

# The Law of Reciprocity

The Law of Reciprocity says that if you give the film twice as much light for half the amount of time, the exposure will remain the same. The idea of this is to help you understand how you can change your aperture and shutter speed settings for the image you want without changing your exposure.

Below are some ordered pairs of f-stops and shutter speeds.

<b>F-stops</b>	<b>F:1.4</b>	<b>F:2</b>	F:2.8	F:4	<b>F:5.6</b>	F:8	F:11	F:16	F:22	<b>F:32</b>
<b>Shutter Speeds</b>	1/2000	1/1000	1/500	1/250	<b>1/125</b>	1/60	1/30	1/15	1/8	1/4

The small number f-stops are the large openings, which let in the most amount of light. The smallest opening has been highlighted with cyan, as it is not available on most cameras. Between each full f-stop there is a halving or doubling of the light, which passes through.

It is easy to see that the shutter speeds also have this 2:1 ratio for duration that in effect is the same as amount. SS below 1/60 have been grayed out as they may produce unwanted camera motion.

All of these ordered pairs of f-stops and SS give the same exposure! This is a lighting condition somewhere between a bright sunny day and indoors.

If all of these combinations give the same exposure what's the difference? The easiest way to understand this is to think about a fast moving subject. If we use a very fast SS, the motion would be frozen. With a slow SS the motion would blur. With aperture opening the difference is Depth of Field.

The larger the opening the less of the picture is in focus.

These concepts of focus and motion are important ones and were brought to the art world through photography. Did you ever see anything out of focus or blurred from motion in a painting before 1839? We will explore the aesthetic implications of both these concepts in the next two weeks.

# Depth of Field

Depth of field is the amount of the image that is in relatively sharp focus. In other words it is the amount that is in focus in front of where you focus plus the amount behind where you focus. There is always twice as much in focus behind as in front. This is one of the products of translating the three-dimensional world into the two dimensional one of photography.

There are three factors which control DoF:

F-stop: The larger the opening, the smaller the DoF.

Distance: The closer the distance the smaller the DoF.

Focal Length: The longer the focal length (telephoto) the smaller the DoF.

Traditionally, some photographers believe that everything in a photograph should be in focus, just as our eyes focus on everything we look at. The great group of American landscape photographers followed this credo. Photography was the first medium to render the texture of the thing itself not a texture produced by the process. In order to see the texture of nature, subjects needed to be in focus. This group of photographers used huge cameras and lenses and recorded their images on 8"x10" or larger sheets of film. They always used the smallest openings on their lenses, f:64 and called themselves the f:64 group. They included many famous photographers including Ansel Adams and Edward Weston.

Conversely, the tradition of portraiture used very narrow depth of field, mostly out of necessity. Early films had very low ISO. With the aperture wide open, exposures would still be 15 seconds or more. It was very difficult to keep a portrait subject from moving. Stopping down the lens would have doubled the exposure time making things even blurrier. The technique was to focus on the eyes and the tip of the nose and the front of the ear would be slightly out of focus. Even though this is no longer a necessity, it remains the style of a formal portrait. In the last century with modern equipment and faster (higher ISO) films, photographers began to use narrow depth of field for a different purpose. Calling it selective focus, photographers would use narrow depth of field to have the focus on only one subject in their photograph as a tool to direct their audience to that subject. More recently many photographers have become even more creative with selective focus. To create the feeling of greater picture dimensionality they made the large foreground subject out of focus so the audience looks past to the sharply focused subject in the background.

As with most things in photography, there are no rules. You can find landscapers who use very shallow depth of field and people photographers who use large depth of field.

For your assignment, please shoot thirty images with subjects using large depth of field and thirty images with narrow depth of field. Remember that it is much easier to record large depth of field with lots of light. Also greater distances, wider angle lenses, and small openings like f:16 help for large depth of field. The opposite is true for narrow depth of field. Please bring the images to class for translation. We will translate the best 10-15 images and get 4 ready for printing.

