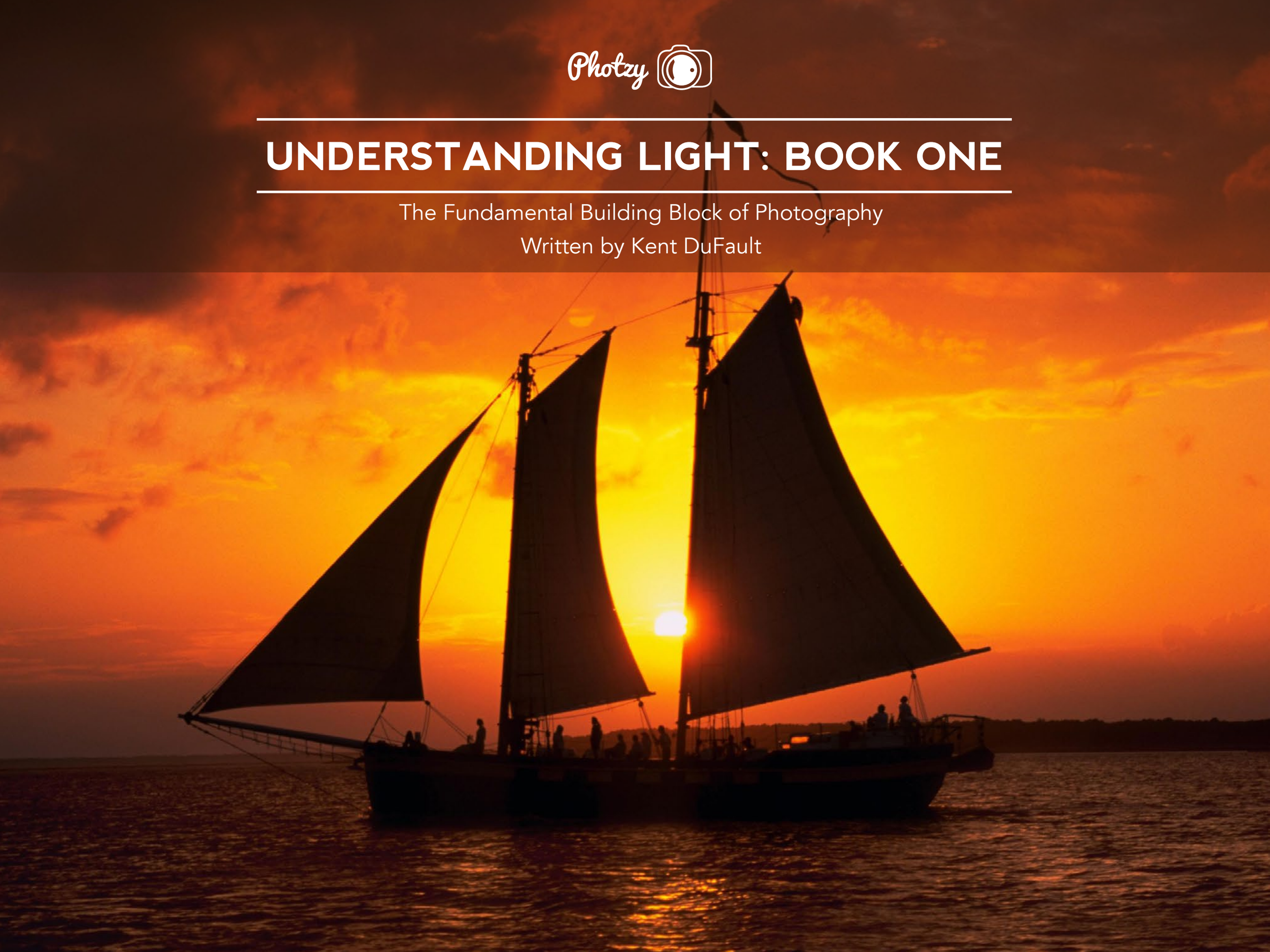
Photzy

UNDERSTANDING LIGHT: BOOK ONE

The Fundamental Building Block of Photography

Written by Kent DuFault



CONTENTS

01

INTRODUCTION

Without light there would be no photography. It's as simple as that.

INTRODUCTION

The concept of photography, as we know it today, came to fruition as the result of a number of previous technological discoveries.

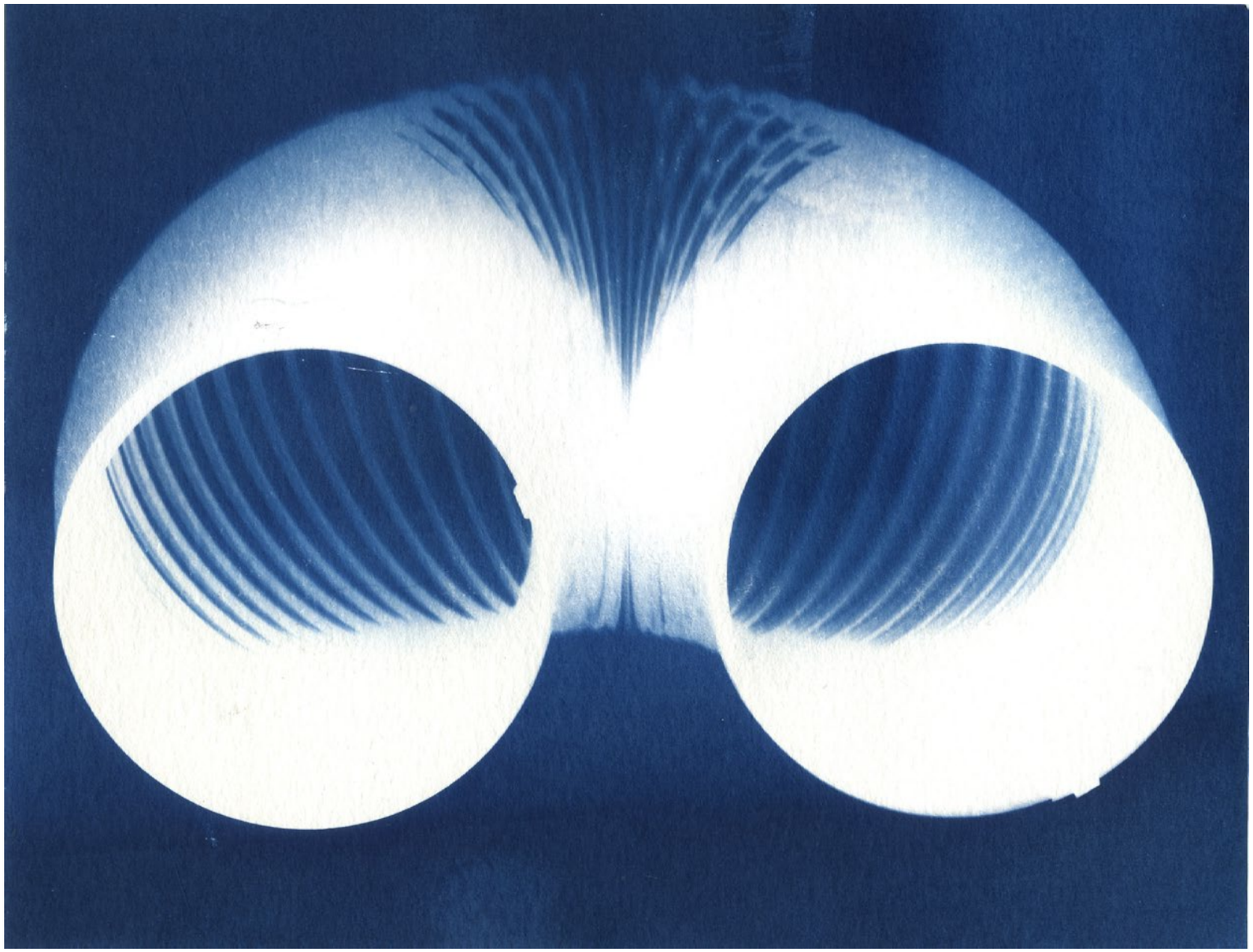
- Chinese philosopher Mo Di, and Greek mathematicians Aristotle and Euclid, described a pinhole camera in the 4th and 5th centuries BCE.
- In the 6th century CE, Byzantine mathematician, Anthemius of Tralles, used a type of camera obscura in his experiments.
- Albertus Magnus (1193–1280) discovered silver nitrate (which led to the observation that silver is light sensitive).
- Georg Fabricius (1516–71) discovered silver chloride (which led to a more stable light sensitive material).
- Daniele Barbaro described a diaphragm in 1566 (which led to the modern day f/stop.)

