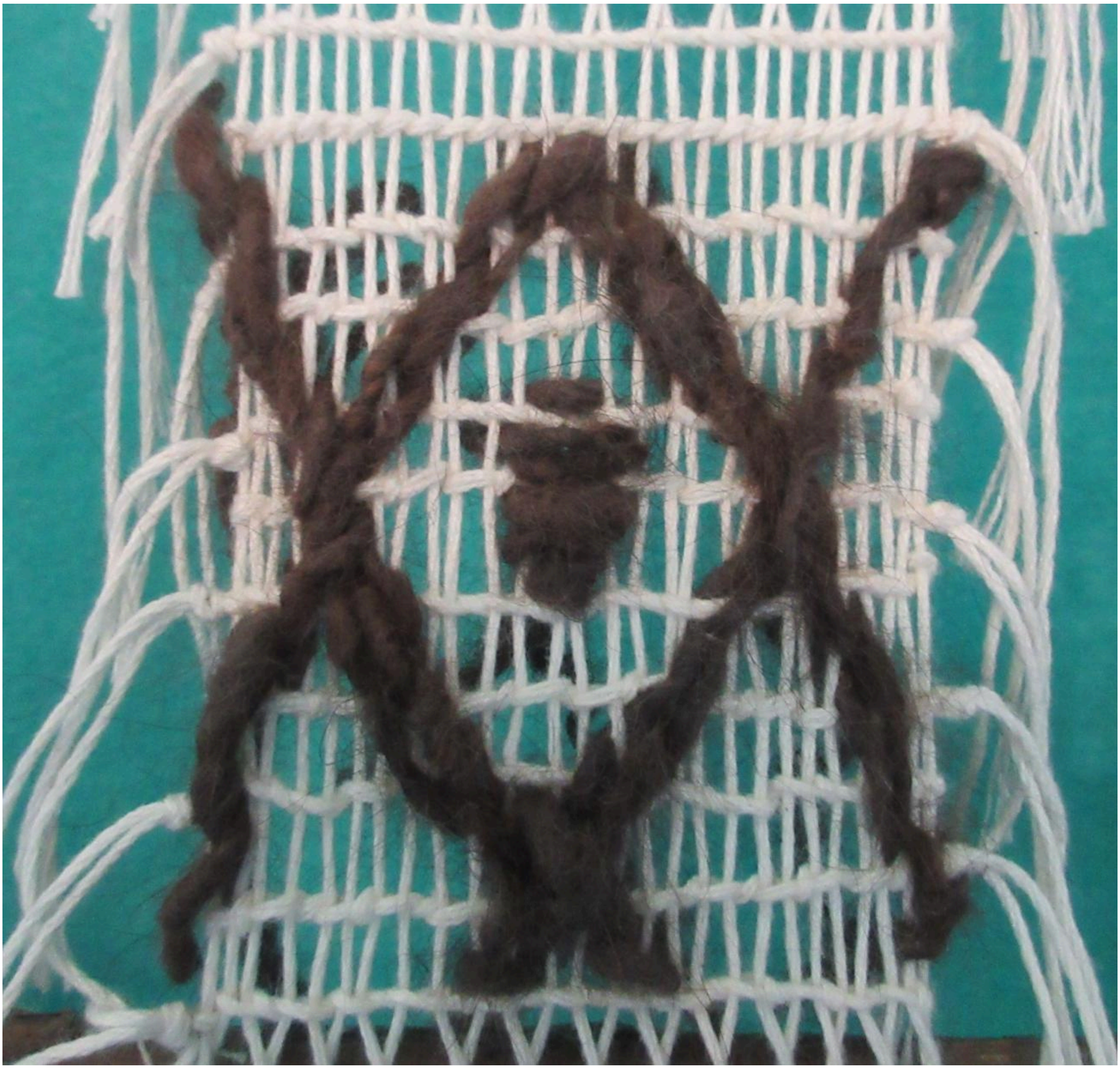

FIG 11. DIVERTED-WARP WEFT-TWINED OPENWORK FABRIC WITH FLOAT WEFT YARNS WOVEN THROUGH THE OPENWORK FABRIC TO CREATE AN EMBROIDERED OR BROCADED EFFECT. PHOTO BY BILLIE J. A. FOLLENSBEE