# Motion

Whenever we have a moving subject, our exposure control of shutter speed becomes more important. As mentioned earlier, we do need to account for the camera's motion most of the time unless we are on a tripod. We use the rule of thumb that says always use a SS that is faster than the reciprocal of the focal length of our lens. For example, with a normal 50mm lens, we would not use a SS slower than 1/50. But in this assignment we want to not only be able to control subject and camera motion but be able to use it creatively.

First of all, let's try to understand how motion works. Basically three factors control motion.

Subject speed: The faster the subject is moving, the faster it appears to the camera.

Distance: The closer the motion is, the faster it appears to the camera.

Direction: Motion coming directly towards or away from the camera appears slower to the camera, and motion that travels directly across in front of the camera appears faster.

We must consider all these factors to help us choose a shutter speed. We must also decide how we want our picture to look: very blurry, mostly sharp with some blur, or completely frozen. It really depends on what we want. Let's take an example and establish some criteria. Let's say our friend is running in the Boston Marathon and we want our picture to show three attributes.

We want to see and read the Boston Marathon placard on their torso.

We want to see them as we do daily so then look like the person we know.

We want to see that they are actually running in the race.

If we use our fastest shutter speed like 1/1000<sup>th</sup> of a second, we can see the placard, but their face has been frozen with the grimace of pain and they don't look right, and since their body is completely frozen, we can't even tell if they are running.

Now let's take a much slower speed like a 1/15<sup>th</sup> or 1/30<sup>th</sup> of a second and use a tripod so we don't shake the camera. Now all the runners are just one big blur. We can't read any placards or recognize anyone, but it is evident that they are all running.

Now let's try a moderate SS like 1/125<sup>th</sup> and try again. From our results we see how people move. Arms and legs may be very blurry, but the slower moving torso is just a little blurry. This goes for the head as well and we see our friend slightly in flux with the grimace of pain smoothed by the motion (looking more like we see them everyday). It is also obvious that they are moving in the pack of runners as they all have blurred appendages, but fairly sharp torsos.

Another way to deal with motion is called "panning". The idea is to move the camera in synchronous motion with your subject moving across in front of you. Use a slow enough shutter speed to create movement in the background but a fast enough one to eliminate any motion from your subject. This is an excellent way to separate your subject from the background or to emphasize the speed of your subject. You can also do this with motion coming toward you with a zoom lens by zooming out as your subject moves in.

Use moving subjects but not automobiles and first decide how you want it to look, blurred, partly blurred, or sharp, and make about 30 exposures. With an additional 30 exposures, create the motion by moving the camera. Try pans or zoom pans or swinging the camera or spinning your body, etcetera. Try to imagine how it will look. Remember, make images not exercises. Translate the best twenty images for printing.

# Point of View

Point of View in photography is the physical position of the camera in relation to your subject. Are you standing up with the camera at eye-level, or looking up or down? Are you at a normal viewing distance, very close or at a distance? Is there any reference for scale in your image? I consider this concept one of the most important in photography.

Holding the camera level at eye level is used in documentary photography and gives the “window on the world” effect. It is if we are actually seeing exactly what the photographer is seeing. When we look up at a subject, we are making that subject bigger than life, more important, three-dimensional, or even primordial. Just the opposite happens when we shoot down on our subjects, making them generic, two-dimensional, and less important.

Size and scale are dependant on cues within our photographs. Use them when you want your audience to realize the size and avoid them when you want to keep scale a mystery.

