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Drawloom Velvet: Exploring a Centuries Old Tradition

Wendy Landry

Since 1986, I have been pursuing my passionate interest in handwoven velvet, both practically and academically. By velvet, I mean extra-warp pile, rather than weft-woven types of pile, such as weft-looping or knotting. Simple, monochrome plain velvets have been woven since the early Coptic period, requiring only simple looms and two simple warp tensioning systems, one for the foundation cloth and another for the pile warp.¹ (On the basis of such a simple set-up, early velvet figuration could be created through the following colour effects using: (a) striped pile warp; (b) ikat/chiné (spaced dyed) pile warp; (c) painted or printed pile warp; (d) 2 striped warps mounted counterchange style (e.g. DLDL/DLDLD); or (e) 2 contrasting warps, motifs picked up by hand or held on a set of half-heddle rods. Simple textural effects include: (a) alternating stripes or bands of velvet (cut and/or uncut) and flat cloth; and (b) bands of differing heights of pile (cut or uncut).

All of the above variations can be created using simple looms with as few as three or four shafts.² For example, the elaborate figuration of Uzbeki velvet ikats is provided by the ikat dyed patterning of the pile warp, which is then woven as a “solid” velvet, whose pile uniformly covers the whole fabric surface.³ This velvet can be woven on a 4 shaft counter-balanced loom with both foundation warp and pile warp separately tensioned with “live” or gravity weighting provided by bags of bricks. Solid velvet pile warps can also be mounted on a single warp beam with uniform tension because all the pile warps are taken up identically.

Examples of chequered patterning in silk velvets date back at least to the 11th century.⁴ Simple counterchange chequered designs can be woven with a minimum of two pile shafts and two pile warps, one of each of two contrasting colours. The two contrasting colours, let us say L & D, can also be wound together as a pair and mounted as a single pile warp in which the two colours alternate. A 4-shaft loom is sufficient for such patterns. To create the chequered pattern, the pile shafts 3 and 4 are ordered in blocks as follows:

- 3rd shaft – LLDLDLD… DLDDL…
- 4th shaft – DLDLDLD… LLDLDLD…

Although the loom mounting for a chequered velvet is simple, the alternation of colours, although likely balanced over the whole piece, requires a separate tension for the ends on each of the two pile shafts. This is best facilitated by weighting the ends of each pile shaft separately on uniformly tensioned warp beams or with live weights. Without separate tension, a recurring build-up of slack pile ends will interfere with smooth weaving and an even pile height. It will

² Rasuljon Mirzaahmedov and Fazlitdin Dadajonov are reviving the tradition of silk ikat velvet in the Ferghana Valley of Uzbekistan. They demonstrated their velvet weaving process at TSA 2012 in Washington, DC on a beautifully carved 4-shaft loom weighted with a bag of bricks for each of the two warps.
⁴ For example, a red and gold silk velvet fragment, Acc. No. 1942-38-1, in the collection of the Cooper-Hewitt Museum, New York, attributed to Spain, 10th-11th century (http://cprhw.tt/o/2D9Vp/).
also leave bubbles of pile on the reverse of the cloth that will adversely affect tension and take-up.

However, once the desire for more elaborate figuration of the pile was conceived, methods of weaving such designs efficiently and consistently had to be developed. It is fair to see these methods as evolving alongside those for weaving the elaborate weft-faced compound tabby and twill fabrics – known respectively as *taqueté* and *samite* – as they seem to have developed in geographically contiguous regions with active trade and migration of craftsmen. Weft-faced compound weaves also benefit from the use of dual tensioning systems, one for the hidden so-called main warps, and one for the tie-down warps, especially over a long length.

Complex velvet figuration is achieved through 4 main types of pile effects, which are often combined. *Voided* velvet has intermittent areas of pile contrasting with flat cloth (exposed foundation devoid of pile; the pile may be either secured into the foundation or floating on the reverse. *Cisébé* velvet contrasts cut and uncut pile. *Pile on pile* velvet contrasts 2 or more heights of pile; often the higher pile is cut but the lower pile is uncut. *Brocaded* velvet covers voided areas with extra pattern weft. Renaissance velvets often brocaded with metallic thread, which must have been very effective in the dim, flickering candle light of the period. In later European velvets, the voided area might be covered with a denser face weave, like a smooth satin or other decorative weave.

Figuration of velvet pile can be accomplished by three principal methods. First, colour or textural patterns can be picked up by hand across the width, and held up on a pattern stick until the pile rod is inserted. Second, heddle rods or shafts can be set up for lifting a pattern in the pile warp; this method can also be extended through manual pick-up. Third, a drawloom harness can be set up to control the pile figuration. Safavid velvet weavers (16th-17th century) complicated drawloom velvet technique further by using a pile warp end substitution method to replace one colour with another so as to make their repeated figures more varied.

