

THE CHARACTERISTICS OF LIGHT

Media Lighting

ABSTRACT

A chapter on the characteristics of light in photography.

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"First you must see the effect of the light and understand the light action"

-Peter Nicastro

Introduction

As one studies the behavior of light as it is applied to photography one realizes that the type of learning is one of visual perception and an understanding in how light turn the image into some type of emotion, verbal or feeling. Each photographer is curious to discover something and light is the medium, and when that camera shutter goes, something magical takes place.

Many rules may exist but ultimately the way each one perceives light is relative to the personal totality, the environment and the program of experiences. What we can see can be observed and study, how the lights makes lines, shapes and forms is up to you. The art of photography is subjective and a complete experience.

What is Light?

It is a form of radiant energy which our eyes are sensitive to and depend upon for the sensation of vision. Light is the energy that permits us to see (Stroebel, 1986).

There are several theories on the transmission of light from the Corpuscular theory (Isaac Newton) where light emitted from a source in straight lines as a stream of particles, to the Quantum theory (Max Planck and Albert Einstein) where light is transmitted as a flow of separate packets of energy, produced in such great numbers that even at considerable distances from the source there are now appreciable gaps between them. Each discrete packet of light is called a photon. The wave theory by (Huygens and Young) argues the light and similar forms of radiation are transmitted as a waveform in some medium and that the radiation can be characterized as moving electrical and magnetic forces. According this theory light waves travel at the speed 300,000,000 meters/second and frequency is the number of waves passing at a given point.

Measurement of Light

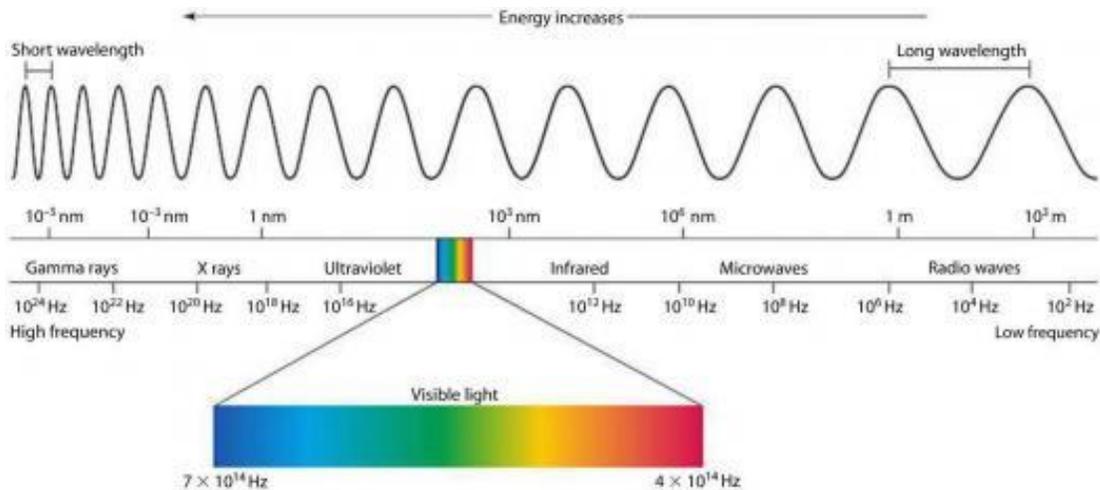
The units of length are based on the metric scale.

Micrometer (μ) 10^{-6} m

Nanometer (nm) 10^{-9} m

Angstrom (A) 10^{-10} m

In the electromagnetic spectrum the visible is a narrow band. Equipped with filters photographic cameras can record visually a large area of the spectrum.



Color temperature meters and exposure meters built-in cameras, hand-held daylight or flash types measure the highlights, and shadows areas of a scene; for example, to measure the exposure of an outdoors scene tonal separation, the light meter can record the incident or reflective light from the subject highlights and shadows areas in f-stops units and the photographer can determine the actual exposure. Sensitive photographic emulsions can record various radiations from infrared to ultraviolet. Digital sensors built in digital cameras can do it as well.

Light Sources

Light sources are measured in Kelvin degrees where daylight ranges from 5,000-20,000 K.