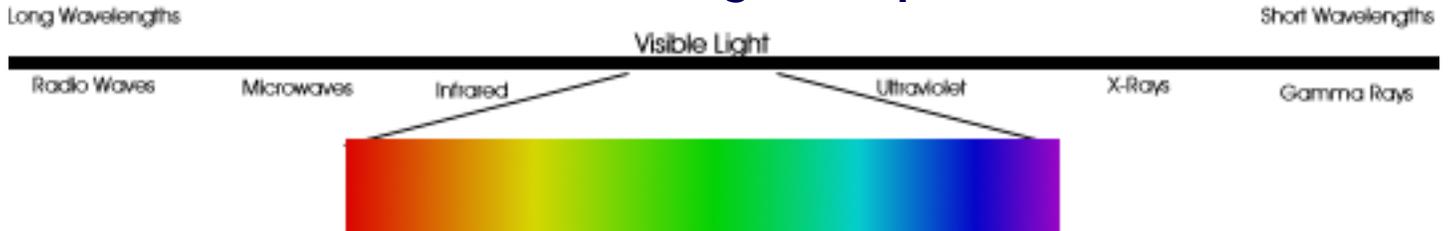
Unusual PoV is often an excellent way to bring attention to your images.

For your assignment, you will need a subject (person) who you know well and will cooperate with you, and an object (any inanimate object) that you can shoot from all angles (no tall buildings unless you plan to rent a helicopter). Shoot 30 different points of view for each, trying for the most unusual ones.

# THE COLOR OF LIGHT

Light is the visible portion of the Electromagnetic Spectrum (radiation from the sun). These wavelengths are the colors of the spectrum: red, orange, yellow, green, blue, indigo, and violet. When all the colors are mixed together in relatively equal proportions they make **WHITE LIGHT.**

## The Electromagnetic Spectrum



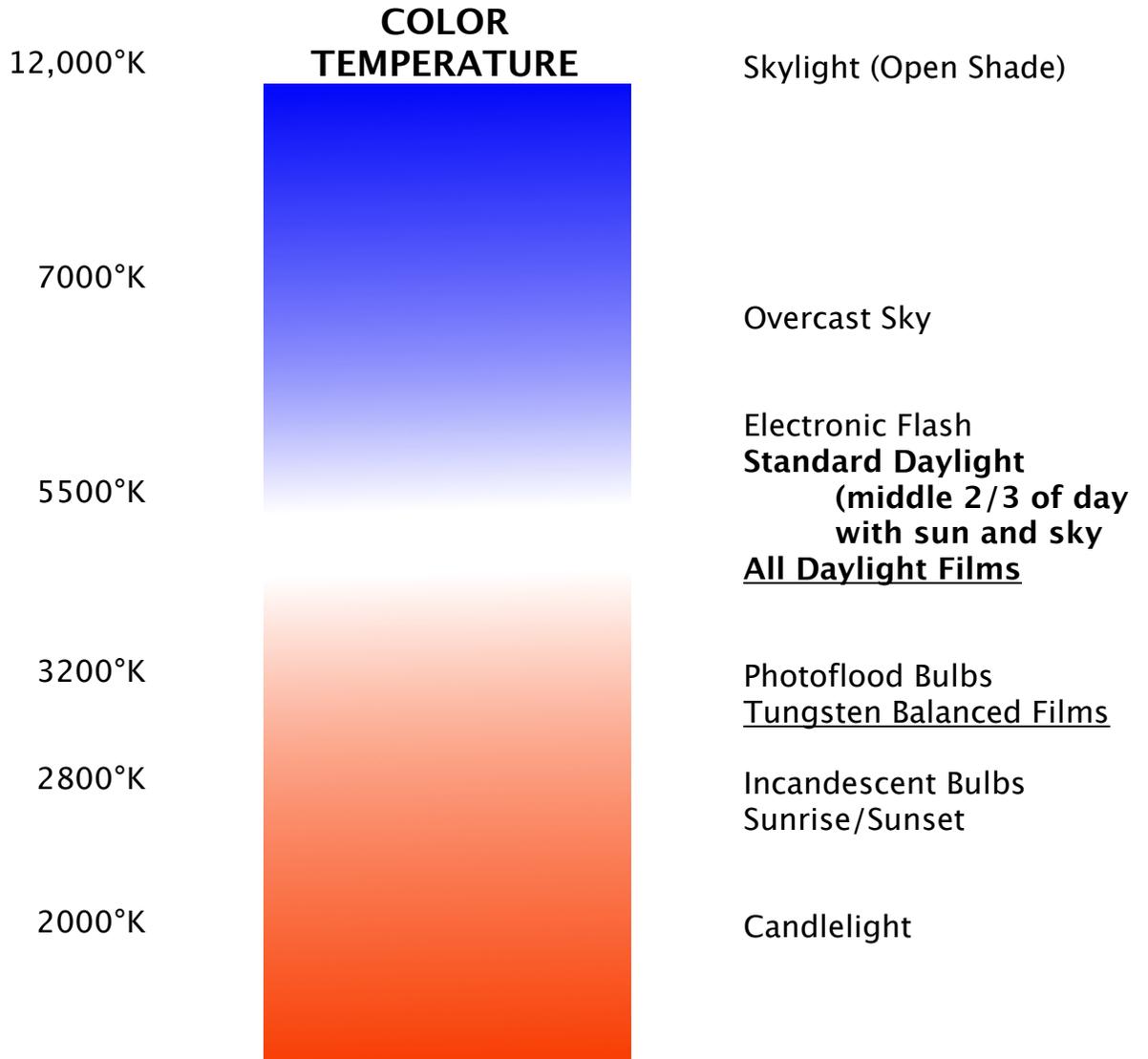
Our eyes see most white light sources like sunlight, electronic flash, and incandescent bulbs as the same neutral color but neither digital sensors or film “see” them that way. With middle of the day sunlight and electronic flash the rendering is neutral. On a cloudy day or in deep shadows the rendering is cool or blue. Early in the morning or late in the day or under incandescent illumination (called Tungsten) the rendering is warm or amber. The system for measuring the relative warmth or coolness of white light sources is called **COLOR TEMPERATURE.**

