

# Some Important Illusions of Color in Textile Designs

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Color beauty in textiles is not entirely a matter of optional choice, or adherence to some principle of color harmony. This is because certain limitations, inherent in the textile industry, tend to qualify results under various circumstances, and to force the designer to exert his intelligence as well as his artistic insight in order to get the best possible results.

## Illusion of After-Image

One important illusion concerns what is called the after-image. It is a fact that when the eye is concentrated on an area of pure color for several moments a sensation of the opposite of that color tends to assert itself on the retina. For example, if a small area of vivid red is placed in line of vision and viewed steadily for several seconds, when the attention of the eye is transferred to an area of white or gray, the sensation of green results. This sensation, which brings out the opposite color of the one originally viewed, is the after-image. In textile design it often introduces serious difficulties and tends to change the appearance of colors in various environments.

The after-image is a phenomenon of vision and consequently must be studied from the standpoint of vision. Thus the chart shown in the Figure can be consulted with some degree of assurance. This chart reveals the four visual primaries as red, yellow, green and blue, and the visual secondaries as orange, yellow-green, blue-green and violet. The after-image is always an opposite. Thus the after-image of red is green, the after-image of yellow is blue, the after-image of orange is blue-green, and the after-image of violet is yellow-green. The same facts hold true if the above order is reversed. That is, the after-image of green is red, and so on.

Simply, when the eye visualizes one color it

tends to bring up the sensation of the opposite of that color—its after-image. And this after-image will exert an influence on other colors that lie adjacent. For instance, a fairly large red pattern in the midst of yellow will tend to make that yellow appear greenish, for the after-image of red is green and, when it mixes with the yellow, a greenish-yellow results. Likewise, the after-image of yellow in this case, which is blue, will mingle with the red giving it a slightly purplish hue.

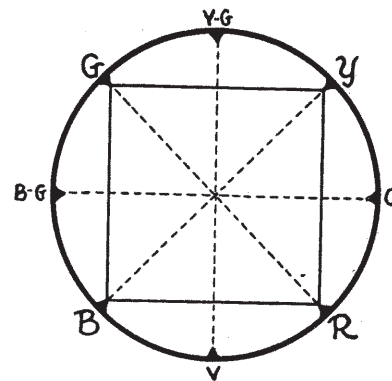


Chart of color relationships in vision. The four visual primaries are red, yellow, green and blue. The secondaries are orange, yellow-green, blue-green and violet. Visual opposites are red and green, yellow and blue, orange and blue-green, and violet and yellow-green.

To give the matter of the after-image an orderly attention, the following summary will prove helpful.

1. The after-image of a color is its opposite. This relationship can be understood by referring to the color arrangements shown in the Figure.
2. Inasmuch as after-images always consist of opposites, color schemes that are made up of opposites will not undergo any change in color character. Red with green, in patterns, will remain true in tone, being made slightly more vivid because the after-image of one fortifies the other.

3. Brilliant colors on neutral areas such as white or gray, will tend to exert a change in the character of those areas. Gray set off by brilliant red will appear greenish. Set off by

EDITOR'S NOTE—This is the second of a series of three articles by Mr. Birren. In the May issue he discussed color theory in an article entitled "The Practical Side of Color Theory as Applied to Textile Design." In the present article emphasis is placed on color facts. The third and concluding article, which will appear in an early issue, will outline several principles of harmony that are unique to the textile industry.

green it will appear tinted with pink, and so on.

4. In other color combinations, not consisting of opposites, the after-image will tend to modify other colors as though they were mixed with the after-image. One example of this was given a few paragraphs above with reference to red and yellow. As another example, yellow patterns on green will, because of the after-image, make the green appear bluish. The effect of green, with its red after-image, will make the yellow appear tinted with orange. Reference to the Figure will aid in appreciating the character of these changes.

#### After-Image Presents Limitations

The influence of the after-image is not greatly important in textile design. This is mainly because its effect is not generally prominent. However, while the after-image may not offer possibilities, it does definitely present limitations. For example, a rather beautiful yellow might be selected to harmonize with an equally attractive red. Each hue might appear beautiful in itself, but when they are combined in a pattern, the yellow might then appear to be undesirably greenish—a color that is not widely appealing. In this example it is assumed that the green after-image of red has mixed with the yellow, turning it toward green. At first sight and thought, the fault might seem to rest with the dyes. (In reality, of course, it rests with the visual fact concerning the after-image).

However, the above disappointment would not eliminate all possibility for a beautiful combination of red and yellow. If the yellow turned greenish because of the after-image of red, it could be made slightly orange in tone. With this done, the undesirable greenish tint would be entirely offset. This one example suggests how the textile designer, when he is confronted by a visual problem, can master an apparently complicated situation with ease.

Color patterns on gray have always presented trouble—particularly where warm colors such as red, orange and yellow are employed. The after-images of these hues are cold. Thus gray with a red pattern will appear greenish. Gray with an orange or yellow pattern will appear bluish. If the cool gray is not wanted,

the effect can be corrected by using a small touch of warm color with the gray dye. For example, if a red pattern makes a neutral gray background appear greenish, a slight touch of red, orange or yellow could be added in the gray dye, and the scheme corrected.