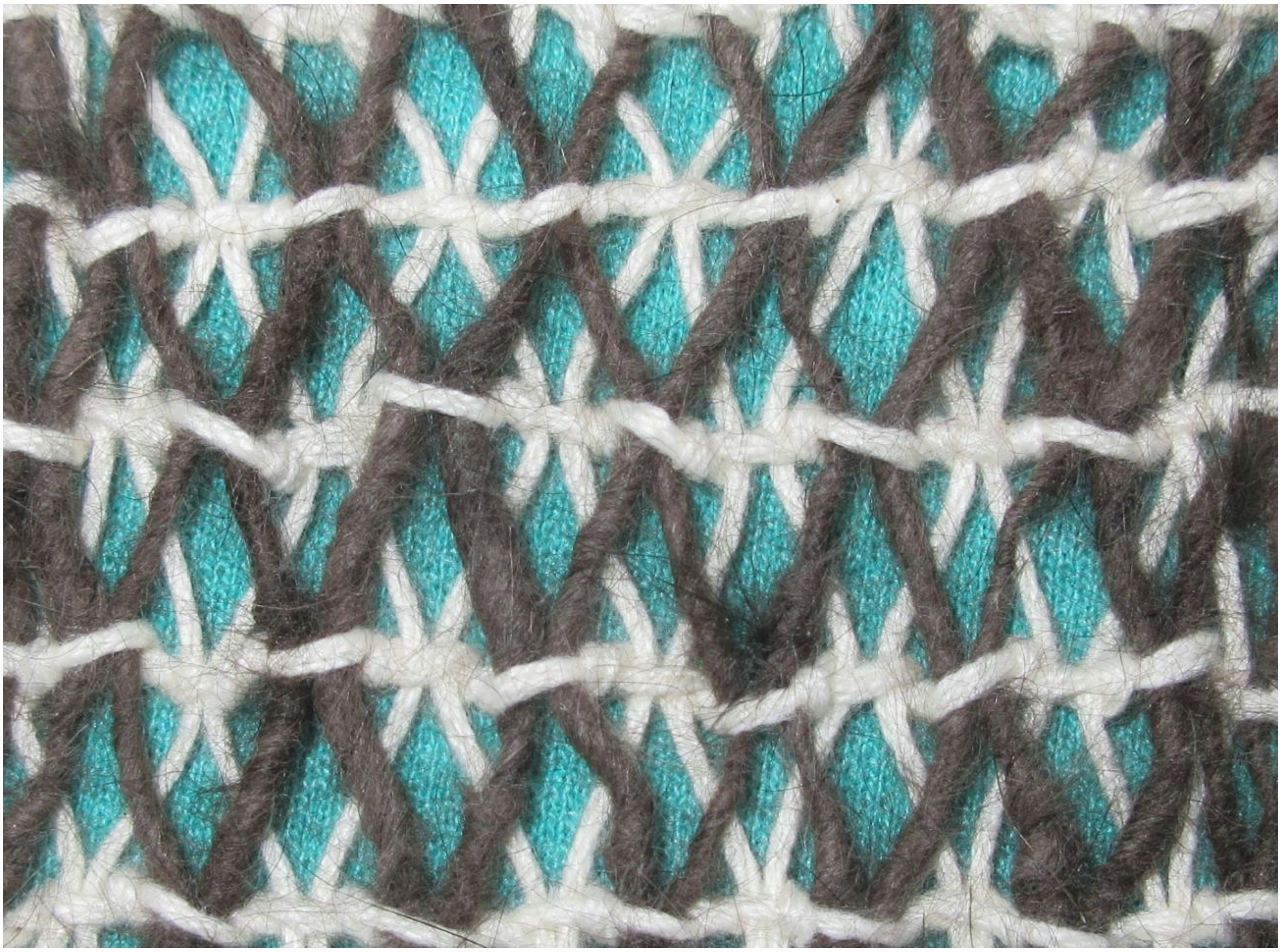

FIG 12. DIVERTED-WARP TWO-COLOUR DOUBLE-FACED CROSSED-WARP WEFT TWINING PRODUCED IN THIS EXPERIMENT. PHOTO BY BILLIE J. A. FOLLENSBEE

