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JACQUARD: A LOOM OF OPPORTUNITY WORKSHOP

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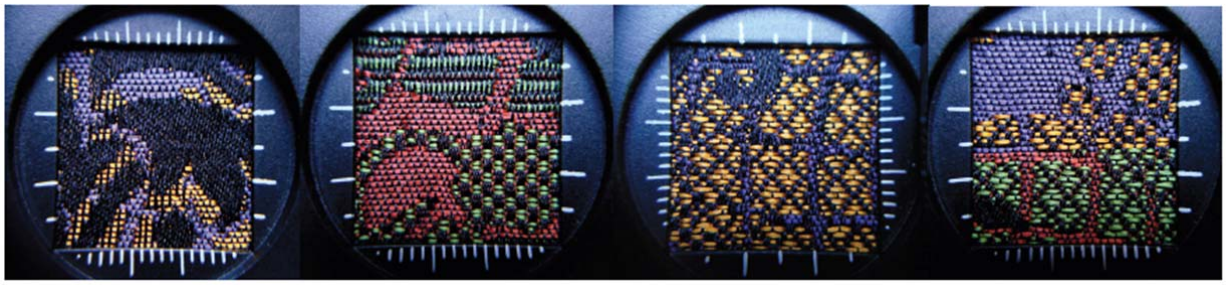
On October 6th, a full-day workshop, **Jacquard: A Loom of Opportunity**, was held by Julie Holyoke from the Lisio Foundation in Florence, Italy. The New Media Center Computer Lab at Architecture Hall, University of Nebraska, Lincoln hosted the event.



The workshop description read:

> *Jacquard design workshop for educators, artists, and designers will be a fun and stimulating day during which many weave and design ideas for figured textiles will be presented and the medium's potential explored.*
>
> *Samples illustrating a range of Jacquard textile types, graphic and weave solutions will be examined. Using Jacquard design software, participants will follow a series of exercises on how to create, modify, and evaluate weave structures and graphics for visual and textural effect. Participants will learn how to construct custom weaves, how to use contrasts in scale, pattern, and figuring techniques to create depth, rhythm, and visual interest. Criteria will be given for evaluating technical correctness of chosen weaves.*

Twelve participants, most of whom had prior experience with the Jacquard medium, attended the event. All were intrigued enough to spend a challenging day 'thinking' in weave patterned surfaces.

Like the workshop participants, all of us recognize the word *Jacquard*, a term that was used in the workshop's title for reasons of familiarity. Today *Jacquard* is no longer associated solely with a costly class of decorative textiles. Looms that allow weave patterning are currently used not only in industry, or in historic silk productions like the Lisio Foundation: a new generation of affordable looms with new names and innovative technologies are found in the art departments of many universities and textile artists' studios. Often this new generation of loom is used as a tool for creative expression rather than to produce functional textiles.

In industry as well, use of weave patterning technology is changing, increasing. Although a loom with figuring capacity costs twice as much as its dobby equivalent, it offers greater versatility, thus justifying the doubled expenditure; with the same loom both dobby and figured cloth can be woven in response to clients' and fashion's demands.

Changes in the *Jacquard* medium, its tools, lower costs and availability, are radically changing the role of the artist, designer, mill technician and weaver.

In the first years of the 19th century, M. Jacquard mounted a mechanical device on top of a loom. His machine transmitted patterning information to the warp ends, thus substituting the drawboy, who until then had manually activated the patterning harness that lifted a selection of warp ends before each passage of the weft.

Analogously to M. Jacquard's invention, textile CAD/CAM of the digital revolution has obviated the need for a number of specialized technicians who previously accomplished the many steps of the Jacquard design and weaving process.

Unlike M. Jacquard's device, which merely substituted one system of warp selection and lifting action with another, digital technology transfers multiple processes from several specialized workers to a single operator. Today's Jacquard designer is artist, drafts person, loom technician and weaver. Training for today's designer addresses both esthetic and technical aspects of weave patterned textiles.