The after-image should be known to the textile designer. Its influence may be subtle, but it is an influence nevertheless, and textile art with color must contemplate its secrets.

Patterns made up of pure colors often appear “fringed” where the sensation of the after-image overlaps from one color to the next. Perhaps this phenomenon was discovered centuries back by the earliest of textile designers, for the use of neutral outlines around bright color areas is as old as the textile art. At any rate, the annoying confusion that may result from rather conglomerate color combinations can often be overcome by using outlines. In doing this the eye is aided in its isolation of color areas, and the after-image “fringe” is greatly eliminated. The use of outlines in textile design is a first principle of harmony and is an old precedent to follow.

#### Illusion of Dimension

Another illusion encountered in the use of color in textiles centers around the factor of dimension. It is true that the warm colors—red, orange and yellow—tend to advance, while the cool colors—blue, green, violet and blue-green—tend to retire. This is an illusion that is due to a definite adjustment of the lens of the eye under the influence of color. In other words, red on blue will tend to appear in front of the blue. The one hue will come forward, and the other hue will fall back.

The quality of dimension suggests many opportunities in textile design. First of all, cool colors provide the best background when a pattern is to be prominently displayed. Again, if one line or contour of a pattern is shown to overlap another, the effect will appear natural only when the color which is supposed to be uppermost is made warmer than the color which is supposed to be undermost. If this condition does not exist, the implied truth of the design will be lost.

Allied to the illusion of dimension is the

fact that a pure color will always appear more pure if surrounded by areas of a dull color. Here one tone works against another. The pure color will appear more pure because of contrast with the dull color, and the reverse. This infers that much beauty of color in textile design can be accomplished with patterns in pure, warm colors placed on backgrounds that are not only cool, but dull in character.

The textile designer, with his medium of colored thread, has much opportunity to accomplish striking results not possible with other mediums such as paints and colored lights. The principles of color isolation and diffusion, encountered in the visual study of color and outlined in a previous article,\* offer many advantages. It is found, for example, that the diffusion of analogous colors (colors that are closely woven together into one common surface) results in much purity and brilliance, while the diffusion of contrasting and opposite colors results in grayness. Changeable silks, in which much striking beauty has been attained, have to some extent exploited and revealed the possibilities of color effects when one or more threads of differing colors are woven together.

The close intermingling of adjacent, or similar, colors is quite prevalent in nature. A red rose will generally show touches of orange and violet—colors that are adjacent to red. Similarly, the wings of some insects will have an iridescent quality that swings from green to blue to violet—also analogously. Color mixture with strands of thread woven together so that the eye must diffuse them, has greatest possibility when the scheme is based on analogy. For example, red with violet, or red with orange, or red with both violet and orange will present a beautiful appeal. When the eye mixes such combinations the resultant color tone remains dominantly red, and no opposite or contrasting hue exists to deaden the effect. At the same time, because the reddish tone is made up of two or three analogous colors, a lively stimulation follows when the eye assimilates them on the retina. In fact, no plain, singly-hued textile surface, woven of one color alone, can have the vivid-

\* The Practical Side of Color Theory as Applied to Textile Design, THE MELLAND, May, 1930.

ness and the power of a surface that gets its dominant color through the diffusion of adjacent hues.

### Effective Use of Colors

This is another simple law of harmony. Analogous colors always blend well together, and this also applies to printed patterns or woven designs. Such schemes as yellow, orange and yellow-green; green, blue-green and blue; blue, violet and red, and so on, are specifically good. In the printed pattern or woven design, on the other hand, contrasting effects may be planned based on opposites. Striking appeals are also possible here; but it must be remembered that opposites cannot be diffused in the weave if the desire is to gain bold purity. Sufficient isolation must exist when opposites are employed, and the color areas must be so patterned as to allow for convenient perception by the eye of each tone.

One trick within the realm of textiles, to gain harmony, lies in the use of a dominant hue or thread to bring the entire surface and pattern of a material into agreeable coherence. For example, let it be assumed that a warm, advancing color such as red is chosen as a pattern and placed on a retiring background of some tone of blue. The two colors might not be altogether harmonious. Then, as a dominant hue, a thread of purple or lavender can be chosen and diffused throughout the entire surface, over the pattern as well as over the background. Harmony would come immediately. The purple or lavender thread would make the red appear purplish, just as the blue would be made to appear purplish. This is a simple and often used device.

Yellow diffused with orange and yellow-green, blue diffused with violet and blue-green, orange diffused with yellow and red, are more schemes in which harmony can be forced through the diffusion of a dominant hue. In fact, the whole subject of color in vision, if given sufficient study, will open up vital channels of beauty to the textile designer. Heretofore unrealized effects will be revealed, and the many good precedents of the past will be bettered and brought to those greater heights of appeal so demanded today.