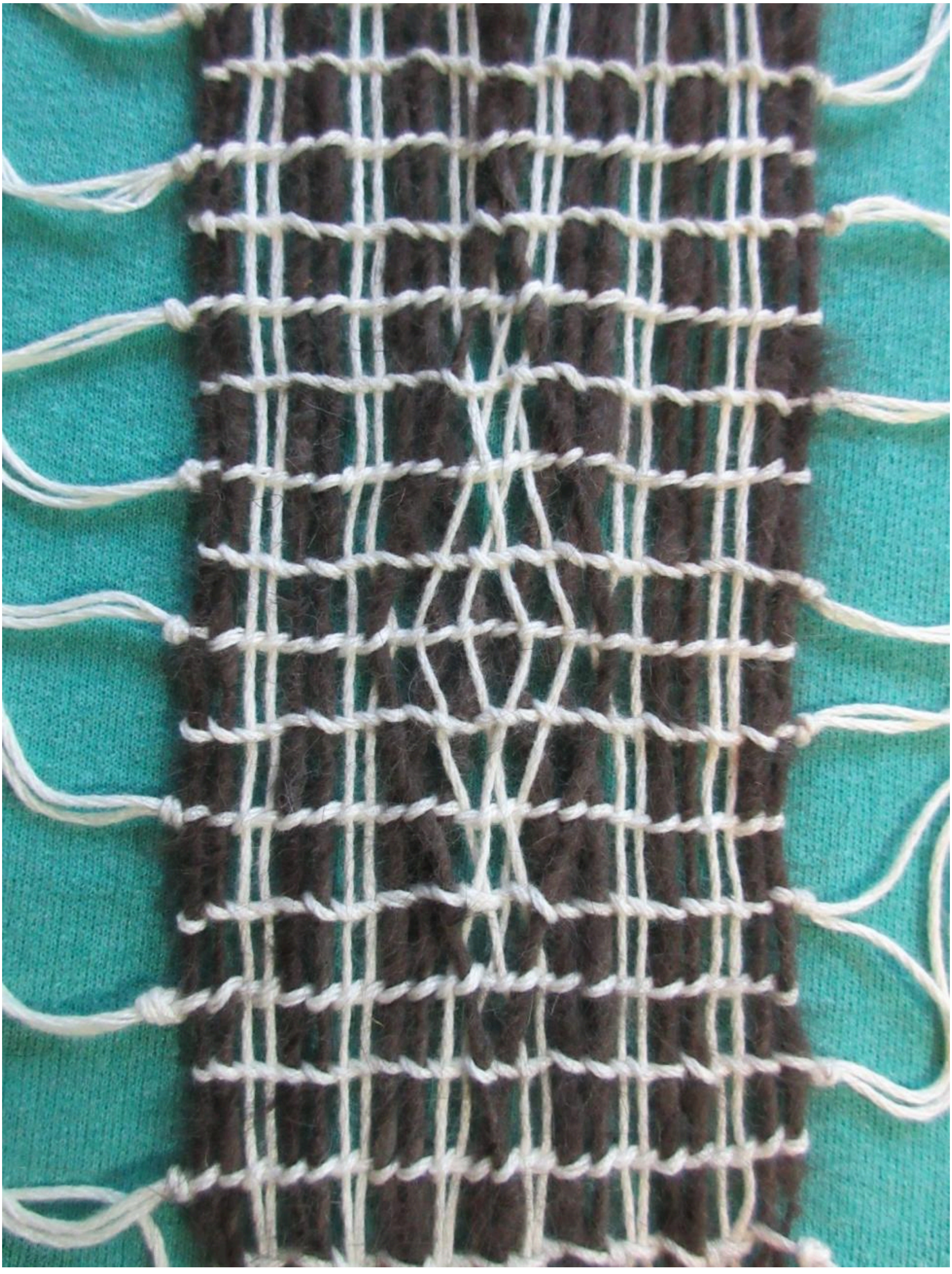

FIG 13. TRANSPOSED CROSSED DIVERTED-WARP WEFT TWINING, IN A DIAMOND SHAPE, PRODUCED IN THIS EXPERIMENT. PHOTO BY BILLIE J. A. FOLLENSBEE

FIG 14. OBLIQUE INTERLACE WEFT TWINING PRODUCED IN THIS EXPERIMENT. PHOTO BY BILLIE J. A. FOLLENSBEE

FIG 15. ALTERNATE TWO-COLOUR WARP-TWINED CONCENTRIC DIAMOND MOTIF PRODUCED IN THIS EXPERIMENT. PHOTO BY BILLIE J. A. FOLLENSBEE

