AMERICAN TAPESTRY ALLIANCE

The Simple, Short Version of Colour Movement in Tapestry

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Illustrations by Pat Spark

Keeping It Simple– Optical blending (optical mixing) is what the eye does with small bits and lines of colour. When something is composed of very small bits of colour, your eye will attempt to fuse those bits and pieces into a whole colour or perhaps a bridge colour- a combination of two adjacent colours that creates a third colour. The size of the little bits of colour or size of the colour field and distance the viewer is from those bits of colour will determine how well the colour melds into a cohesive unit. In painting it was called divisionism or pointillism. On a monitor or TV screen it is called a pixel or pixilation. Pointillism and divisionism are related to stippling which uses dots in varied concentrations to create another colour or depth of colour.
So what does this have to do with tapestry? Almost everything! Structurally tapestry is composed of thousands of small rice shaped dots of colour. These dots are created every time a weft travels across one warp and can be made either more blended or diverse by controlling the composition of each dot- i.e. the spun yarn itself and/or the weft bundle.

If you are using a single yarn as the weft, the dot is influenced by the dye job and the blend of coloured fibers which are spun together to make the yarn. This is not necessarily true if you are using multiple yarns in the weft bundle. In that case, the yarns themselves control the distribution of colour in the dot. In order to perceive the design, the eye of the viewer is required to blend all of these little dots into a whole. Tapestry relies on the perceptive ability of the eye and mind to mix the color spots into a fuller range of hues. In order to get the maximum effect of optical blending, one needs to stand at a distance from the tapestry. The greater the spacing of the warp sett, the further the distance needs to be. To get the full effect of the blending at 10 warps to the inch, you need to stand about ten feet from the tapestry and at 5 warps to the inch you need to stand even further away. For closer warp setts, for example 20 warps to the inch, the viewer must stand much closer, say five feet. (Note: This rarely happens because people prefer to view small format tapestry at a very close distance–two feet or sometimes less. This means you must be more careful with your blends and use more mélanges than chinés. See mélange and chine below.)

You can research these phenomena by studying pointillism and divisionism, and looking at the paintings of George Seurat, Paul Victor, Jules Signac and other colour theorists. While not tapestry weavers, their research is valid when thinking about and designing tapestry and using colour in tapestry. Interestingly, they were heavily influenced by Chevreul, a French chemist, dyer and repairer of old tapestries at Gobelin, or at least citations from Chevreul in another book, Grammaire des arts du dessin, written in 1867 by Charles Blank, a 19th century French art critic. Chevreul had happened to notice that he could not get the right colours to repair the tapestries unless he recognized and took into account the adjacent colours and slightly overlapping colours which had the effect of creating another colour when seen from a distance. BASICS FIRST – There are two major ways of using optical blending in tapestry weaving. One is blending colours in the wefts and the other is using weaving techniques to blend the colours. **Optical Blending Using Mixed Colours in the Weft.** The physical mixing of yarn or fleece of different colours that are then perceived by the eye as one colour.

1. **The weft used by itself.** The weft can be made from one colour of dyed fiber or blended from differently coloured fibers to create the illusion of one colour. However, the yarn itself can have properties which affect its colour. Various qualities of yarn can cause its surface to appear to be one large unit or it can be broken up into many small units. If the surface is one unit, light will reflect off it easily and the colour will appear lighter because of this (reflection). If the surface is broken up, the light bounces off the many surfaces and less of it is reflected to the viewer's eyes (inter-reflection). In this case, the yarn will appear darker.

Inter-reflection and reflection are major factors in the colour we perceive in the yarn we are using for tapestry. Inter-reflection occurs when light enters a textured area, such as a fuzzy yarn or tapestry rib, and is reflected back and forth from the multiple fiber surfaces. Each time the light bounces off the surface, part of it is absorbed by the dye in the fiber and the rest is reflected. It then reflects onto another fiber where the process is repeated. This reinforces the colour of the dyed surface, causing it to look darker and richer. (Lambert, Staeplaere & Fry, 1986, p.112)

Factors that determine inter-reflection and reflection are:
a. Length of the fiber-The longer the fiber, the more colour you will see.
b. Tightness of the twist- Generally the more tightly the yarn is spun, the deeper the colour when woven. The tighter twist will create a more blended yarn and the colours will seem darker or greyed. The looser the twist or spin the lighter the colours.

c. Crimp or curl- The more crimp, the darker the colour because the colour or light is bounced around in the crimp and less is reflected back to the viewer.
d. Differences in loft: fuzzy vs. smooth- Loft (fuzz) or lack of fuzz can darken or lighten the way a yarn looks when woven. Fuzzy yarns such as mohair will create shadows because the fuzz prevents some light from being reflected back to the viewer. Shiny (silky looking) yarns always look lighter in colour because they have more surface to reflect light. Because of their fuzziness, cottons will look softer and deeper in colour than a smooth silk or rayon of the same colour when woven.
e. Rib structure of the tapestry.-The deeper the rib structure, the less light and colour reflect back to the viewer. (More shadow is created.) Some yarns, including those spun from a crimpy and short-stapled fleece as well as those that are fuzzy, absorb even more light and hold this light within the rib.

