

THE NATURE OF LIGHT & COLOR

WHAT IS LIGHT?

1. The ancient Egyptians thought that light was the gaze of _____, the god of the sun, illuminating the earth with his sight.

2. Later, the ancient Greeks thought that sight was created by rays, or beams of light emitted by the _____.

3. Alhazen, an Arab physicist, (born in Basra, Iraq, lived 965-1,040) promoted the theory that light came from an _____ source, like the sun.

4. Our current understanding comes from physicist James Maxwell. In the 19th century, he discovered that the forces of light, electricity and magnetism were all the same –they are all manifestations of the _____.

5. The **ELECTROMAGNETIC SPECTRUM** ranges from short wavelength energy, (such as cosmic rays, gamma rays, x-rays, uv rays), to long wavelength energy (infrared rays microwave & radio waves).

6. The colors we see are just a small slice of the electromagnetic spectrum known as the "**VISIBLE SPECTRUM.**"

7. Although Sir Isaac Newton didn't know about the electromagnetic spectrum, but he experimented with the nature of color and light when he was 23 years old (in 1666).

•**Experimenting with prisms, Newton bent sunlight & transformed it into 7 colors: red, orange, yellow, green, blue, indigo and violet.**

- he found that the prism bent _____ light the least,
- and that the prism bent _____ light the most.
- he also found that white light is the _____ of all colors of light.
- and that black is the _____ of light.

Right now you are probably asking yourself, "What does this have to do with photography and color?"

Answer: It's about the NATURE OF COLOR in everything you see...

"COLOR" IS DETERMINED BY TWO FACTORS

COLOR TEMPERATURE is the first factor that determines the colors we see

8. Color Temperature ranges from " _____," to " _____," to " _____."

"WARM" color temperature light can be caused by...

- natural light sources
 - afternoon light (more about that later)
 - other "warm" sources (fires, candles)
- artificial light sources
 - tungsten light bulbs

"COOL" color temperature light can be caused by...

- natural light sources
 - overcast, or cloudy sky
 - open shade
- artificial light sources
 - blue color temperature light
 - light filtered by an object
 - light filtered by water

"OTHER" color temperature light can be caused by...

- natural light sources
 - light reflected from a colored surface or environment
- artificial light sources
 - fluorescent light
 - purple neon light

PIGMENT is the second factor that determines colors we see

9. a. Pigment is determined by an object's _____ or _____ of light.

b. if an object is colored, then it is _____ that color, and absorbing all other colors.

c. if the object reflects all the colors the same amount, then the object appears _____.

d. if an object absorbs all the colors of the spectrum, and reflects none, the object will be _____.

THE NATURE OF COLOR: MIXING PIGMENT vs. MIXING LIGHT

There is also difference between PIGMENT and LIGHT when it comes producing color.

MIXING PIGMENT FOR COLOR

10. Mixing ratios of magenta, cyan & yellow produces all the colors of PIGMENT that we see.

- a. mixing the three primary colors of PIGMENT, produces black.
- b. Mixing PIGMENT to create black is known as _____ COLOR.

MIXING LIGHT FOR COLOR

11. Mixing different RATIOS of red, green & blue LIGHT, produces all the colors of light that we see.

- a. equally mixing the three primary colors of LIGHT (red, green & blue) produces white light.
- b. mixing the three primary colors of light to produce white light is known as _____ COLOR.

12. So, the two factors that determine the color of an object are

- a. the _____ of an object.
- and...
- b. the _____ of the light striking an object.

PSYCHOLOGY OF COLOR

Colors often have different meanings in various cultures. And even in Western societies, the meanings of various colors have changed over time. At this time, in our culture, researchers have found some common values associated with specific colors. The following are very, very broad brush descriptions of the psychology associated with color, whose meanings may be different depending upon a host of factors.

Black

Black is often associated with authority & power.

It is popular in fashion because it makes people appear thinner. It is also stylish and timeless. Black can also imply submission. Priests often wear black to signify submission to God. But black outfits can also be overpowering, or make the wearer seem mysterious, aloof or evil. Examples of this can be seen in the portrayal of villains, such as [Dracula](#), or Darth Vader, who often wear black.

White

White is often associated with purity, innocence and sterility.

Brides traditionally wear white to symbolize innocence and purity. White reflects light and is considered a summer color. White is popular in decorating and in fashion because it is light, neutral, and goes with everything. However, white shows dirt and is therefore more difficult to keep clean than other colors. Doctors and nurses wear white to imply sterility.

Red

The most emotionally intense color, red stimulates a faster heartbeat and breathing.

It is considered the color of love, or passion.

Red clothing gets noticed and makes the wearer appear heavier. Since it is an extreme color, red clothing might not help people in negotiations or confrontations. Red cars are popular targets for thieves. In decorating, red is usually used as an accent, rather than the dominant color in a room.

Pink

The most romantic color, pink, is more tranquil.

Sports teams have been known paint the visiting locker rooms (used by opposing teams) a soft pink color so their opponents will lose energy.

Blue

Peaceful, tranquil blue causes the body to produce calming chemicals, so it is often used in bedrooms. It causes the opposite reaction as red, but blue can also be cold and depressing.

The color of the sky and the ocean, blue is one of the most popular colors. Fashion consultants recommend wearing blue to job interviews because it symbolizes loyalty. People are more productive in blue rooms. Studies show weightlifters are able to handle heavier weights in blue gyms.

Green

Currently one of the most popular decorating colors, green symbolizes nature. It is the easiest color on the eye and some claim that it can improve vision. It is a calming, refreshing color. People waiting to appear on TV sit in "green rooms" to relax. Hospitals often use green because it relaxes patients. Brides in the Middle Ages wore green to symbolize fertility. Dark green is often associated masculinity and has been used to imply wealth. In the United States, green is also the symbol of money.

Yellow

Cheerful sunny yellow is an attention getter. While it is considered an optimistic color, very bright yellow rooms can agitate some people, causing them to lose their tempers... some studies have found that babies will cry more in a room painted an intense yellow.

It is the most difficult color for the eye to take in, so it can be overpowering if over used. Yellow enhances concentration, hence its use for legal pads. It also speeds metabolism.

Purple

The color of royalty, purple connotes luxury, wealth, and sophistication. It is also feminine and romantic. However, because it is rare in nature, purple can appear artificial.

Brown

Solid, reliable brown is the color of earth and is abundant in nature. Light brown implies genuineness while dark brown is similar to wood or leather. Brown can also be sad and wistful. Men are more apt to say brown is one of their favorite colors.