First designers are taught a method of observation, how to 'see' and analyze both visible surface and inner structure of woven fabrics. The same set of tools that enables the designer/artist to analyze why a given technique, weave or design is effective in an existing sample serve as basic skills when creating new and original textiles, for defining objectives and resolving the many technical challenges posed by the Jacquard medium.
These basic tools include:

- *Visual analysis*
- *Structural analysis*
- *Weave drafting techniques*
- *Technical evaluation of weaves and artwork*

Visual analysis

The visual effectiveness of a weave-patterned textile depends on the amount, nature, and range of contrast between its weaves structures. The observer's considerations may or may not be recorded.

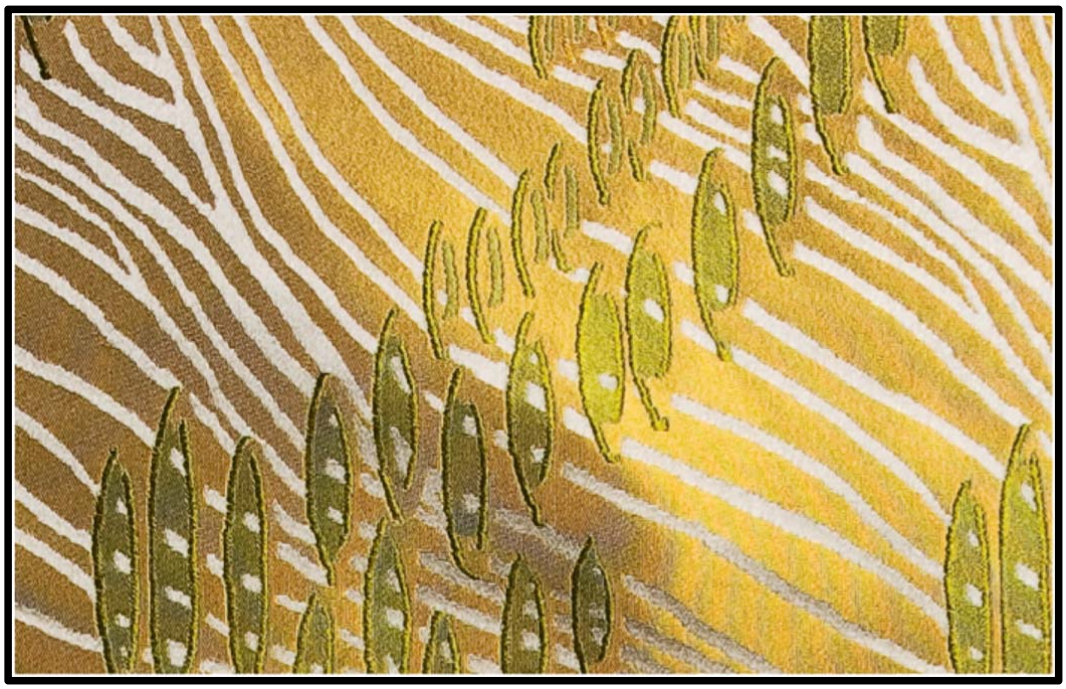
- Identify the number of distinct weave structures and each weave's function: ground or pattern?
- Define the kind of contrast: weave, material or design based?
- Are different weave classes used? Tabby and derivatives, twills or satin?
- Observe other structural differences: warp, weft faced or balanced weaves? Single or compound structure? Loose/tight, long/short floats, flat/raised, etc.
- Is contrast due to variations in materials, color, sett?
- Is contrast due to the artwork? Such as variable quantities of each weave effect present on the textile's surface? Differences in scale between motifs? Minute/large motifs, smooth/fragmented outlines, round/angular areas, receding/dominant levels or planes.
- Define the level or degree of contrast between weave effects: subtle or emphatic? Gradated or unevenly distanced?