In velvet weaving, figurative motifs require separate tension for each pile warp end. Traditionally, this tensioning system has involved the use of individually tensioned bobbins or spools mounted on in multiple rows on a bobbin rack. This rack is shown in many illustrations of French and Italian velvet looms. A more accessible version is shown on the Indian velvet loom at the School of Princely Textiles website. However, as I will show, simple gravity-based methods work well for the studio handweaver.

Drawloom systems were in use for at least 1000 years before the invention of the Jacquard system, and provided the basis from which the Jacquard system was derived. Basically, a drawloom provides an elaborate method of pick-up, and is related in principle to the idea of half-heddle rods still practised in, for example, some South East Asian pattern weaving. A set of

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6 See [https://princelytextiles.wordpress.com/tag/velvet/](https://princelytextiles.wordpress.com/tag/velvet/).
weighted pattern heddles or shafts, controlled by a system of numerous cords, was traditionally
operated by a drawperson who either sat above the loom or stood beside it to pull the cord groups
according to the pattern desired. Indian and Persian drawlooms use a compact and flexible
system of stretched cords instead of shafts for the figure/draw harness, with a drawperson sitting
above and behind them. 7 20th century draw devices for handweavers put the draw action directly
in the hands of the weaver throwing the shuttle. This single-handed operation makes drawloom
weaving of velvet feasible for the studio weaver working alone.

For finely rendered curvilinear designs, a draw device has advantages over hand-picking. Like
manual pick-up, a draw device allows each pile end to be individually controlled (unit draw) or
in repeat patterns (shaft draw). Manual pick-up requires each pile end in each row to be picked
up individually across the width. A draw device allows pile ends to remain up (or down) so long
as they are to stay up (or down) in the pattern sequence over multiple rows, which makes pulling
the pattern easier and faster. Furthermore, groups of draw cords can be lashed together to store
and pick up an entire row of a pattern just by pulling the lashing cords. The draw device can also
help to minimize mistakes in handpicking of fine threads.

Some complex drawlooms, such as the ancient Chinese model described by Hsiao & Yan, 8 also
had 3 or 4 harnesses (sets of shafts working similarly), whose shafts or sets of individual cords
controlled warp ends by means of different actions – some just rise, some just sink, some do
both, and some remain in the resting position, by means of treadles or draw device.

Countermarch looms, such as those made by Glimakra, allow such different actions to be
combined easily. They also permit the use of both shaft draw and unit draw together, which is
useful for velvet designs that combine repeating patterns with non-repeating figuration.

Figured velvets differ from other well-known drawloom fabrics in that only the pile warp is
handled by the draw harness. This differs from damask, for example, in which both the cloth
shafts and the damask draw device are attached to each of the ends of a single warp. 9 Although it
is not necessary in velvet weaving, it is extremely useful to have the pile warp ends also entered
into long-eyed heddles on at least one or two shafts separate from the foundation cloth, in order
to lift or lower them all at once to clear the shed or to fasten them into headings, etc. However,
they are not integral to the foundation cloth, just secured into it.

I wanted to build my own draw device for several reasons. First, I already had pattern heddles
with weights and large cones of fine yellow harness cord that were included with my second
hand Glimakra loom. Second, I gain deeper understanding by analyzing and building my own
loom adaptations. Third, I wanted my adaptation to accommodate both unit and shaft style
devices, as well as my particular pattern heddles and cords, without redundant parts. Fourth, I
had to suit the adaptation to the particular needs of velvet.

8 Kuo-Hung Hsaio and Hong-Sen Yan, “Synthesis of Ancient Chinese Drawloom for Pattern-weaving,”
9 However, it is also possible to combine velvet with damask cloth, with what amounts to a complex dual draw
system, with one draw system allocated to the damask cloth and the other allocated to the pile.
A unit draw system allows for the greatest figural flexibility and requires less depth. A shaft draw system is best for repeat patterning. These two types can be combined. I began by building the more compact unit draw system, to leave more room for the bobbin rack at the back of the loom. My design for the draw cord frame (Figs. 1 & 2) was initially based on the Myrehed unit draw frame sold for use with Glimakra looms.\(^\text{10}\) I designed the frame to fit within my overhead beater exactly, with extra holes in the side posts for adjustment (Fig. 3). I cut and tied the loops for all the cords, and dyed half of the cords green to provide a contrasting colour. The yellow and green cords were mounted in groups of 10 each for easier counting, as in the Myrehed system. The lower reed replaces a comber board of European draw harnesses. Other draw systems use a second reed to space the draw cords towards the top or back.\(^\text{11}\) I found that unnecessary. I designed a system of slender metal rods in a suspended holder to hold my metal pattern heddles with their attached lingoës while mounting them, which can then be re-arranged to separate and align the heddles during weaving so they will move freely without tangling (Fig. 4).