2. **Multiple wefts used together:** Techniques such as chinés, mélanges, colour fades and the stippling effect made by twisting these wefts together can create optical blending. Using multiple yarns in the weft bundle creates more little dots of colour when woven. Each half pass creates a dot of a colour on every other warp. The next half pass makes another series of dots along the fell line that creates a second series of coloured dots. Each of those dots is composed of the multiple wefts in the weft bundle. (Note: When woven, the colour generally travels from side to side across the fell line. But the weft bundle can also be woven eccentrically.)

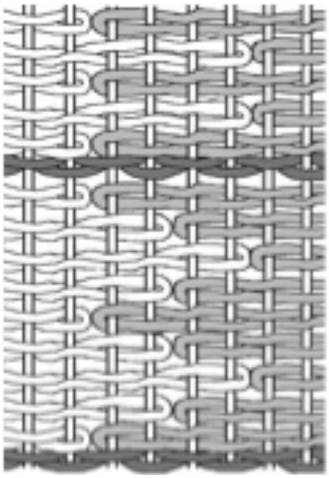
a. Colour and texture in tapestry are determined by the threads in the weft bundle. The two techniques for mixing these threads are chiné, which uses opposite colours, and mélange, which uses similar colours. With optical blending, a chiné will usually blend to make a greyer (muddier) colour than a mélange. This is because it is difficult for the eye to blend the opposite colours and it fatigues while trying to do so, greying the colours. These greyed colors can be nice because they have more life than a dyed grey usually has. Mélanges are used when you want a blended, but bright colour. (Note: the chiné of black and white will not create grey. They are too different for the eye to blend. You will get speckles instead of a blend.)
b. Both chinés and mélanges can produce fades of colour from one to another. The most basic colour fade uses two colors in the following pattern: 4-0, 3-1, 2-2, 1-3, 0-4 and variations thereof. (This means a weft bundle blend composed of 4 threads of one colour and 0 of another, then another weft bundle with 3 of one and 1 of the other, etc.) Variations in texture, reflection, and sheen can also be achieved by using these same basic weft bundling techniques.

c. The weft bundle can also be twisted while weaving. The more twisted, the closer the dots of the colour mix that come up. This gives you smaller dots of colour that the eye can blend more easily into a new colour. The weft can also be twisted as it is laid in the shed to determine which colour in the weft bundle shows up better or more often. This will also make the colour shift look less striped as you weave across the fell line.
d. Stippling is a more controlled twisting of the colours for shading which can be done in each pass or half pass. It is a placement of the wefts so certain colours in the weft bundle appear on the surface. It can be done with a simple twist of the weft bundle or by creating a tighter or lesser spin of the weft as it is laid into the shed. It is used as a way to deepen the colour mixture by having more of a specific weft colour show up closer together.

Optical Blending Using Weaving Techniques. *Hatches, hachures, crenulated weave structures, pick and pick, and floating bars.*

These techniques have one very basic thing in common. They move colour vertically up the warps in specific ways and at the same time create bridges or third colours in their simplest forms. They can also travel across the fell line. When viewed from a distance, these techniques optically blend the coloured shapes and lines into another colour, or they optically blend by creating small bars and dots of colour or small triangular areas.

1. Hatches are generally one point, which means they are composed of one turn as they build up the warp. Defensive and offensive colours within the battage (a French word for the field of conflict) can be double sided. In the simplest hatch, you have two base colours and the bridge colour they create. Defending colours and offending colours are determined by what is happening in the design.



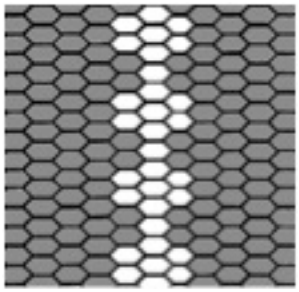
- Hachures work in the same way as hatches but are composed of three or more turns (points), allowing for larger bands of colour distribution. The hachures can be diamond shaped, with obtuse or acute angles. They can be very long or very short.

Top drawing is of single point hatches with a simple battage between them.