Contrasts Part 1

All three textiles above illustrate subtle contrasts of color, weave and material. Each uses only two distinct weave effects. On the right: a figured plain weave is woven in silk using tabby for the ground and warp floats for the patterning. In the damask on the upper left by Janina Von Weissenberg, Lisio Foundation School, silk warp and cotton weft are woven in 1/2 basket for the ground and 8 shaft warp satin for the pattern. The damask, lower left by Annette Scherying, Lisio Foundation School, is woven with white silk warp and woolen weft in warp and weft faced 8 shaft satins.

Contrasts Part 2

The same silk damask quality with self-patterning weft technique is used for both textiles shown on this page. In the sample above, a fragmented exchange between the yellow and black weft areas, dependent on the design, breaks up the smooth appearance of the ground.
By Matthias Holz, Lisio Foundation School.



The silk damask above uses two self-patterning wefts and three smooth satin areas in white (warp satin 8), yellow and green (weft satin 8), then a green weft float to define the cypress trees' shapes. By Sheetal Khanna-ravich, Lisio Foundation School.

Training

In the figured silk textile above by Morgan Bajardi, Lisio Foundation School, areas of dark warp satin 8 contrast sharply with wefts patterning in flat and weave fragmented areas woven in three brilliant colors: purple, orange and yellow.

Structural analysis

Sample analysis, like visual analysis, serves to define the components of a fabric. The results are recorded during the analysis process:

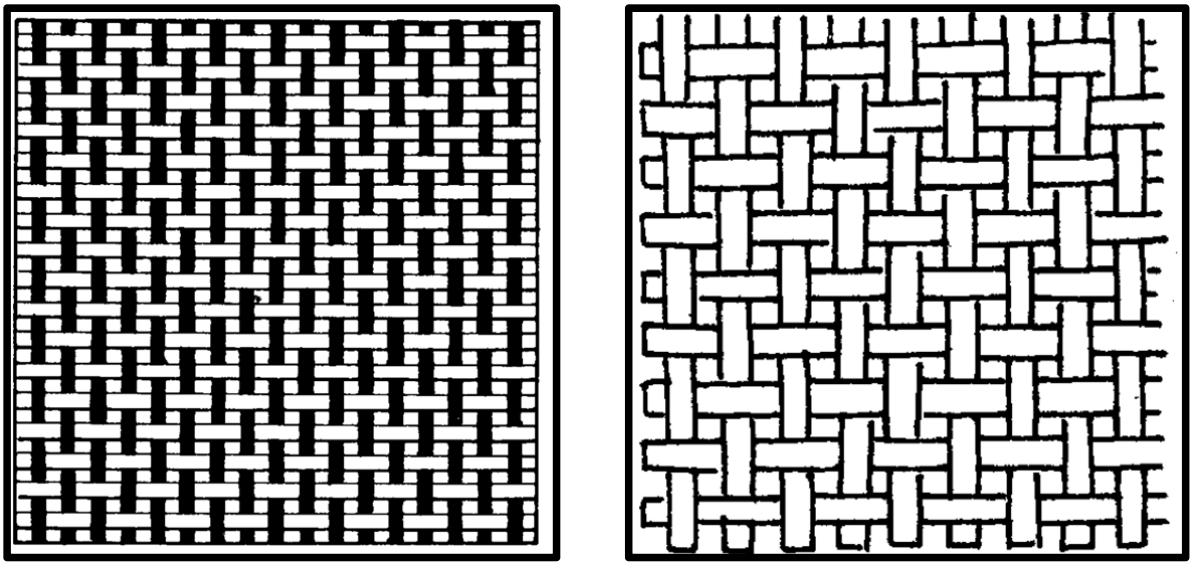
- Warp and weft direction, face and reverse of textile.
- Warp(s): number, function, sett, materials
- Weft (s): number, function, sett, materials
- Weaves: number, function (ground or patterning), structure recorded in verbal and or graphic form.