- daylight (sun + sky)
- Incandescence (heat energy)
- Tungsten lamps
- Candle flame
- Discharge lamps
- Fluorescent lamp
- Luminescence
- Bioluminescence
- Chemiluminescence
- Phosphors
- Fluorescence

Light sources used in the photo studio

In the modern photo studio photographers use continue and electronic flash, electronic strobes and speedlights have more power than continuous lights but they can be harder to manage.

- Tungsten lights (flood and spot)
- Lead

- Flash + strobes
- Continuous soft box lighting 5500K

Characteristic of Light

What we can define light as we observed and study.

Direction

Where is the light coming from? the angle between the camera and the light affects the shadows of the image. And the direction of light controls the width of the shadows.

Exploration, isolation can help us understand the effects of the direction of light.



Intensity

As light falls on a subject by illumination it creates a shadow(s). A light source appears less intense when is farther away from the subject, as it gets closer the subject become brighter and the shadows, shape and form are more defined. In the picture below a small flash very close to the subject burst a flash of light making part of the subject very bright not capable to illuminate the surroundings. This known as the falloff, the decrease of light intensity based on distance.



Colour

Color temperature from wax candles to the sun is measured in Kelvin degrees. Digital cameras have a way to adjust the “white balance.” A simple dial can adjustment color temperatures such as sun, shade, overcast, flash, tungsten, halogen and fluorescent lamps. Color correction charts are available to reproduce color in specific lighting conditions. Visual perception plays an important role in detection the chromaticness, saturation and lightness of color. Color contrast and hue selection is of great concern for photographers. The use of light sources and the control of the lighting is a delicate process that requires a patience and visual perception when reproducing a subject from the real world.



Contrast

Highlights midtones and shadow areas in a scene are measured using the ten light-value zone system, a technique which allows the photographer to separate shadow, mid-tones and highlight areas distinctively into “zones”, using exposure and printing controls. In digital photography using the grey scale mode, pictures can be taken to record in full grey scale, as shown in the ocean shot at right.



Quality

In low light conditions the quality of light does not help to reproduce the scene with detail forcing the photographer for long exposures or setting the camera to high ISO, which add grain and noise to the image. Some continuous sources such as fluorescent white can be intense, but not optimal to reproduce daylight. For these reasons electronic flash is used by professional photographers in commercial and scientific work.

The Control of photographic lighting

In a photographic system the elements of control are the following:

- Optical Lenses
- Apertures and shutters to control the amount of light in the camera
- Filters to control the temperature and lighting hues.
- Other elements are reflectors, diffusers and absorbers which are generally used in a control setting.

Because of the various sizes and modifiers electronic flashes can give the photographer better lighting control and by limiting the spread of light, “painting with light” becomes the photographer’s brush. The narrower the beam of light, the more directional the light is, commercial photographers use flash zoom capabilities or narrow honeycombs modifiers for example, to purposely highlight part of a product or label.



Transillumination is quiet common technique to light glassware, slides and living structures with translucent characteristic such as leaves, fish, larvae and other sea creatures.

Electronic Flash

The studio strobes or portable speedlights give the photographer the ability to control the power, direction, intensity and quality of light and reproduce the similar quality as outdoor daylight. Portables strobes are ideal since are more reliable than speed lights. Electronic flashes work with reflectors and modifiers such as the beauty light reflector, which has intense daylight characteristics; other modifiers such as umbrellas and large reflectors can soften the lighting to produce soft skin and good color reproduction. Other modifiers, such as diffusers, absorbers and filters can work well with continuous and electronic flash as well.



One of the great advantages of speedlights is the small size, weight, range of power and the ability to zoom into smaller areas and block the light from unwanted areas of the scene. There are accessories one can attach to speedlights, such as snoots and grids (honeycomb). The disadvantages are use of alkaline batteries and size and in some cases limited power. The advantages some speedlights are not subject to shutter restrictions, therefore they can be use outdoors as fill lights and allow low apertures for shallow depth of field.



Lighting Ratios

The difference on tonal separation from dark to light areas in a scene or falling on a subject's face. Low Contrast 2:1 or 1 stop, 4:1 or 2 stop, 8:1, 3 stops

High contrast 16:1 or 4 stop

Extreme contrast or 7 stop

Your Turn

Find a light source and a subject, study its effect. Gather all your experience compose and Take your first shot and enjoy!



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