The higher the color temperature, the cooler or bluer the color that the film renders and vice versa. The color temperature scale is based around 5500°Kelvin which is called **STANDARD DAYLIGHT** (the average of 2/3 of the middle of the day with sun and sky). Unlike film which are only balanced for standard daylight (5500° K), or tungsten (3200° K), a Raw file can capture many color temperatures all in the same file. Light Balancing filters which change the color temperature of a source for film are totally unnecessary with digital cameras using the Raw format.

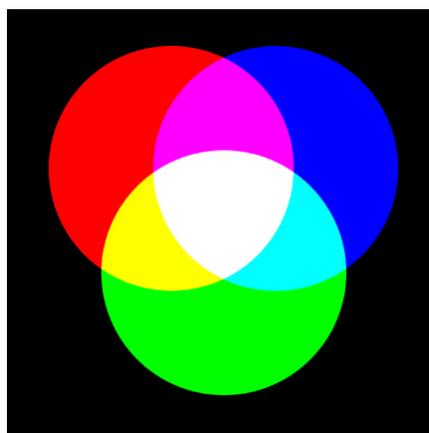
Light sources which lack one or more of the colors of the spectrum are not white light sources but are called **NON-CONTINUOUS SPECTRUM EMITTERS.** Certain wavelengths (colors) are missing and most films record strong color casts. These casts are more or less filtered out in the Raw translator. Fluorescent lights are the most common of these types of light sources and the only ones that can be easily corrected. Other non-continuous emitters include most street lights which are predominately two types, mercury vapor and sodium vapor. The former appears blue-white to our eyes and green to the sensors and film and the latter appear orange to our eyes and all recording media.

**ULTRAVIOLET (UV), SKYLIGHT, POLARIZING, and NEUTRAL DENSITY (ND)** filters are also used for color photography. UV and skylight filters are basically the same and should be used to remove excess UV when no other filters are being used at shooting distances of at least 25'. ND filters take away light without influencing color and are available in most densities. Polarizing filters remove reflections from most surfaces and also will darken the sky. **ALWAYS USE A LENS SHADE WITH FILTERS.**

The only time you might need a light balancing filter for digital is for the flash to help balance it to the available light.