These are just a sampling of the historic steps that led toward modern day photography.

They all have one thing in common- the use of light.

Without light there would be no photography. It's as simple as that.

The earliest photographic images were photograms. There wasn't even a camera involved.



andeecollard
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This photogram, of a toy Slinky, illustrates how an object can affect the travel of light.

Placing translucent or opaque objects on top of light sensitive paper, and applying light, creates a photogram.

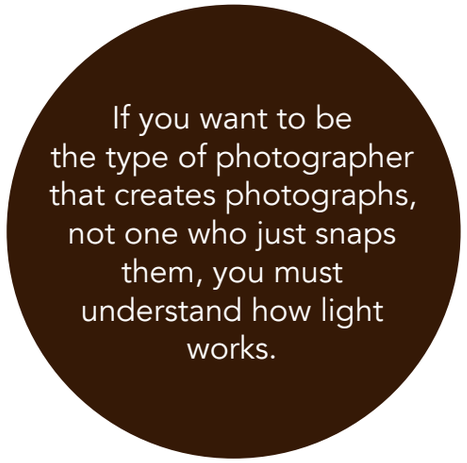
Studying photograms is a great tool to help you understand how light can be altered.

The primary thing that has changed over the centuries in the development of photography (up to today's digital photography) is "how" light is used to alter a light-sensitive material to form an image. That material used to be film, or paper, which was coated with a silver-based chemical compound. Today, the light sensitive material is an electronic sensor.

Doesn't it make you wonder what the light sensitive material will be in another 50 years?

The common element throughout the history of imaging (photography) is "LIGHT".

That's why it's a fundamental building block.



Now… have you heard other photographers say, “Wow! That’s nice light.”

Have you yourself said that? Do you notice the diminutive changes in the light around you?

Many photographers do not take notice of the light around them. This is especially true of the digital-age photographers who are mostly untrained.

When I say that, I’m not pointing fingers or even stating that you MUST care about “light” to be classified as a photographer.

But- if you want to be the type of photographer that creates photographs, not one who just snaps them, you must understand how light works. And, once you understand how it works, it will be to your advantage to thoroughly understand how to manipulate it. These skills will help you create photographs that you can pre-visualize in your mind.

As a result of studying and understanding light, you will get consistent, more predictable, results.

TMAB2003
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Many years ago, when I first began studying photography, I spent hours (days… maybe even weeks) studying how different types of light affected different types of shapes. I produced countless images such as the one of the baseball above.

Lighting, shooting, and studying the resulting photographs of simple shapes will go a long way toward teaching you how 'light' works.

Assignment - Photograph simple shapes using standard household lights such as a lamp or a work light. You can create your shapes out of cardboard, or you can find items around the house. At a minimum, you want a ball shape, a box, and a pyramid. Create at least 20 images of each shape while moving the light and/or changing the characteristics of the light. Examples of how you might alter the light are: place white semi-opaque paper between the light source and the object, or confine the light by placing a tube between the light source and the subject. Get creative with how you alter the light. Keep notes and study your final results.

This is a very important point.

Light has characteristics. It's malleable. Light can change naturally, or it can be changed artificially.

What do you think the "Gary Fong Lightsphere" is actually doing? It's simply altering the characteristics of the light source.

In the next chapter, we are going to discuss the two primary characteristics of light (as relates to your photography).

I want you to understand something...

I am not an optical engineer or a physicist. I don't want to bore you with tons of technical data. If that is what you want- this is the wrong guide for you.

I want to give you enough information so that you (hopefully) understand how light works, how it can be changed, and how it all affects your photographic endeavors.

There will not be a lot of formulas or overly intense diagrams.