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\(^{10}\) See Myrehed Väv och Textil website for Myrehed draw attachments, [www.myrehed.se](http://www.myrehed.se).

\(^{11}\) See Alice Hindson, *Designer’s Drawloom*, [Charles T. Branford Co., 1958] for other draw devices.
Maintaining an even tension of the foundation cloth and good packing of the weft is crucial to achieving a good velvet cloth. I keep my foundation tension as tight as possible and beat very firmly. I have found that ½ oz fishing weight per pile end works well for the live weighting. To accommodate individual tensioning, I built a bobbin rack, using an inner frame salvaged from an old Leclerc floor model warping mill. I sized and spaced the bobbin rods to suit metal sewing bobbins and other weaving bobbins. I drilled holes at 1” intervals for the bobbin rods in two narrow strips of wood that were screwed to the inside of the upright posts of the warping frame. The drilled holes were aligned just above the surface of the uprights, so the bobbin rods can be inserted above the uprights, as though resting on them. The ends of each rod were fitted with plastic caps to prevent the rod sliding out of its holes. The advantage of this arrangement is that if thicker rods are needed, it is simple enough to replace the narrow strips with other narrow strips with larger holes or different spacing. This will be discussed presently.

My first pile warp was set up using hand-made bobbins to accommodate the triple strand pile ends I was using, with the pile warp traveling down below the back foundation warp beam and then up on an angle (Fig. 5). This set-up proved unsatisfactory for several reasons. My handmade bobbins did not always retract adequately after lifting despite the weights, possibly due to friction from the closely set warps, and the angling back up to the inclined rack. This caused slack in some of the pile ends and left bubbles on the reverse. I could not use thinner rods, because the weight of the bobbins was causing them to bend. Other larger bobbins in my stock had no separation between the pile warp and the winding space for the weights. I also found that most of the bobbins on the rods were awkward to access for repairing ends or replacing empty bobbins. The available space behind my loom did not allow me to lay out the rack closer to the floor. So I reconsidered the use of the rack, ultimately abandoning its traditional use. I changed to a free-hanging system in which the pile warp ends lie above the foundation warp and drape over the warp beam, either in small grouped chains of adjacent pile ends, or individually draped over the rods in the inclined bobbin rack (Fig.6). These systems are more easily accessible for adjustment of the length and weights or repairs, as necessary. The warp ends move more freely. This method also facilitates colour substitution of pile warps, as in the Safavid method.
From the beginning of my velvet work, I needed to create conventions to represent velvet structure with my weaving software. In addition to distinct, bold color, I represent pile ends and rods as thicker than foundation or brocade threads. This makes the pile stand out more clearly.

For these drawloom velvet samples, I threaded a 5/1 satin foundation with three foundation ends between each pile bout, on shafts 1-6 (Fig. 7). Shafts 7-8 were used only at the edges for a simple basketweave selvedge. Each pile end (white) was threaded first through its weighted pattern heddle behind the shafts, and then through a long eyed heddle on one of the last two shafts (in plain weave order). This double threading system allows me to treadle the pile ends in order to secure them into the foundation, as well as lifting them with the draw device according to the velvet figure pattern. Thus the draw device needs only to be operated only for the pile row, which is an efficient arrangement. These samples were sleyed in a 15 dent reed with 3 foundation ends and 1 pile end per dent. This six-end threading can also be quickly changed to a 2/1 twill or a tabby or basketweave foundation structure, simply by re-tying the treadles appropriately.

I use a tapered wooden sword to clear & open sheds and to beat wefts in under the previous rods. I also use it to holds the pile out of the way below the foundation ends if necessary. This is useful for weaving plain satin between projects or for weaving hems with less bulk and more flexibility.

In fast pile, the pile is woven into the foundation structure for security, by means of the pile shafts, rather than the draw device. If the pile colour contrasts strongly with the foundation, dots...
of tied pile will show in any voided areas, especially if the foundation is a plain weave. It shows less if the foundation is twill, and is fairly well concealed in a warp-faced satin foundation. Unfast pile, in which the unused pile ends float across the back without being secured in the pile, does not show in voided areas.