Weave drafting techniques

The ability to draft and read a range of weave drafting systems enables a designer to:

- Accurately record the component weaves of a figured textile during sample analysis or when creating a new textiles
- Construct, evaluate, compare, modify and correct simple and compound weaves
- Communicate technical data to loom or manufacturer
- Consult existing textile documentation and archives

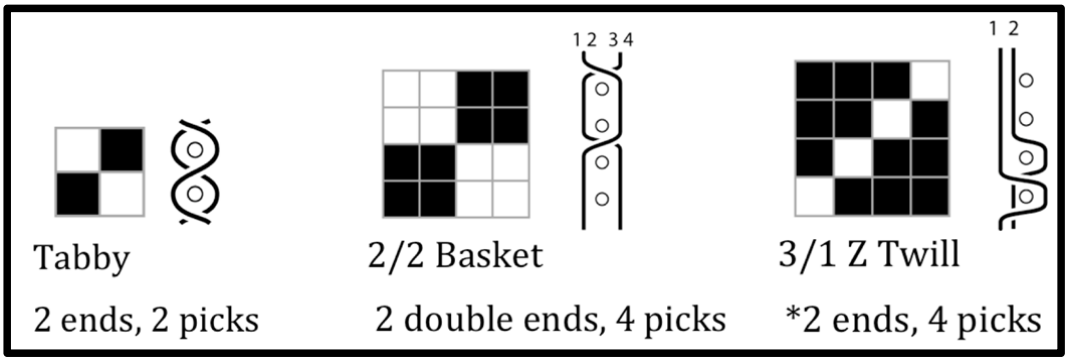
Many systems exist for illustrating and drafting weaves. An illustration is a drawing that represents the interlacement of warp and weft, but does not necessarily give complete information for the reproduction of one repeat of the weave. A draft records in graphic form all information necessary for reproducing a weave.



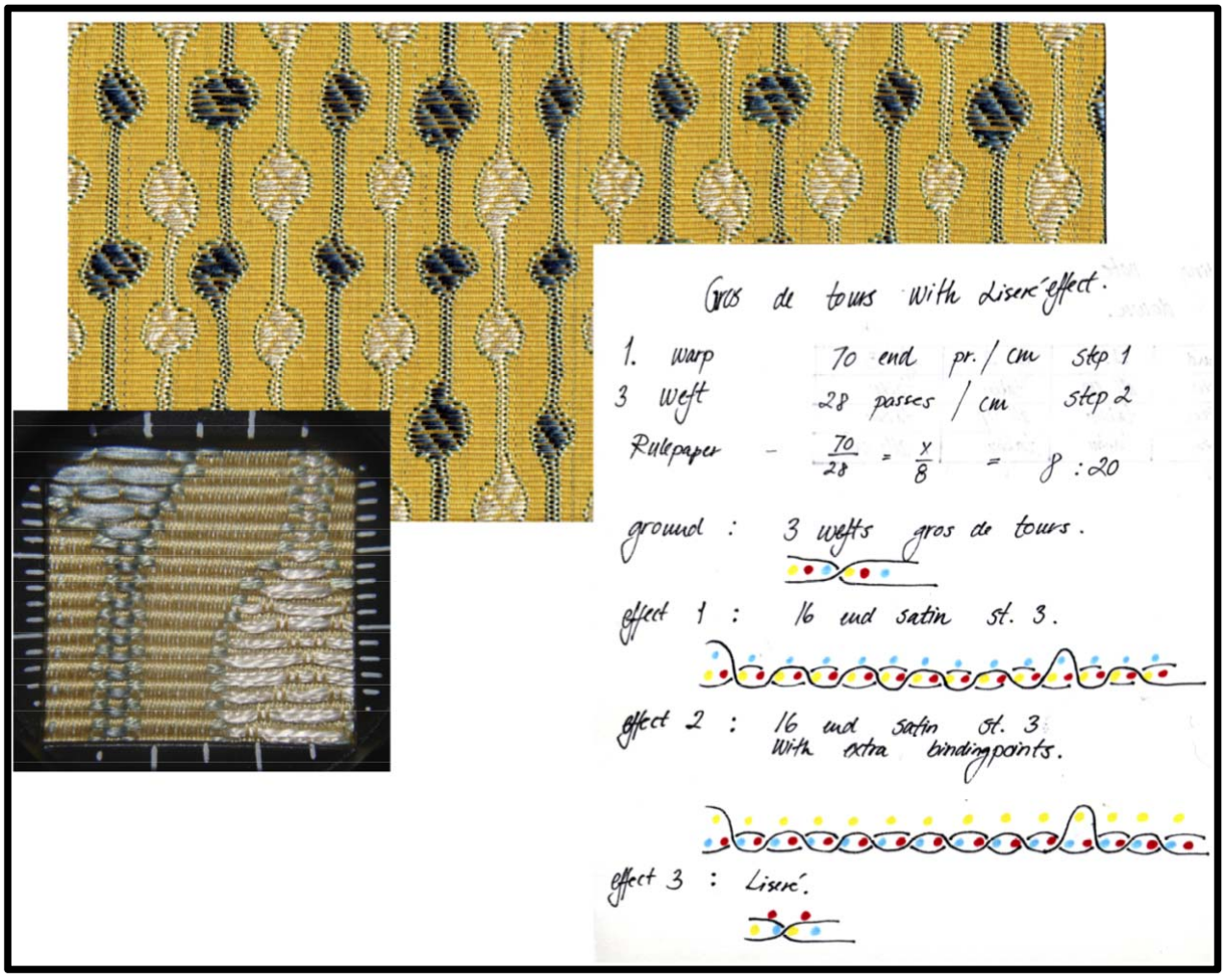
Two illustrations of tabby or plain weave.