Bottom drawing is of 3 point hachures.

The battage is larger, creating a triangular shape.

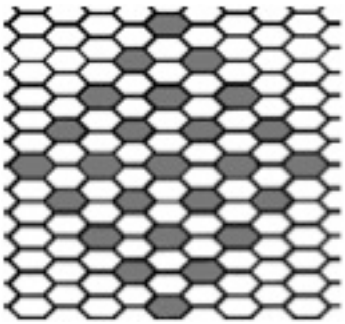
Drawing is from Tapestry 101 by Kathe Todd-Hooker



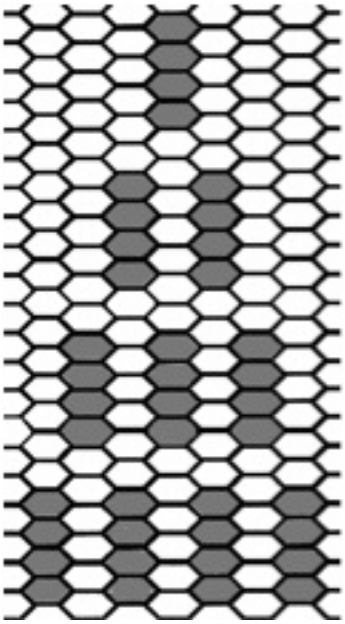
- Crenulated weave structures are related to hatches but have many turns on the same warps between the colours. Think zippers and the crenulated shapes of the top of fairy tale castles.

Drawing of simple crenulations from Tapestry 101 by Kathe Todd-Hooker

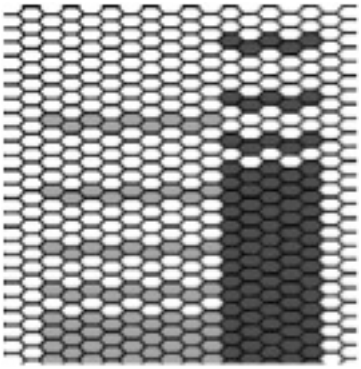
- Pick and pick (demi-duites) can also distribute colour up the warps, one half pass at a time. Demi-duites are only marginally related to hatches, hachures and crenulated weave structures. But pick and pick can be done as hachures and hatches. Pick and pick can also be used to produce dotted lines and grids of dotted lines that can be spaced closer or further apart to create color density or very close together to create lines that move up the warp instead of across the fell line.



The shape in this drawing is created with pick and pick dots. It is from Tapestry 101 by Kathe Todd-Hooker.These vertical lines are created with pick and pick dots. It is from Line in Tapestry by Kathe Todd-Hooker.



- Floating bars are single passes of colour or small rectangular blocks of colour that can be moved closer or further apart to create colour areas and colour blending.They can be any length and distance apart as long as they always contain at least a whole pass. (Note: If done in whole passes, they don't change the shed of the area or adjacent areas.) Sometimes weavers space them using the Fibonacci series to move from one colour to the next.I prefer to use my eye rather than a mathematical formula that can be easily misaligned by so many weaving variables.



This drawing shows floating bars from two different shapes. It is from Tapestry 101 by Kathe Todd-Hooker.

NEXT STEP- Colour Theory

So the question becomes, how do you control and manipulate these techniques and the structure of the weft and weft bundles, you need to know a little bit about colour theory. There are hundreds of books written on colour usage and theory. Colour theory can be as complex or as non complex as you wish it to be. Johann Wolfgang von Goethe, Isaac Newton, Michel Eugène Chevreul, Ogden Rood, Albert Munsell, Wilhelm Ostwald, Josef Albers, Wassily Kandinsky, Faber Birren, Leonardo da Vinci, and Johannes Itten all wrote and formed opinions and scientific principles for colour usage and how they personally perceived that it worked. I always refer to and remember Johannes Itten and Wassily Kandinsky. In my mind Itten is the how and Kandinsky the why. Kandinsky to me isn't so much a colour theorist as a symbolist. In his writings, he referred often to the symbology of colour and its use in music and in design. He related it to his own reality and perception. Kandinsky had ties to the Russian Blue Rose group. The name of this group derived from a poem by Novalis written in Moscow in the early 1900's. This poem is full of colour imagery. I was first introduced to Kandinsky and his writings while I was in high school by a favourite provocateur uncle who was writing a dissertation on Russian symbolists. Kandinsky's and Itten's systems and concepts are the ones I memorized and internalized to the point they are part of me. It is important to find a system of colour and study it so that you learn the ins and outs of how colours work together and against each other.
When referring to Itten, I prefer to use the seven colour contrasts he identified. These are easy to remember. I use them to figure out the most extreme possibilities of colour choice for a weft bundle. Then I choose colours which are between these extremes if I want a mélange or colours which are closer to the extreme if I want a chiné.

