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Quick Tips in Design
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Part 2: Using Color

Color is all around us, and it's probably for that reason that most people don't think much about it. Many people haven't had to think about color since their days in grade school when they made projects out of colored construction paper and watercolor paintings to bring home to their parents.

Fortunately for us, techniques for using color have been broken down almost into a science. Hundreds of years and generations of artists and designers have explored color and how it can be used to achieve a specific desired result. There are literally dozens of books about color and how to use it, and there are many ways to apply color technique.

COLOR TRIANGLE
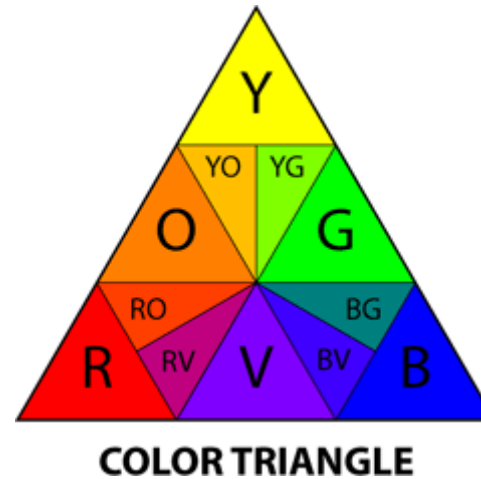
Primary and Secondary Colors

You may remember someone (probably in grade school) teaching you about color, and the concepts of primary and secondary colors. These are the basic colors just about everyone is familiar with.

The primary colors are yellow, red, and blue. These are considered the foundation of color because when mixed together and in different combinations, all other colors can be created from using these three primaries. Notice that the primary colors are located on the corners of the color triangle. The primary colors are the "cornerstones" from which all color principles are based.

PRIMARY COLORS

YELLOW + RED = **ORANGE**
YELLOW + BLUE = **GREEN**
RED + BLUE = **VIOLET**
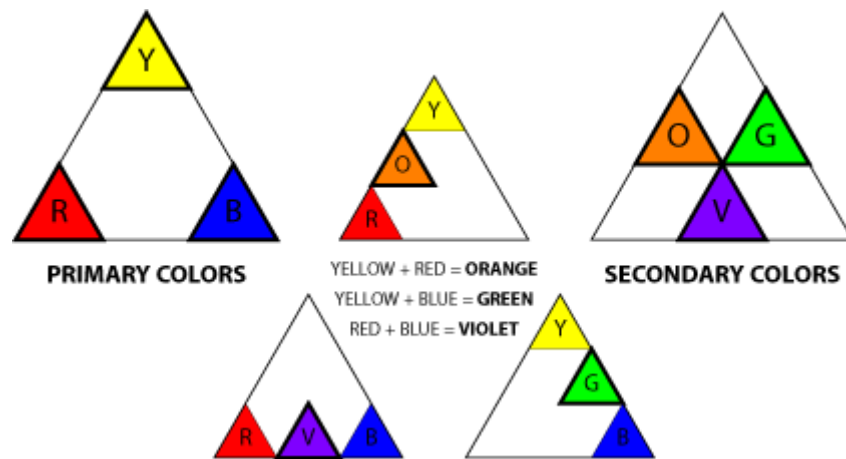
SECONDARY COLORS

Secondary colors are created when equal amounts of any two primary colors are mixed together. (You may remember having difficulty with this in grade school. That may have been from the use of "student grade" materials which use fewer and cheaper pigments, sometimes achieving unpredictable and disappointing results.) The secondary colors orange, violet, and green are located on the sides of the color triangle.

Any pure color is also referred to as a hue. Each color is a hue. Changing hue means changing the color itself.

Primary and secondary colors can be used in an image to attract attention and create energy, but be warned that overuse of these colors may give a design a simplistic, childish, or even amateurish look. Children's toys often use primary colors to keep attention focused, but many people carry those associations into adulthood and don't react positively to pure primary/secondary color usage.

It has been suggested on many occasions that an artist's sophistication and career development can be observed through their use of color. The argument is that visually using

mainly primary and secondary colors suggests that the responsible party has not had the time to experience, develop, and explore color and its infinite possibilities. That doesn't mean these colors shouldn't be used, but it is something to be aware of and to watch out for when designing for some audiences.