The following drafts show two commonly used systems: drawdown drafting on squared or graph paper and sectional drafting. By far the most frequently used system today, the drawdown, adopts the convention of a filled or black square, or other sign to represent a warp end raised over the weft. A ‘missed’, white or blank square represents the weft passing over a stationary or lowered warp end. In sectional drafting, the relative positions of warp and weft are recorded by using lines to represent the warp ends and round, or other smaller marks, to indicate each pick in the weft repeat.

This second method of drafting is particularly useful for drafting weaves with multiple series of warps and/or wefts.



When drafting twills in sectional format, only the first two ends of the total warp repeat are shown. All regular twills 'step' or shift upwards (or downwards) one binding point in a fixed diagonal progression, therefore only the first two warp ends are sufficient to record the warp's position relative to every pick in the weft repeat.



All four weaves in the textile above are drafted in sectional format.
Stine Ostergard, Lisio Foundation School.

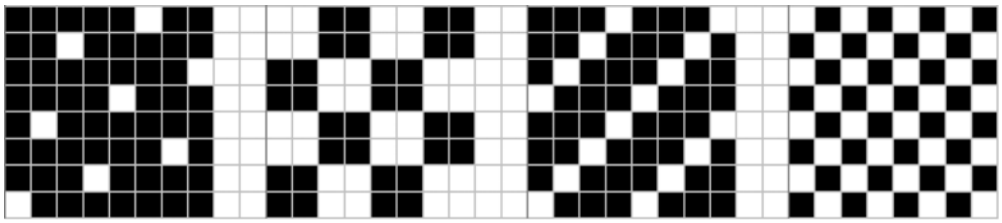
Technical

Technical evaluation of weaves and artwork
Initially weaves are chosen for esthetic effect, to add surface interest and contrast to a figured textile. Before a test sample is woven, each structure is evaluated for technical correctness. Often weaves must be modified in order to satisfy technical parameters or limitations. During this process, the designer seeks a compromise that best conserves the visual characteristics of the original choice.