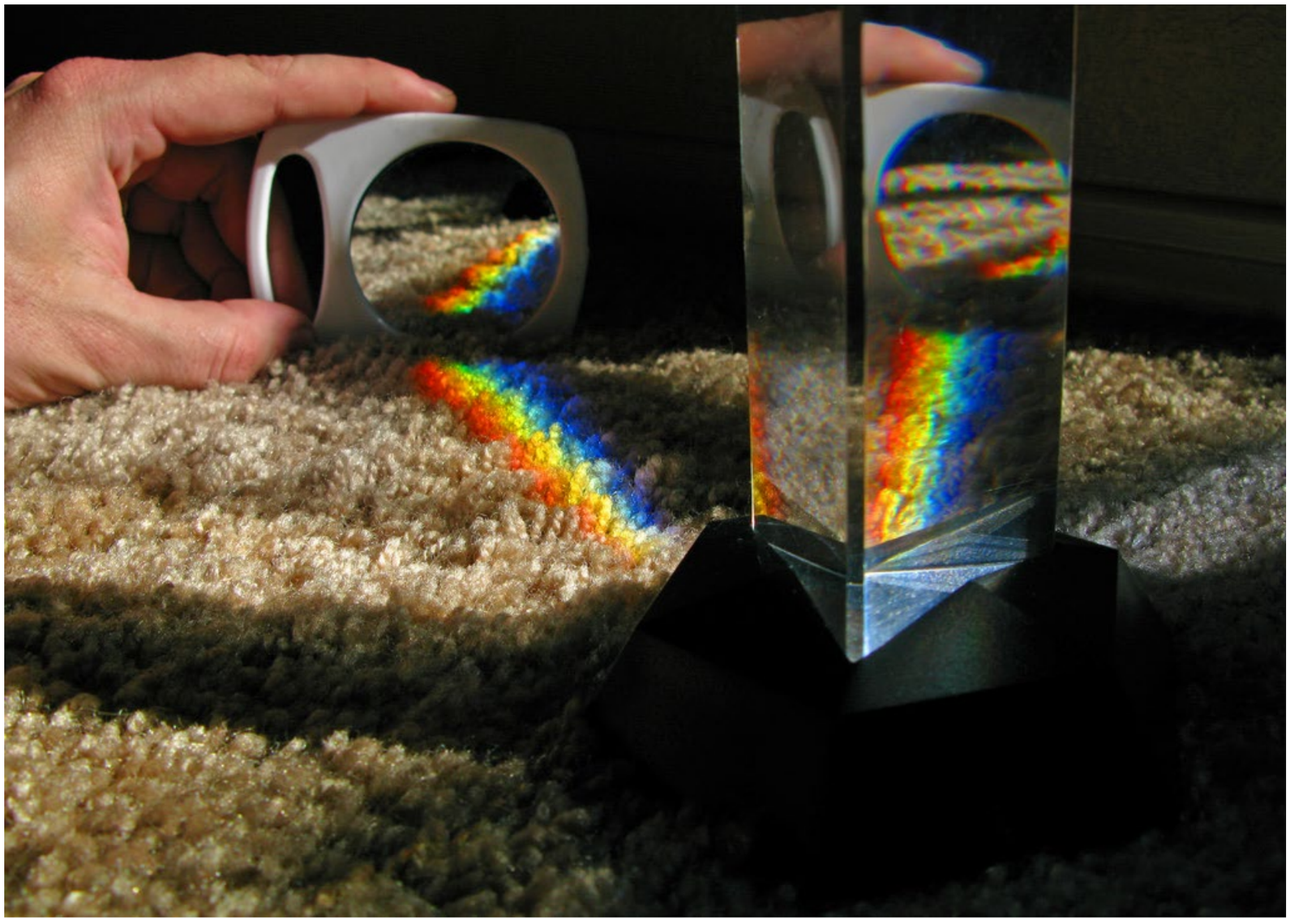
However, if by the end of this guide you can sit back in your chair (just as I am), look over your shoulder toward a window, and recognize what type of light you're seeing, how that light would affect a subject, and how that light would record within your camera- well then- I would consider this premium guide a success.

02

TWO CHARACTERISTICS OF LIGHT THAT EVERY PHOTOGRAPHER NEEDS TO UNDERSTAND

Ask yourself these questions:

1. Do you know why the glow of a sunset is orange-red?
2. Do you know why a photograph that you took in your office turned out green?
3. Do you know why when a theatrical production uses gels on their lights, you can see that color?



sburke2478
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LIGHT WAVELENGTH

Let's step back to elementary school for a moment…

Remember when your teacher pulled out a prism and held it up to a light source, thus creating a rainbow across the room?

It didn't mean much back then (did it), other than, "Wow. That was pretty."

But that illustration is very important to photographers and their understanding of light.

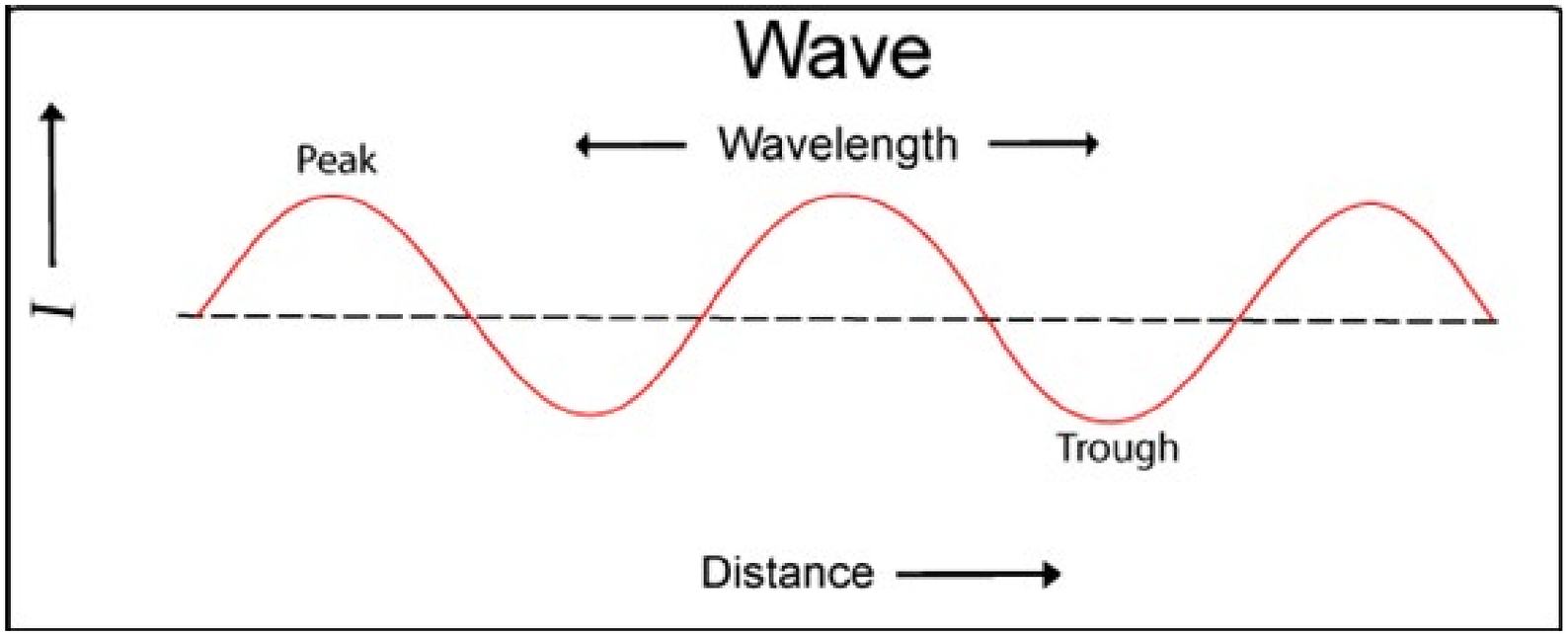

Illustration Courtesy of NASA - Public Domain

Light travels in waves: just like water. When light is created, and begins to travel in waves, it is traveling in a straight line.

Let's look at light waves and dig out the core reasons why this is important to us as photographers.