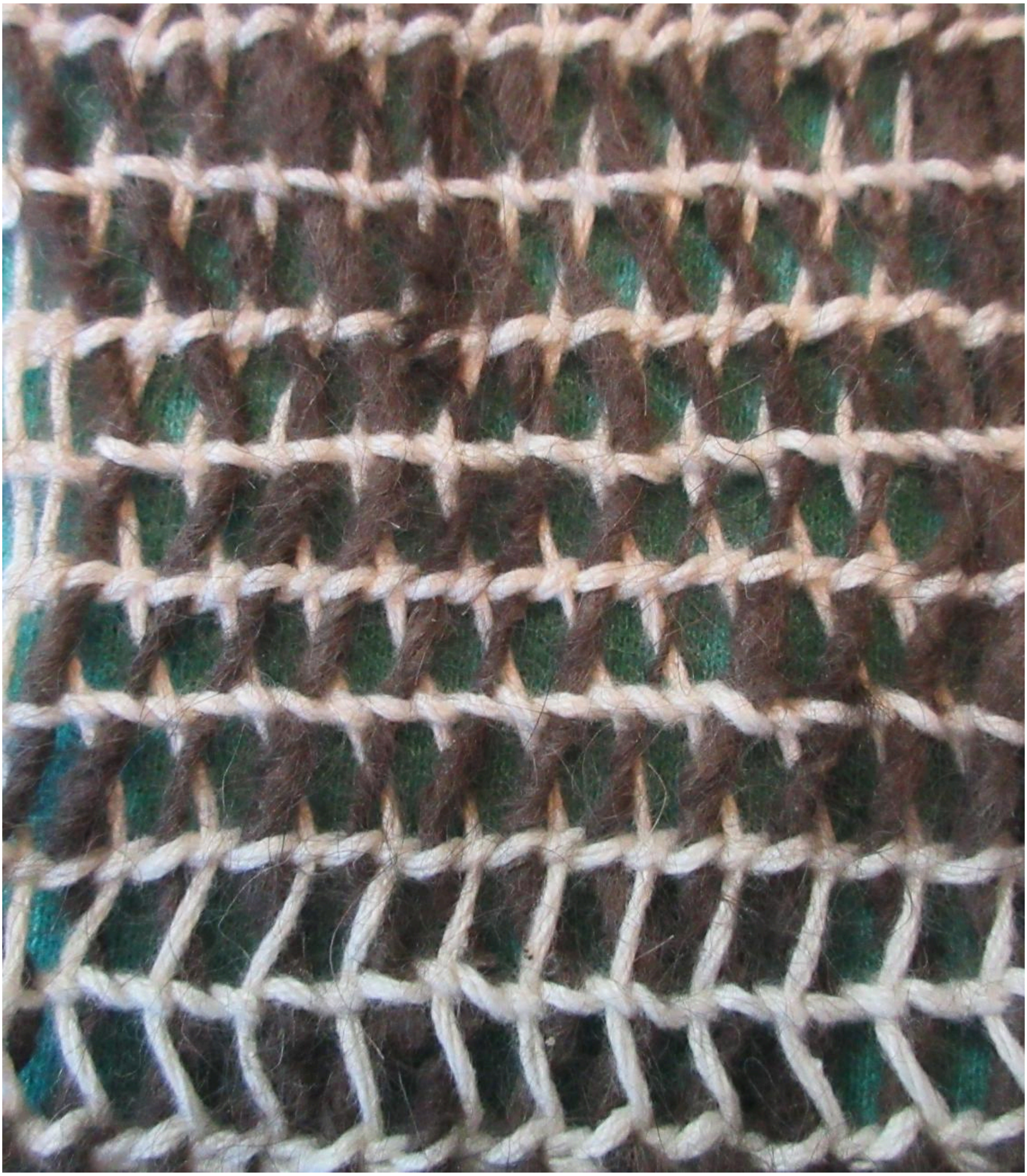

FIG 16. TWO-COLOUR, DOUBLE-FACED CROSSED-WARP WEFT TWINING ZIG-ZAG MOTIFS PRODUCED IN THIS EXPERIMENT. PHOTO BY BILLIE J. A. FOLLENSBEE