Factors to consider are:
•***Take-up***
•***Weave stability***
•***Surface strength***

Take up
The warp shortening produced by the interlacement of warp and weft, is the most limiting factor in figured weaving. Though many weaves may be used in a figured textile, all warp ends are wound on the same beam (or beams if there are multiple series of warps) and are equal in length. The single warp ends that compose a warp must maintain equal tension to ensure a clean shed and avoid warp breakage. For equal tension to be maintained the amount of interlacement of each end with the weft must be approximately equal to the interlacement of every other end wound on the same warp beam.

In the drafts below, the number of shifts in position from warp raised to warp lowered varies relative to an equal number of picks (8 picks in each draft, irrespective of weave repeat).



Satin 8 *2/2 Basket* *3/1 Twill* *Tabby*

Number of shifts from warp raised to warp lowered in 8 picks:

Satin 8	1
2/2 basket	2
3/1 twill	2
Tabby	4

Of the four weaves shown above, satin 8 produces the least take-up, tabby the most; 2/2 basket and 3/1 twill produce an intermediate amount of take-up.

Differences in take-up between weaves in the same textile may or may not produce significant tension problems. Other factors, such as the quantity and position of the various weave effects in a design may augment or mitigate warp tension problems.

Factors to consider when weaves with a range of take-ups occur in the same textile:

Design related
- checkerboard, meander, diagonal, and overall designs tend to mitigate or compensate for differences in take-up.
- vertical stripes, symmetrical motifs, medallions may generate take-up differences.

Material related

- elasticity and tensile strength of warp materials: continuous filament yarns or yarns composed of animal fibers in general support more tension differences than staple and/or cellulose based yarns.
- Yarn surface can affect take-up. If material with a rougher surface is used in the warp or weft, the interlacement between warp and weft may be less mobile, limiting the amount of adjustment in tension that can occur between tighter and looser weaves.

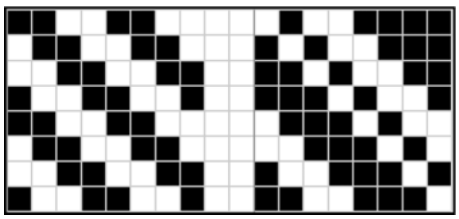
Sett and lateral pressure

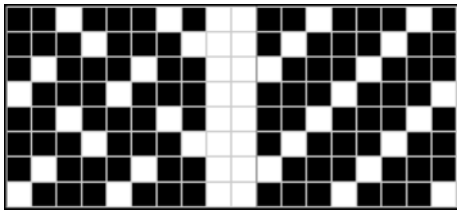
- lateral pressure caused by sett, or tighter/looser interlacement of weft with warp, can stabilize the warp's position and limit tension adjustments along the length of the warp ends.

Weave stability

Not all textiles, such as wall hangings, are exposed to abrasion, movement, or the various 'stresses' that require weave stability. Evaluation of weave stability is based on a textile's end use.

Weave stability depends first on frequency of interlacement. Another important factor is tightness, created by the proximity between the single binding points that compose a weave structure.





The draft on the left of each pair guarantees more stability, while maintaining similarities of weave family, texture, blend of warp or weft face, take-up, etc.

Surface strength

As with weave stability, evaluating the appropriateness of each weave effect and its resistance to abrasion, snagging, etc depends on the intended use of the textile.

Factors:

- float length, yarn construction, dimension and materials
- warp or weft faced weave structures
- sett of yarns appearing on effect's surface /space between yarns
- size of weave effect area
- structural strength and stability of adjacent weaves

The role of the designer/artist today requires versatility and a wide range of skills; the boom in digital technology has replaced many labor intensive processes; weave patterning looms have become accessible to both individual weavers and industry; and yet the steps in the process from first intuition of a design to the finished textile remain:

- Sketch, development of artwork
- Design in repeat
- Transformation of design into pointpaper draft
- Definition of weaves structures

- Sampling
- Modification and/or correction of design and or weaves
- Transmission of warp action to loom
- Production of finished textile

Silk damask with one warp, two ground wefts and one pattern weft.
By Emelia E. Haglund, Lisio Foundation School