The Primary Colors of Light



# Color in the Real World

When we look at the color of things, we are looking at pigments and we are all seeing somewhat different colors even though we might agree on the name of the color. **Color is the most relative of all media.** The color wheel for the theoretical colors of light does not allow photographers to communicate with other color artists who work in the real world of pigments.

Pigments have their own color wheel and systems for describing color. The CIE and Munsell systems are examples of these systems which all use approximately the same three notions to describe color. The first is **hue** which is simply the name of the color. **Value** is the color's place on the gray scale equivalent to what we call density except that the higher the value the lighter the color and lower the density. The third is **saturation** which is the purity of the color. Purity or saturation may be adulterated by black or white or gray or by another color.

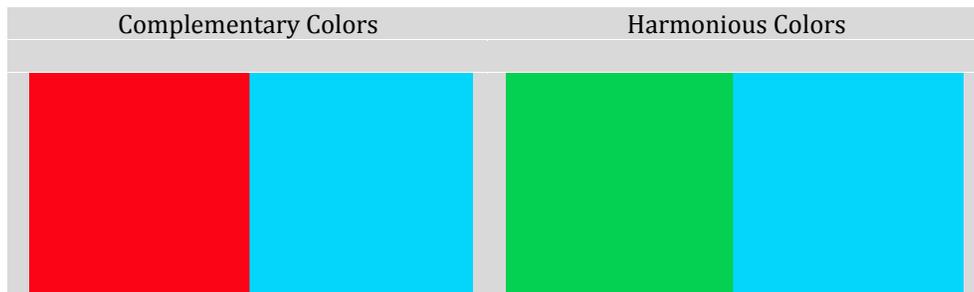
We can relate this understanding to our photographic interpretation. If we want maximum saturation for a color, we need to learn at what value that takes place. Some colors reach their maximum saturation at middle value like red and green. Others like yellow and orange maximize somewhat higher (lighter). Blues and violets saturate at darker values. With a little help from the zone system, we know how to place these values of various colors for the best effect.

Two other terms that help describe color and are often confused by photographers are tint and shade. Tint is hue plus white, and shade is hue plus black. Generally tints and shades have psychological effects. Tints represent the "up" and shades "down". We can manipulate our materials to the desired effect by simple exposure manipulations. Digital images should be captured Raw and rendered to be tints or shades in the translator. How much depends on the contrast as well as the planned effect. High contrast lighting greatly reduces the amount of manipulation that can be accomplished without changing the entire look of the image. Conversely, small changes with low contrast may not be noticeable. The Interaction of Color by Joseph Albers examines how we perceive color and demonstrates many of the illusions of color. You will appreciate the complexity and relativity of color by doing the exercises that Albers has outlined. You can continue your studies of color by using color swatches (ColorAide swatchbook or cutouts from the Sunday newspaper supplements). Try working with two colors to find the nature of similar and complementary colors. Then try making triads (three color combinations), looking at them over time, and trying substitutions. You may find these colors appearing in your photographic ideas. You may need to bring one or more of the colors to your scene.

# COLOR IDEA

## The Nature of Color

Unlike B&W where contrast between subject and background, etc. means a large difference in density, color contrast may exist between colors with the same density. If we take opposites, called complementaries, we can have strong color contrast between colors of the same value (luminance). Complementary colors form strong contrasts in the same way strong density differences do in B&W. Symbolically these subjects of contrasting colors tend to show strong differences between whatever they are representative of. Two persons wearing complementary colors will expose their differences, real or imagined. Non-complementary colors do not create harsh contrasts and are called harmonious colors. Similarly, two persons wearing harmonious colors will expose their similarities.