Tints and Shades

When white is added to a color, the color is diluted and produces a *tint* (also referred to as "pastels"). A *shade* is created when a color is mixed with black.

everything between
white and red is a
—— **TINT** ——

everything between
red and black is a
—— **SHADE** ——

WHITE   PURE   BLACK
RED

Brilliance and luminosity are terms used to describe the amount of black mixed with the color to create the shade. "Zero brilliance" or "zero luminosity" is black.
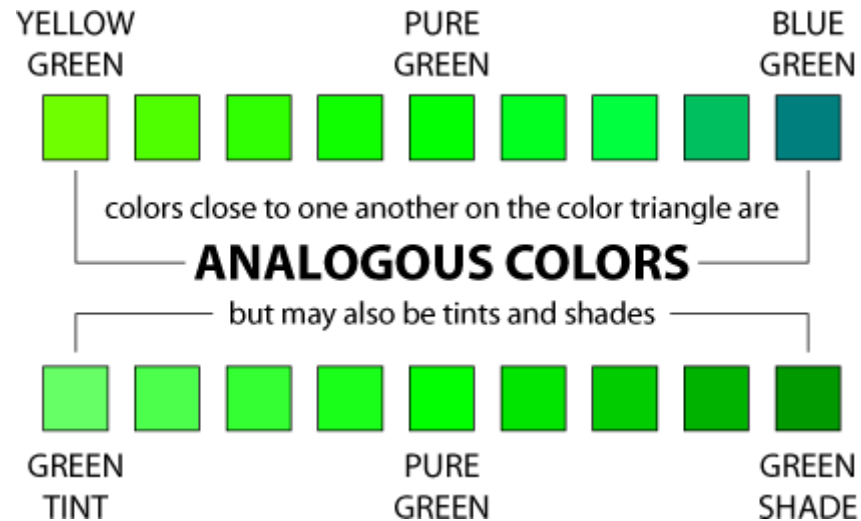
Whenever a color is "diluted" by mixing white or black into it, the color loses *saturation*. The color pink is created by mixing red with white. Technically the color pink can be described as "a tint of red" or "low-saturation red."

The effect of tints and shades upon the observer varies based on how they are used, but both are visually weaker and have less energy than does pure color. Traditionally, products targeted to women include more tints, while products for men are often more saturated. Whether this is the development of social conditioning or is based on physical gender is difficult to tell, but it does appear to work when targeting a gender-based audience.

COLOR TRIANGLE   with TINTS   with SHADES
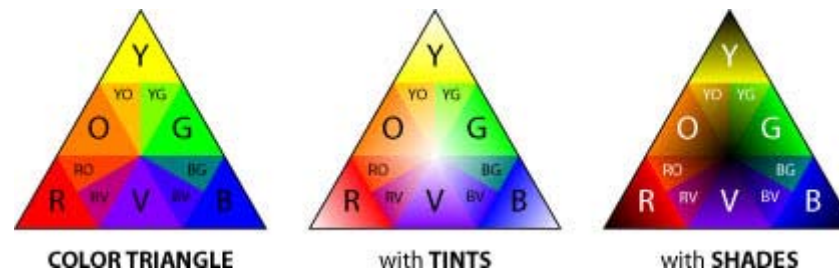
Analogous Colors

The term analogous means "like" or "similar." Analogous color can be used to create subtle differences in an image or design. These subtle differences create a peaceful and more harmonious feeling from an image.

YELLOW   PURE   BLUE
GREEN   GREEN   GREEN

colors close to one another on the color triangle are

ANALOGOUS COLORS

but may also be tints and shades

GREEN   PURE   GREEN
TINT   GREEN   SHADE

In the <u>previous article (Using Value)</u> we created a simple logo with type and value changes.

The same design can be used but with color applied. Many times designs may match colors used in existing publications and products, and for this example blue is used by the institution and is the required color in the design.

Using blue as a starting point, analogous tints and shades can be applied to create many different options. The result is that each variation creates a unified feel (some more than others). This is a particularly good method for applying color to designs which have limitations on reproduction. For example, the design may appear not only on paper but on T-shirts and coffee mugs. The cost of reproducing a design multiplies for every additional color used. If only blue and tints of blue are used in the design, only one ink needs to be used in printing the design on a T-shirt. Shades will require the use of two inks, both blue and black.

ANALOGOUS TINT & SHADE VARIATIONS

PCSE **PCSE** **PCSE** **PCSE** **PCSE** **PCSE**
DEPARTMENT OF PHYSICS COMPUTER SCIENCE & ENGINEERING

Analogous hues can also be used to create different results. Using different (but similar) colors adds more visual interest to the design. Be careful when using analogous colors not to make the variations too similar, since the results may not appear in reproduction.

ANALOGOUS HUE VARIATIONS

PCSE **PCSE** **PCSE** **PCSE** **PCSE** **PCSE**
DEPARTMENT OF PHYSICS COMPUTER SCIENCE & ENGINEERING
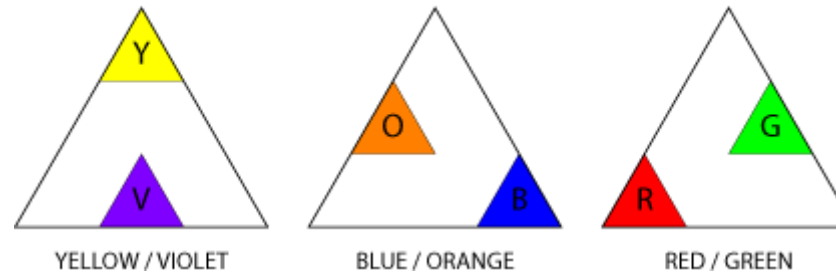
Complementary Colors

Find a primary color on the color triangle. Draw a line directly opposite the color and you have discovered the complementary color.