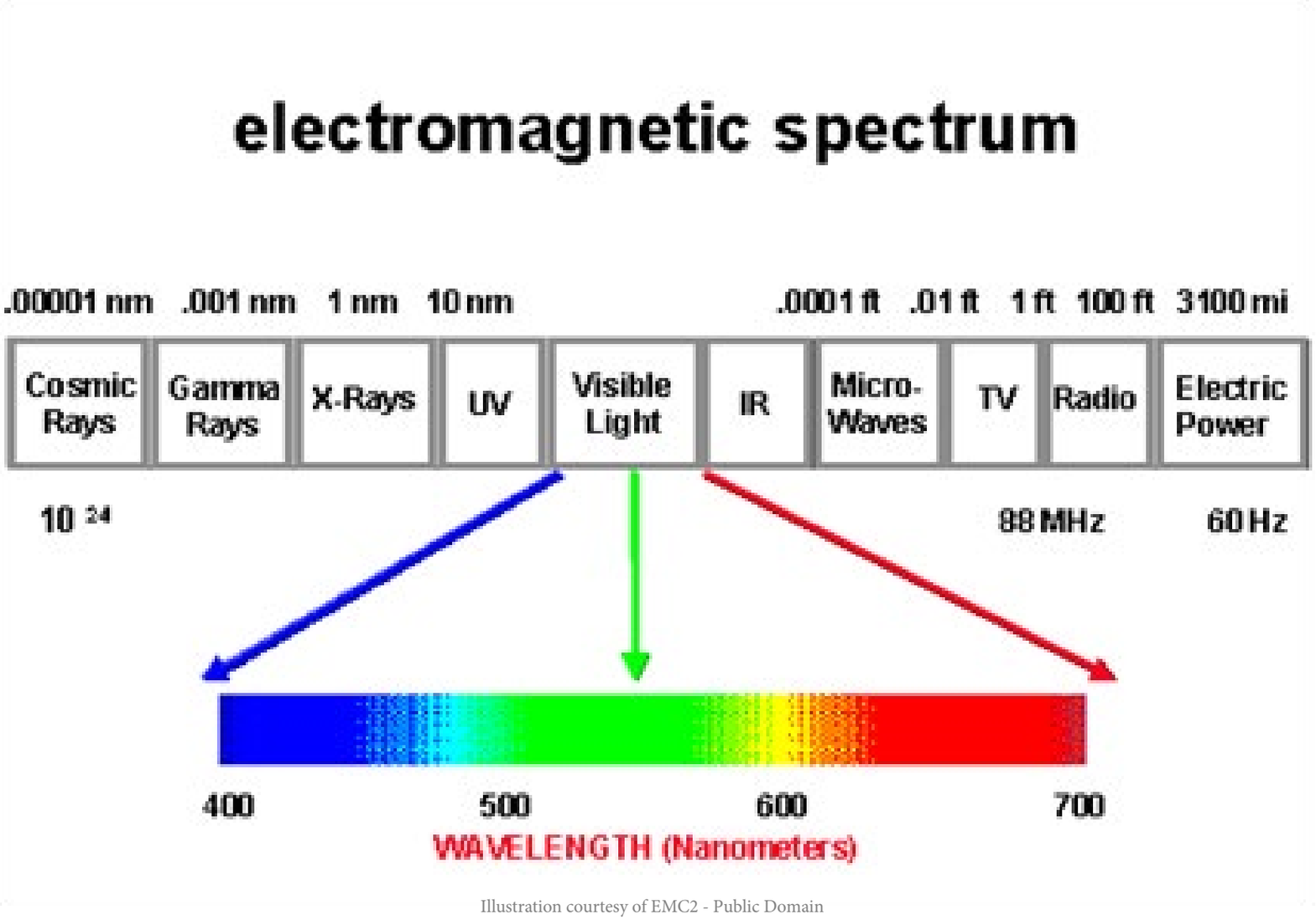

Illustration courtesy of EMC2 - Public Domain

This illustration shows you that the visible spectrum of light is very small.

There are six points that I would like you to take away from this chart.

1. The wavelength of light to the left of the chart is short and fast, and the wavelength of light to the right of the chart is wide and slow.

2. The speed of the light wavelength creates heat, and this heat is measured in Kelvin.

3. Fast short wavelengths have a higher color temperature measured in Kelvin, and appears as the color blue.

4. Slow wide wavelengths have a lower color temperature measured in Kelvin, and appears as the color red.

5. All the different wavelengths in between have different temperatures measured in Kelvin and appear as all the different colors of the rainbow (that our eyes can see).