## How Much Color

The question is really how many colors. Let's begin by trying to include as many color as possible. When we have all the colors, our photographs look real and normal, but seldom allow for using color to our advantage. So let's go the other direction and use only one color. In much the same way, this does not really allow for much interpretation and the image must stand on its B&W attributes regardless of the color of monochromatic image. Now let's look at two colors. We can have either harmonious color or complementary color. The simplicity of only one relationship doesn't allow for complex ideas to come forth in most still imagery. However, it can have a great impact—just look at the cereal boxes at the grocery and see how complementary colors are used to garner attention. Most strong complements have an immediate impact that is powerful, but short lived (we don't need to look at it again, we know how it looks). We can see the use of multiple 2-color images in slide shows where these 2-color ideas will work when the images all work together with multiple images and multiple contrasting and harmonious 2-color ideas. Generally, 2-color images are just too simple for the singular image.

With the addition of a color or two to make 3 or 4-color imagery, our photographs can now have both contrasting and harmonious relationships within the same image without the distraction of too many colors. A look at modern painting will show a similar palette usage limited to 3 or 4 colors. This is the best scenario for using color to express your feelings and ideas in photography. To this end, we are going to make triads with colored paper, work with them and then go out and find those colors in the real world, trying to isolate those colors, and hence, your color idea.

## Isolating Color

How do we reduce the palette without a ton of post processing? The two best methods I know are cropping and the use of neutrals. So when you are shooting, you may have to move in or zoom in to isolate your color idea. Neutrals (grays, blacks, whites and very desaturated colors) can surround or separate your colors without influencing them and changing their relationships. There are lots of ways to make things work and these neutrals don't need to look the same. They can be shiny or dull or textured or smooth making the neutrals different in different pictures.

## Assignment

Please put together colored paper and make at least two triads, and look at them and shift around or replace the colors until you are satisfied. Find and shoot these colors in the real world and isolate them. Try to carry over the ideas or feelings of how the color relates to your photographic subjects. Don't be afraid to bring some of your colors in the form of clothing or backgrounds, etc. to the places you want to photograph. Don't get discouraged; this is not an easy assignment and only a beginning to improve your understanding and use of color in an image or group of images. It is a simple process to remove color locally with post processing, but for this assignment, you should isolate your colors in the camera, not in Adobe Camera Raw.

# Web Imagery

Images used for printing can be much too large for the internet. While this file size is necessary for high quality prints that you can continue to adjust without degradation, web images can easily be made from these files. For raster graphics, the jpeg format is recommended. This is a compressed format that degrades every time you manipulate and save it. Always make new jpegs each time an image needs to be modified. The best place to make individual images is inside PS with the Save For Web command. However for our purposes, it is much easier to use a slide show template in Bridge to prepare our imagery to be seen on the web.

## WEB AUTOMATIC SLIDESHOWS

Start in the Bridge essentials view and rank or label only the selected images for the slide show. Once only those images show, you can move them around for the correct order. Then switch to the output view and select html. You then select a template which you like and fill in the blanks for titles, etc. Save the slide show in a separate folder so you can keep the files together and it will play on any web browser. You will need to make these to hand in on a CD for the collected assignments and the final portfolio.

Step by step:

AFTER ARRANGING THE CHOICES IN THE ORDER YOU DESIRE, MOVE TO OUTPUT. Chose "Web Gallery", Template = slideshow, style=darkroom. Then move on to "site info". Fill in the first two blanks for the Gallery title with a title for your slideshow, and the Gallery Caption should contain your copyright (E.G. ©2010 NRennie) where the copyright symbol is option g. Leave the "color palette" and go to "appearance" and set the preview size to Extra Large but leave the thumbnail at medium, a 4 or 5 second duration, and the transition effect of Fade. Next, type in a name for the gallery and click save to disk and put it in a folder separate from any other files. Once saved, it is simply a matter of going to where you saved it and double clicking the index.html file to initiate the slide show.