PRIMARY COLORS AND THEIR COMPLEMENTS

YELLOW / VIOLET   BLUE / ORANGE   RED / GREEN

Complementary colors have many uses. As opposites on the color triangle, the colors react off one another visually when placed alongside each another. This effect has been described as creating energy, or a visual "vibration," that can be used if those results are desired. Others find the results outright heinous, so it's important to be aware of how complements effect one another. Either way, complements definitely demand attention.

WHEN USED TOGETHER, COMPLEMENTARY COLORS REACT VISUALLY

Another use of complementary colors is in traditional media. If we were to mix paint using two complementary colors, we would end up with gray. Interestingly, the resulting gray isn't the same as would occur when mixing white and black to create a value. Mixing complements produces a chromatic gray that is considered to be more visually interesting than a value.

The next time you're in an art museum, look closely at the gray on a painting and you may be surprised to find it is actually composed of colors rather than black and white. The common CMYK printing process (cyan, magenta, yellow, and black—the printing equivalents

of the primary colors), while very versatile, just isn't capable of completely reproducing all of the nuances of color. This is one of the reasons why reproductions (posters and prints in books) often lose some of the feeling and impact that can be seen in the original.

PRIMARY COLORS AND THEIR SPLIT COMPLEMENTS

YELLOW / RED-VIOLET
YELLOW / BLUE-VIOLET

BLUE / YELLOW-ORANGE
BLUE / RED-ORANGE

RED / YELLOW-GREEN
RED / BLUE-GREEN

Split complements are a variation on the concepts of complementary color. Split complements are analogous colors on either side of the complement. Because the split complements are close in color to the complement, they still carry some of the visual energy that is observed in complementary colors but without as much of the harshness.

SPLIT COMPLEMENTS STILL REACT VISUALLY BUT ARE LESS DRAMATIC

Applying the concepts of complementary colors to the logo creates drastically different results from what was achieved previously. The logo takes on a completely different feel based on how the concepts are used.

COMPLEMENT & SPLIT COMPLEMENT VARIATIONS

PCSE **PCSE** **PCSE** **PCSE** **PCSE** **PCSE**
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ENGINEERING

Setting either the descriptive text or the acronym as blue and then applying complementary color concepts to the remaining text creates an effect of separation. The results attract attention but are not unified and visually break down the balance of the original design. Because the acronym and descriptive text are divided by the use of color, the results attract attention to the separate parts. While that isn't the desired result for our example, it does show how complements might be used in other applications.

COMPLEMENT & SPLIT COMPLEMENT VARIATIONS ON ACRONYM ONLY

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ENGINEERING

PCSE **PCSE** **PCSE** **PCSE** **PCSE** **PCSE**
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In the second example, the descriptive text remains black and complementary color concepts are applied only to the acronym. The results are improved, keeping the design more unified and the type more legible. The use of complements show an increased energy over the logos that used analogous colors.

This is when color usage may become tricky. The Department of Physics, Computer Science & Engineering may enjoy the increased energy from the complementary color usage, but the results also resemble the logo designs from some sports teams. If the client wanted to suggest a greater excitement in their public image, these examples might be their preferred choice. These might also be suited for recruitment purposes by attracting attention and suggesting energy.

On the other hand, the Department of Physics, Computer Science & Engineering may not find the results appropriate for their public image and decide that the analogous color examples are more representative. When using color in design it is important to know the desired end result to use color most effectively.

Psychology of Color

There are theories as to why we react to color the way we do, many based on what color means in nature. Bright colors, like the yellow on a bee or a flower, attract attention but can suggest different meanings. For the bee, the yellow is there to warn others to pay attention or they'll get stung. For the flower, the yellow is there to attract others so that the flower will be pollinated. Either way, yellow is a color that demands a reaction from earthly observers.

One method for applying color is by dividing it into warm and cool colors. The primary color yellow is "hot," red is "warm," and blue is considered "cool." The "warmth" of secondary colors can vary based on how close they are to yellow and red. Yellow-green is "warmer" than blue-green, and draws more attention from the observer.

The technique of using warm and cool colors can be used in an image to draw attention to a specific area or to suggest space. Warm colors advance, and cool colors recede.

Applying Color Theory to a Photograph

Many people are unaware that the professional photographic images they see on a daily basis have been modified to produce greater impact. With color theory it's possible for anyone to "dress-up" their photos to create more dramatic results.