6. This is where the photographic terms ‘color temperature’ and ‘color balance’ come into play.

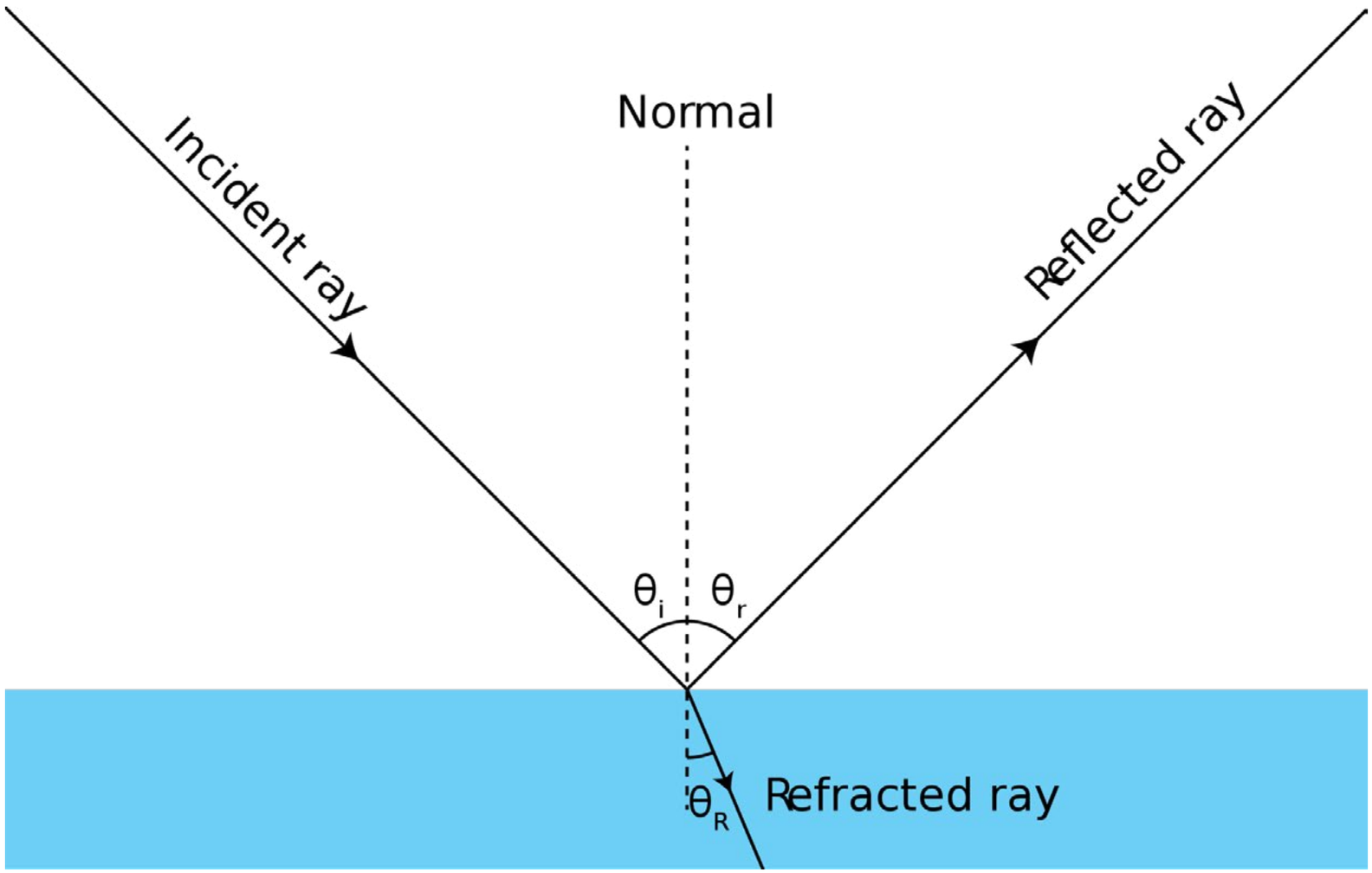

Illustration courtesy of Wikipedia.org - Public Domain

We have established that light moves in waves and that it generates heat (measured in Kelvin) and that this heat creates a color.

Let's quickly look at some other reasons that the wave-action of light is important to photography.

Have you ever been to the beach and watched how waves hit a pier, or a seawall? They hit it, and then they bounce off going in the opposite direction at an angle that is the reflection of the original path of movement.

That happens because of a law of physics called, "The Angles of Incidence, Refraction, and Reflection".

Jeff Breaks
https://www.flickr.com/photos/libelul60/2145926844

By understanding how light waves reflect and refract you will be better equipped to "light" your photographs.

This is what I want you to learn from the illustration on the previous page:

1. Light that hits an opaque object will reflect at an angle equal to the angle of incidence.

2. Light that hits a translucent object will refract. (Don't worry about the angle. It's not important.)

Assignment - If you have trouble understanding angles, go spend an afternoon on a pool table. When the billiard balls are hit, study how they reflect off of the bumpers. The game of pool makes use of the Laws of Incidence and Reflectance. Imagine in your mind that the ball is a ray of light. Then imagine that you're about to take a photograph with a portable flash attached to your camera. Finally, imagine you want to bounce the light using the Laws of Incidence and Reflectance. How would you position the flash head so that the reflected "light wave" will move in the direction of your subject?

Martin Cathrae
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Going back to our beach analogy- have you ever been to the beach and watched a wave roll in and hit some rocks?

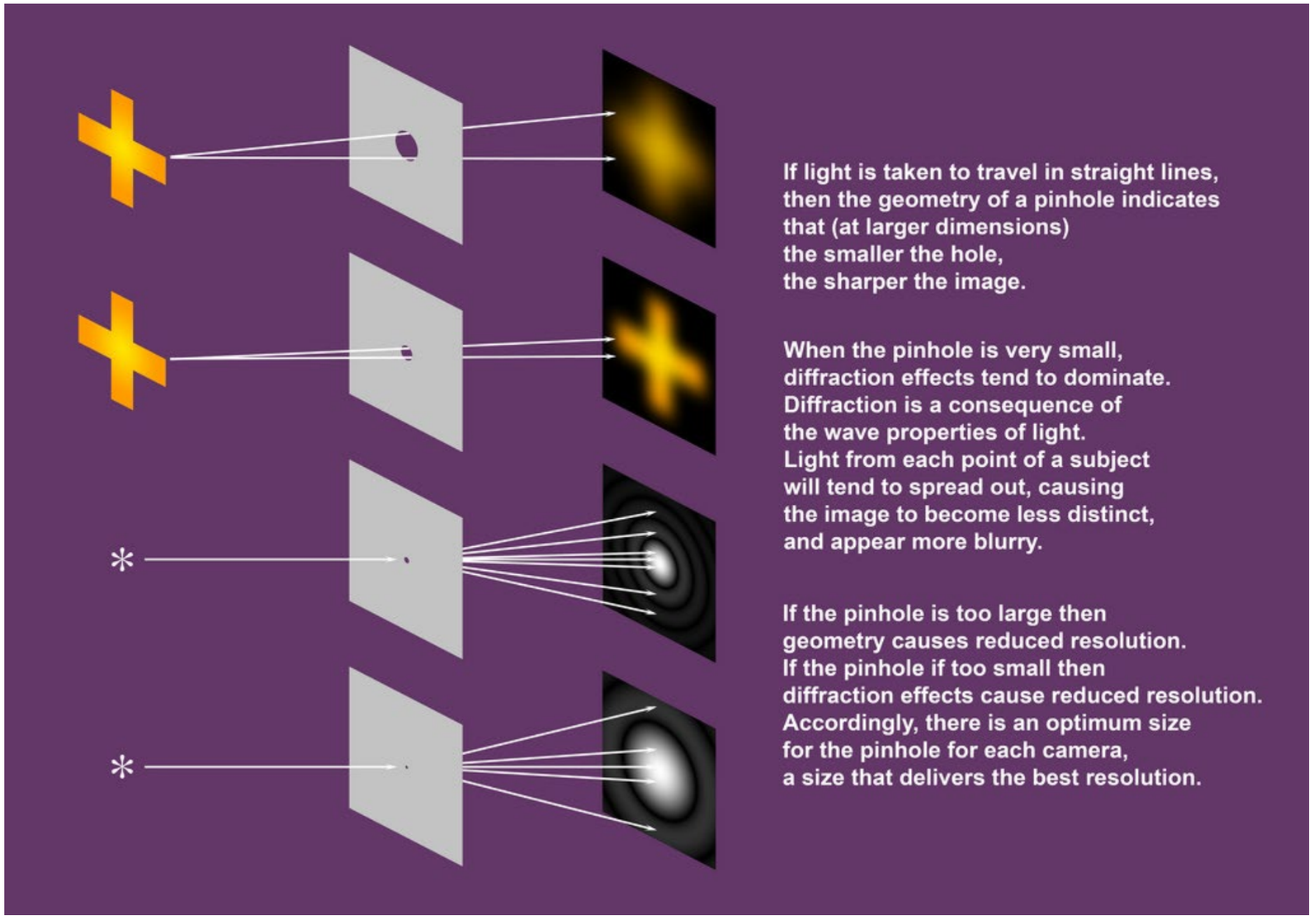
The wave comes in as a solid mass of water. It hits the rocks and reflects back in a spray.