Note: It might help if you have a range of coloured yarns available and make wrapped combinations of them as you are reading this section.

Itten's seven colour contrasts

(More or less borrowed/liberated and rewritten from Itten) Note: Colours are usually involved with more than one contrast at a time, but often one contrast is dominant over the others. For instance, colours have temperature (warm/cool) and value (light/dark). They can be complements or in another colour wheel relationship.

Contrast of hue–

There needs to be at least three colours in a composition. Only undiluted colours in their most intense luminosity or brightness may participate. The most extreme contrast uses the primary colors, red/blue/yellow. The further away a hue is from its primary, the weaker the contrast. White weakens and black intensifies in a contrast of hues. This contrast is primarily used in shape areas, not in weft bundles.

Contrast of light and dark—

The strongest contrast is black and white. Any colour automatically transforms neutral anywhere on the value scale to its complement. For instance, when red and white yarns are bundled together, the white will take on the appearance of red's complement– green. Achromatic grey is a vampire, it deadens the colours around it. There are gradations of value in a light and dark contrast. Pure colours vary in their value and brilliance. Yellow is the lightest value and the most brilliant. Violet is the darkest and least brilliant. Red and green are the same brilliance and value.

Contrast of cold and warm—

The warmest colour is red-orange; the coolest is blue-green. All colours or hues travel or move between them in the colour circle. Colours may appear warm or cold as they are contrasted with warmer or colder colour hues. Cooler colours seem more distant and appear to recede; warmer colours seem closer and appear to float forward.

Contrast of complements—

Complements are direct opposites on the colour wheel; each colour only has one. They will excite each other to their maximum vividness when adjacent to each other. Any two complements mixed in a weft bundle, will yield a greyed out colour. If you stare at a colour and then close your eyes, you will see that colour's complement in an after burn or after image. When complementary coloured shapes are next to each other, this property of after image creates stable colour combinations which can be somewhat bland. A more exciting contrast is to use split complements (see below).

Simultaneous contrast (two types)–

The first type occurs when the eye simultaneously requires the complement of a colour when it is viewed and if not present, the eye generates the complement spontaneously. The eye perceives the non-existent complement. The combination of a colour plus a neutral grey will cause the eye to tinge the grey automatically with the complement of the colour.
The second type occurs when a colour is paired with its split-complements which are either of the colours that are one step to the left or right of the colour's actual complement on the colour wheel. These colour combinations automatically produce a shift in the eye to the complement. This is one of the more dynamic visual colour effects.

Contrast of saturation—

The contrast that is created between pure intense colour and dull diluted colours. Diluted colours are tones (a colour mixed with grey), tints (a colour mixed with white), shades (a colour mixed with black), and colours mixed with their complements.

Contrast of extension—

The contrast of big and little colour patches and how they relate to each other. With this contrast, you vary the proportions of colour in the composition. If you want a balanced composition, without one colour dominating another, you use the most dominant colour in the least amount. You then use the least dominant colour in the most amount, etc. For instance, if you are using bright yellows, beiges and light greys in your composition, you would use a small amount of the bright yellow because it is so dominant. Then you would use a middle amount of beige and a large amount of the light grey since beige would be more dominant than the light grey.
Note: When colours come together closely, strange things happen such as:

Simultaneous Contrast-

A third type of Simultaneous Contrast was identified by Josef Albers and Chevreul. It occurs when a combination of colours next to each other appear to change hue, value, or intensity. When two colours are touching each other, their similarities in hue, value and intensity will blend, forcing their differences to appear as dissimilar as possible.

Inductive Colouring—

The illusion or ghost of a colour's complement in a neutral colour area, when the neutral area is next to a shape of pure colour. For instance, when a yellow or yellowed neutral (such as ecru) shape is woven next to a white shape, a light violet glow will appear in the white shape. This is because the after image of the yellow is violet and staring at the yellow causes eye fatigue. Your eye then sees the complement of the image colour.

Wow! A lot of information, but it is easy if you take it one step at a time. As you weave a tapestry, keep about an inch wide section of warp to the side to sample colour combinations as you weave. Take notes in a weaving journal. Save the sample so that you have something to refer back to. Another way to get started is to keep a notebook with cardstock pages with series of holes punched in the card stock. Create a weft bundle or even a series of weft bundles and half hitch them to the card stock and then just play adding or subtracting colour combinations as you go. The easiest way to learn is to just weave and observe!