With the photograph at hand, it often helps to take a look at the colors already present in the image before making changes. Working with the existing color will allow the

modifications to fit more seamlessly within the image.

Many landscapes, either in print, television, or motion pictures, have been modified to create greater impact. The blues in the sky and/or water are often exaggerated, and other colors may be applied to further emphasize the changes. Because many landscapes contain blue from either the sky or from water, blue is a good base color to begin modifying a landscape. Cranking up the amount of blue is a simple modification that just by itself can create dramatic results.

*original photo with
levels corrected*

*increased blue in sky, applied
complement orange 15% to
sign, 40% to building*

With blue increased, the options for making a foreground subject stand out are relatively simple by applying complementary colors or split complements. In our landscape example, the most direct method of applying blue's complement orange also worked with the existing red hues that were natural in the photograph. The "warmer" nature of tinting the

foreground orange also made the subject more immediate to the observer. With careful application of this technique, the observer wouldn't be aware the image was modified unless they had the original available for comparison.

In our second example we have a photograph with a woman walking past an alley. There is already an abundance of yellow in the image, so yellow will be our staring point for the modifications. Blue-violet is a split-complement to yellow and presents contrast between the alley and the foreground's already yellowish tones. Further contrast was created by slightly increasing the yellow in the foreground, but only by 15% so as not to make the woman look jaundiced.

The results in this example are obvious, but not necessarily negative. Most viewers will be able to notice the modifications, but that isn't necessarily a problem if the modifications encourage the viewer take more interest in the image.

original photo with
levels corrected

increased yellow in foreground
by 15% and applied split
complement blue-violet to alley

These are simplified examples of how color theory can be applied to photographs, but it's easy to find other methods to apply to your own work. Looking more closely at the media will lead to discovery and many more ideas of how color can be applied to images.

Interaction of Color

When is yellow not yellow? When does gray change and look more like a color? In our example there are four boxes. Depending on which box you look at, the colors can appear to change even though they are all the same.

The gray box within the yellow square looks darker than the same gray box within the violet square. Stare at any of the examples and you may notice the gray doesn't appear to be "just gray" anymore, but instead takes on some of the appearance of the complementary

color of the color next to gray (the gray next to yellow can appear more violet).

Even though color is based on scientific principles, how our brains interpret color is an entirely different thing that can't always be explained as easily.
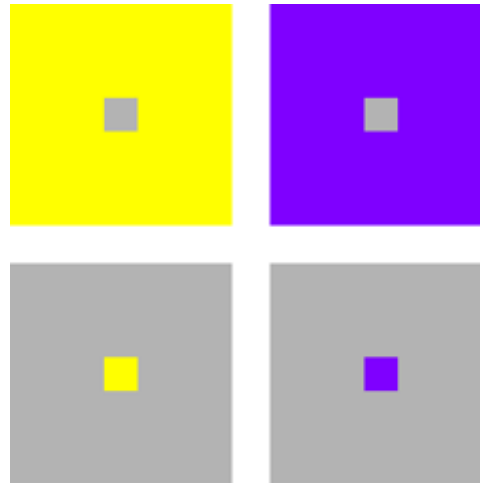
The same yellow, violet, and gray were used, yet they appear to change relative to how they are used together.

Color Processes

The discussion of color thus far has been based upon the principles of reflective color, meaning when light bounces and reflects off an object. Things change when the color is emanating from light. When light is used to create color, yellow is no longer a primary and is replaced by green. Instead of mixing yellow, red, and blue to create color, light uses red, green and blue (RGB). This is the same technique used in televisions, which is why if you look very closely at a CRT screen you can actually see the separate RGB pixels. The RGB

color mixing process is the most common option available in computer software, primarily because most computers present information to users with CRT screens or LCD's, both of which use RGB color mixing.

Another color process that is widely used is CMYK (cyan, magenta, yellow, and black). This is the process used for most print reproduction, whether it is a color inkjet printer or large printing presses for books and magazines. CMYK color mixing is a common option in most computer graphics software.

RGB and CMYK are just different methods for creating color. All of the principles of color still apply. Many beginning users of computer graphics software are frustrated by the RGB and CMYK color mixing restrictions. Some software (Painter is one example) is targeted to users of traditional media, like oil painting or watercolor, and offers different color mixing tools that more closely resemble the color triangle presented here.

Even though this discussion has covered some of the basics of color theory, it's important to remember that color, like all visual tools, is subjective. How people react to the same image differs greatly from person to person. By using some of the principles discussed, it is possible to use color to more consistently affect how viewers react to visual work and to communicate a specific message.

The next article will build on what has already been presented in a discussion of Perspective and the Illusion of Depth.

Also in This Series

- *Part 2: Using Color—August 2003*
- [Part 1: Using Value](#)—July 2003