Light waves work in much the same way.

The more specular the reflecting surface is, the harder and more intense the light bouncing off of it would be. The less specular the reflecting surface is, the softer and less intense the light bouncing off of it would be.

Let's put that into perspective it as relates to the rocky beach image to the left.

The rocks represent a specular surface. When a wave hits the rocks almost all of the water comes back in a big splash.



Dominic Alves
https://www.flickr.com/photos/dominicspics/4589827160/in/photostream/

Now, let's imagine that instead of rocks, the shoreline is a mangrove of trees. That same exact wave comes in and hits the trees. Only a small portion of the wave will be reflected back and dispersed. The bulk of the wave will pass through the trees, and the amount of water that is reflected back will be small and have less force. This represents a less specular surface.

Light waves react in much the same way as waves in the water.

Earlier, I mentioned that light travels in straight lines. Keep that in mind. Light ALWAYS travels in straight lines.

Take a look at this illustration.

The fact that light always travels in straight lines is at the very core of why photography even exists. When looking at this diagram, did you notice the angle of incidence and refraction? This is what allows an aperture to form an image!

Here's what I want you to learn from the illustration on the previous page:

1. Because light always travels in a straight line, when it passes through a diaphragm, it refracts and can form an image.

2. Because light always travels in a straight line, when light is generated in a shape, it maintains that shape until dispersion destroys the shape.

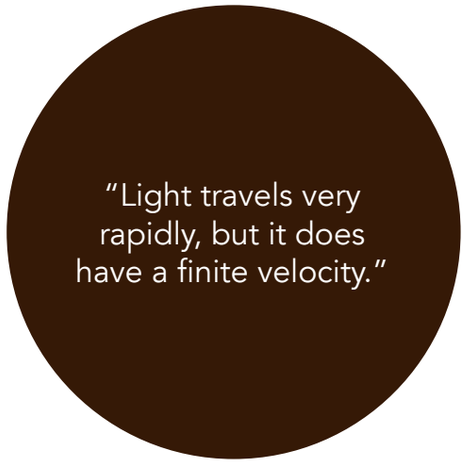
3. Because light always travels in a straight line, when it is passed through a diaphragm, it becomes focusable.

4. When you're creating photographs, your optimum f/stop will be somewhere in the middle. It will never be the smallest f/stop nor will it be the largest f/stop. Not that you can't use those f/stops (especially your widest setting), but when practical go for the middle range (f5.6 – f/11.5).

LIGHT INTENSITY

"Simply stated, light is nature's way of transferring energy through space. Light travels very rapidly, but it does have a finite velocity. You might find it interesting to remember, the next time you watch a beautiful sunrise or sunset, that the sun itself actually dipped below the horizon eight minutes earlier—it takes that long for the light to reach the Earth!"

Bill Blair
(http://violet.pha.jhu.edu/~wpb/spectroscopy/basics.html)



Now that is some pretty cool information about the sunset occurring eight minutes before we see it!

But, this is what I really want you to understand from that quote:

We all know that light has a specific intensity and that the intensity can be changed (think of a dimmer switch). There is a lot of scientific mumbo-jumbo that can be discussed about light intensity. But as photographers, we don’t need to know that. All we need to know is that there is bright light and dim light.

That’s about all that really matters.

But- this point from the above quote is very important!

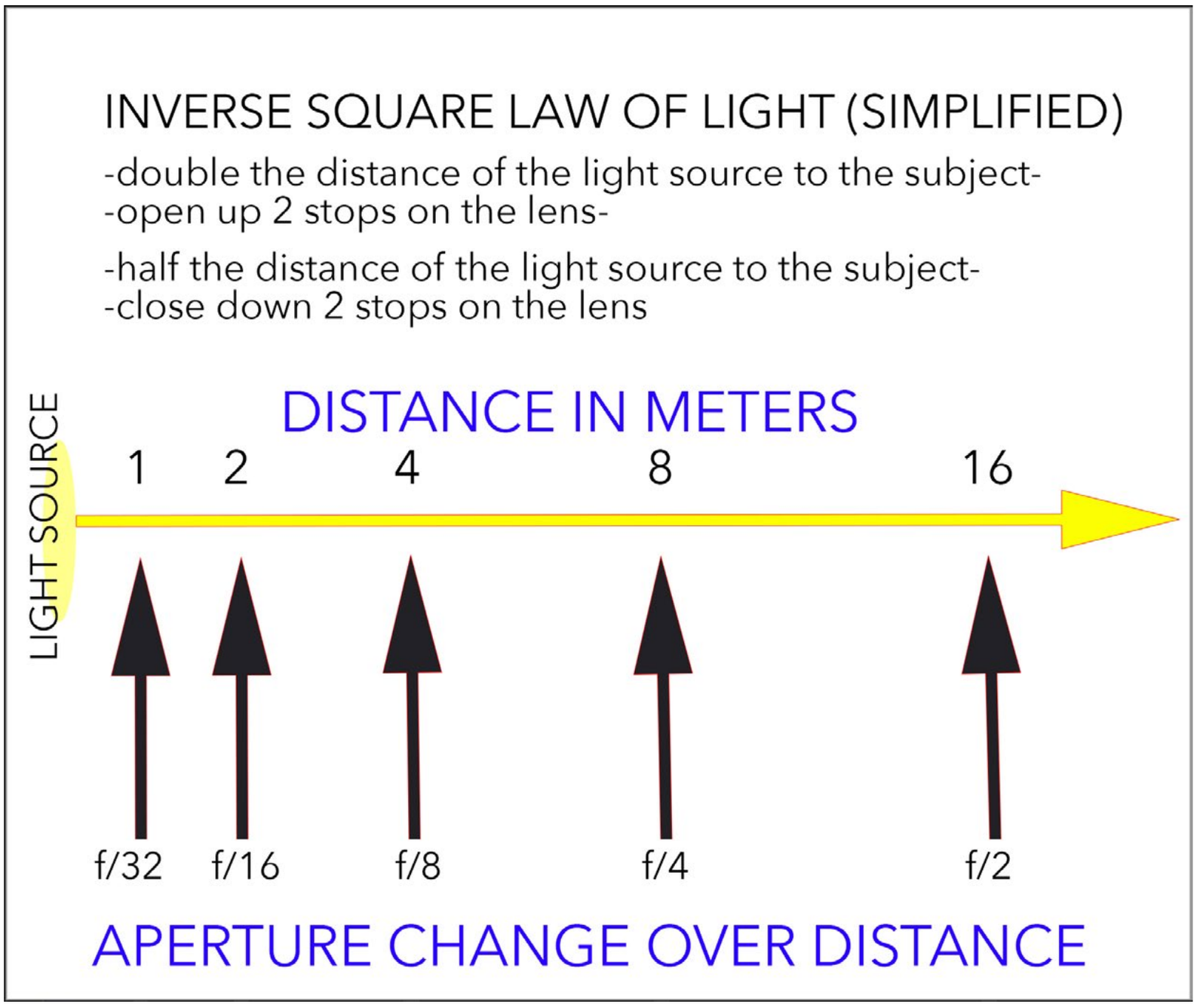
“Light travels very rapidly, but it does have a finite velocity.”