Operating the draw device is simply a matter of pulling down the cord loops over the pegs below (Fig. 8). As each cord loop is pulled, the attached pattern heddle at the back rises, and its attached pile end rises (Figs 8 & 9). Unpulled pattern heddles stay down. In front of the reed, the whole pile warp sits just above the foundation, so that the pulled pile ends rise above the others. This makes the shed into which the pile rod is inserted. Before and after each pile row, the pile is held down below the foundation weft.

After abandoning the bobbin rack, I turned to work on some modular designs, in which five adjacent pile threads worked as a group (Fig. 9). This allowed me to simplify the warp weighting, by chaining the pile ends in groups of five, draping them over the top of the foundation warp to hang freely over the back beam with appropriate weights on each chain. This grouped weighting is faster to adjust as the available warp length moves forward. Pulling the units goes faster with a modular design, as the loops can be pulled as a group. If rows are also grouped, they do not need to be pulled until the design changes, so weaving goes faster too. Whatever the type of design, the ratio of height to width of the point paper or design grid must match the final expected end/pick counts of the woven samples, or the design will be either elongated or squashed. Figure 9 shows a modular design woven in pile on pile *ciselé*: the first rod lifts the ends that will be loops, the second rod which immediately follows lifts the ends that will be higher and likely cut. In this case, the shafts efficiently lift all the loops at once, while the draw pulls only those ends needed for the second rod. The second rod lifting the higher ends rolls
up and sits on top of the lower rod. My samples show that there is plenty of room for play in a modular design set-up.

Surgical scalpel No. 11 is perfect for the job of pile cutting, and is readily available through medical suppliers. It cuts with the blade up, rather than down. I push the blade through the tunnel of pile loops while the rod is pulled out the other side. The last 3-4 few rods are left in place without cutting, until more pile rows are finished (Figs 10 & 11).

![Fig. 10. Voided free cut ciselé. W. Landry.](image)

![Fig. 11. Brocaded free cut ciselé. W. Landry.](image)

There is always an option to cut only some of the rows, or some of the loops in a row. Figure 10 shows my experimentation with the effects of cut and uncut using pile ends formed of 3 different coloured strands. The apparently white loops become a pale blue-grey when cut (Fig. 11).

Brocading adds at least two more weft picks and shuttle changes to the weaving sequence between each pile row (Fig. 11). The foundation may still show a lot despite the brocade threads. This satin foundation allows the brocade weft to slide over and cover the ground better than a plain weave foundation would. The brocade can be tied by one of the foundation ends, or a separate tie-down warp (which would likely require its own independent warp tension system). Brocade wefts should lie on the surface as much as possible so as not to interfere with tight packing of the foundation which secures the velvet from pulling out.

Many figured velvets have two or more colours of pile, organized in two or more separate warps. This is what is meant by polychrome velvet. They may be used alternately to weave designs of 2-4 pure colours. Figure 12 shows how two pile warps of contrasting colours allow a tonal palette of 10 distinct colours (cut and uncut). The basic polychrome draft in Figure 13 assumes long-eyed heddles on pile shafts 7-10. Although not shown in this draft, on a drawloom all pile ends are also threaded individually through pattern heddles behind shafts, alternating colours. This draft can easily be amended for other foundation weaves, such as Gros de Tours, twill, or satin.
For polychrome work, the draw cords of the pattern heddles should be re-arranged so that alternate colours correspond to the colours they control, i.e.: yellow cords used for lighter colour, green cords used for darker colour. This will help ensure that the correct colour is pulled.

Fig. 12. Polychrome palette of 10 colours. W. Landry.
Fig. 13. Basic draft for polychrome velvet on drawloom. W. Landry.

Fig. 14. Polychrome pile warp mounted on single back beam, separated by colour and shaft, and individually weighted with weights suspended from paper clips. W. Landry.
Figure 14 shows my preferred polychrome pile warp set-up: efficient to wind the warp, set up, and adjust. The two colours can be wound together on the warping mill and stored on a single pile beam (located on a second loom frame behind the main loom). Between the back beam and the heddles, the pile ends are separated by colour and shaft, with each pile end individually weighted. The weights are suspended from paper clips, which are easy to add and remove. Each pile end can move forward at its own pace without affecting its tension. The spacing helps ends to move freely, without jamming up or tangling. The minor disadvantage of this system is that it is not good for substitution of pile warp ends.

My velvet research is designed not only to understand how velvet may have been woven in the past, but also how contemporary handweavers might be enabled to weave velvet in their own studios with modest means. I view the history of velvet weaving technique as a resource that can lead to understanding the key principles but need not constrain the techniques we can use today. So I continually experiment with the process and tools, while seeking methods that are effective, streamlined, affordable, and creative.

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