What this means (to you) is that the light you send out to light your subject (for example from your flash) can fizzle out before it gets to its intended target.

That statement is true whether it’s direct light, or light that you’ve altered.

Have you ever been to a concert and noticed all the camera flashes firing around the venue?

Those folks are getting nothing but a photograph of the person’s head that is sitting in front of them. Why? Because light has a finite velocity, and the intensity of the light does not create enough velocity to drive the light waves all that distance to the stage.



Do you know why light waves have a finite velocity?

It's because they hit matter (particles in the air) that cause the light waves to break up and disperse. That's why light waves travel much further in outer space; outer space is a vacuum.

A good question, that I'm sure is bouncing around in your head, would be…

Well, how do I know how fast the velocity of the light dies off? Great question!

In order to help you understand the diagram on the previous page, let's talk about a couple of photography scenarios...

- You are outside photographing a subject standing ten feet in front of you. The sun is your light source and is to your back. You have a slightly overcast sky. Your camera meter indicates an exposure of f/16 at 1/125th. But, you decide to move the camera within five feet of the subject. What is the correct aperture now? It's still f/16. You changed the camera to subject distance, but you did not change the 'Light' to subject distance.

- You are outside photographing a subject standing ten feet in front of you. The sun is behind your subject. You attach an electronic flash as a main fill light source, because of the backlighting on the subject. You set the flash to manual mode and determine that the best exposure indicates an f/stop of f/16. You then ask the subject to move 10 feet further away from you- closer to the sun and away from the flash. What is the correct aperture now? The correct aperture would be f/8. You moved the subject closer to the sun, but that's not the main light source. The main light source for the subject is your flash, which is now 20 feet from the subject. You doubled the distance of light source to subject.

- You are photographing a subject standing ten feet in front of you. Your light source is a portable flash mounted on a stand and placed ten feet to the right of the subject. According to your meter, and a test shot, a proper exposure indicates an f/stop of f/8. However, you decide that the light on the subject would be better if it were closer. So, you move the light source to five feet from the subject. What is your new f/stop for a correct exposure? It is f/16. You cut the distance of light source to subject in half- that equates to a 2-stop increase in aperture.

- You are photographing a subject standing ten feet in front of you. Your light source is a portable flash mounted to the camera. A correct exposure indicates an f/stop of f/16. But, you decide to use the swivel head and bounce the flash off of a white ten-foot high ceiling. What would be the correct f/stop now? The light is traveling a distance of ten feet up to the ceiling. It is then being reflected and traveling another ten feet down to the subject: for a total distance of 20 feet. The correct aperture is f/8. (In this scenario other factors would also affect the exposure, such as the specular quality of the ceiling surface.)

Any time you cut one element of the “Exposure Triangle” in half, one of the other elements must double to maintain exposure.

The evolution of “aperture measurement” occurred in the late 1800s. There were actually several systems that were developed. The standardized system, as we know it today, was adopted worldwide in 1961. It’s based on the numerical system of the square root – (ex. 2 squared = 4).

This square root system, as it applies to the measurement of exposure (light) in photography, is applied to all the elements of exposure: aperture, shutter speed, and ISO (imaging sensitivity). This is known as the “Exposure Triangle”.

Any time you cut one element of the “Exposure Triangle” in half, one of the other elements must double to maintain exposure. Conversely, any time you double one of the elements, one of the elements in the “Exposure Triangle, one of the other elements must be cut in half to maintain exposure.

03

OTHER CHARACTERISTICS OF LIGHT

Russel Bernice
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In this photograph a highly polished mirror has reflected soft window light. As you can clearly see, the light has become harder and more focused than the source.

REFLECTANCE

The characteristic of light- called reflectance- is important to photographers for two reasons.

1. Reflected light is typically softened.

2. Reflected light is typically dispersed.

Did you notice the term “typically” in both of those statements? That’s because it’s not 100% true all of the time.

For example, you could take a soft light source and bounce it into a highly polished mirror. The light reflected of off the mirror would become harder and more direct than the source itself.

But in general, photographers use the characteristic of reflectance to soften and disperse light.

Knowing how light reflects is one of the most important skills that you can learn as a photographer.

There are a number of very important characteristics of reflected light. We will dig a little deeper into that in a later chapter.

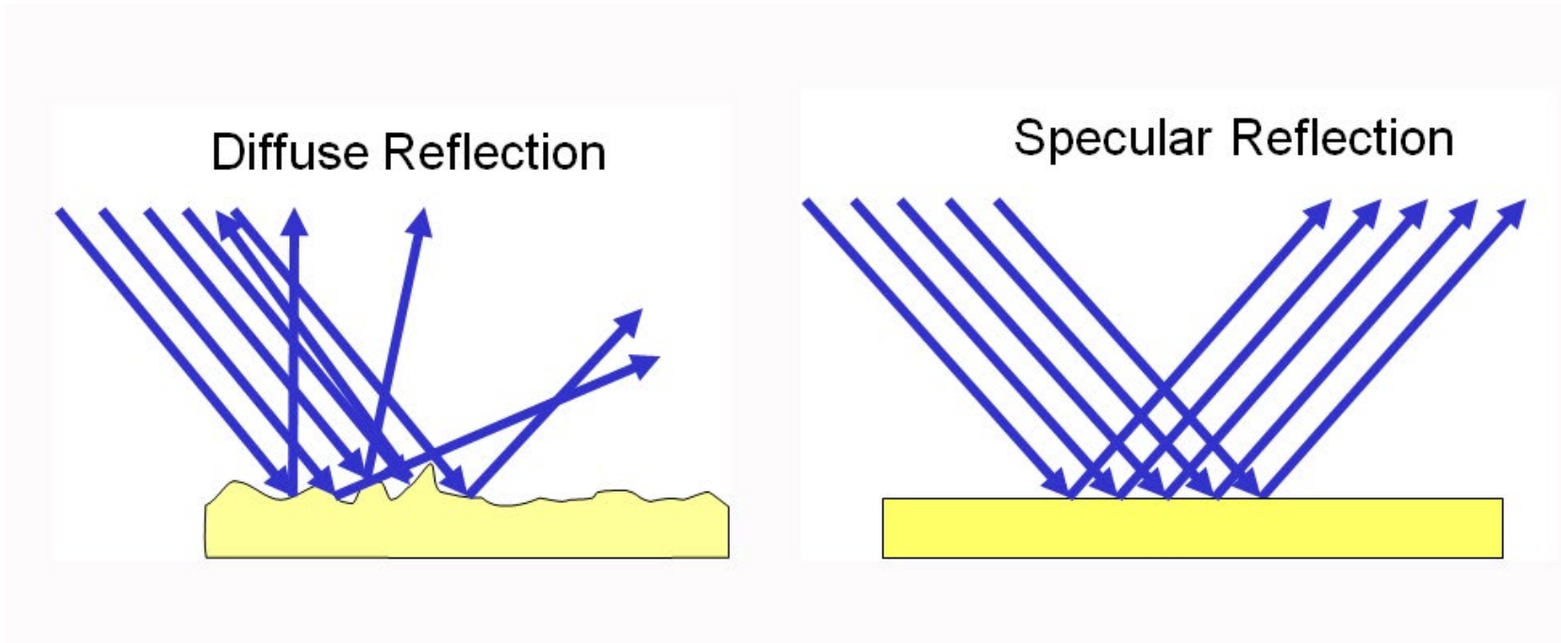

Illustration courtesy of Jennifer Ouellette

When working with reflectance and dispersion together, the result CAN BE soft light.

DISPERSION

Dispersion is the action of changing a tightly patterned direct light wave into smaller, multiple light waves that are traveling in different directions. Dispersion is what photographers refer to as "soft light".

- The main point for you to understand is this: By disrupting the direction of light waves that are being transmitted from a light source you create "soft light" by dispersing the light waves into different directions.

The photograph to the right is a great illustration of light being transmitted.

Noon
https://www.flickr.com/photos/rainchurch/5000330252

TRANSMISSION

When light hits an object, some light waves are reflected, some are absorbed, and some are dispersed. Transmission occurs when the absorbed light waves pass through the object and continue on.

The entire window is being struck by the same light waves.

The light waves hitting the lower portion of the window are passing through clear glass. Clear glass has a very high transmission rate, so very few of the light waves are being reflected, very few are being dispersed, and most of the light waves are transmitted through the glass with little alteration. That's why there is hard direct light hitting the floor and furniture.

Now, let's look at the area where the window shade has been pulled down.

Light is transmitting through that area as well. If very little light were being transmitted, the window shade would be black. The window shade has a lower rate of transmission than the clear glass.

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Do you know what the window shade is doing?

The rate of light transmission is lower, so the rate of light reflectance is higher, and the rate of light wave dispersion is higher.

Where is the soft light in this example? If you were going to photograph a portrait, with someone sitting on that couch, would you use the window light without the window shade, or with it?

You should use the window shade.

The window shade, by lowering the transmission rate, has created dispersed light.

When you pop one of those diffusion domes onto your portable flash, do you know what is happening?

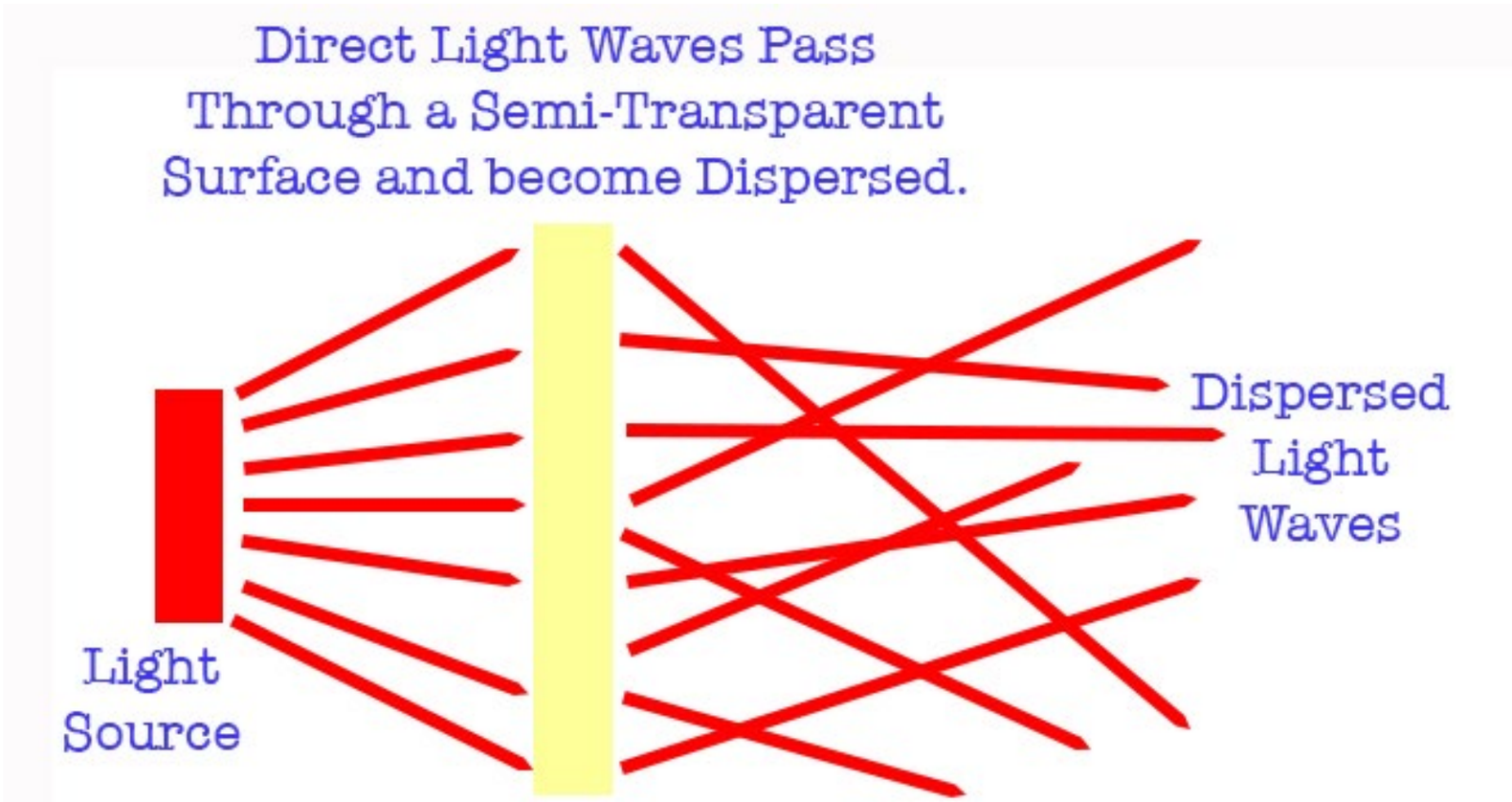
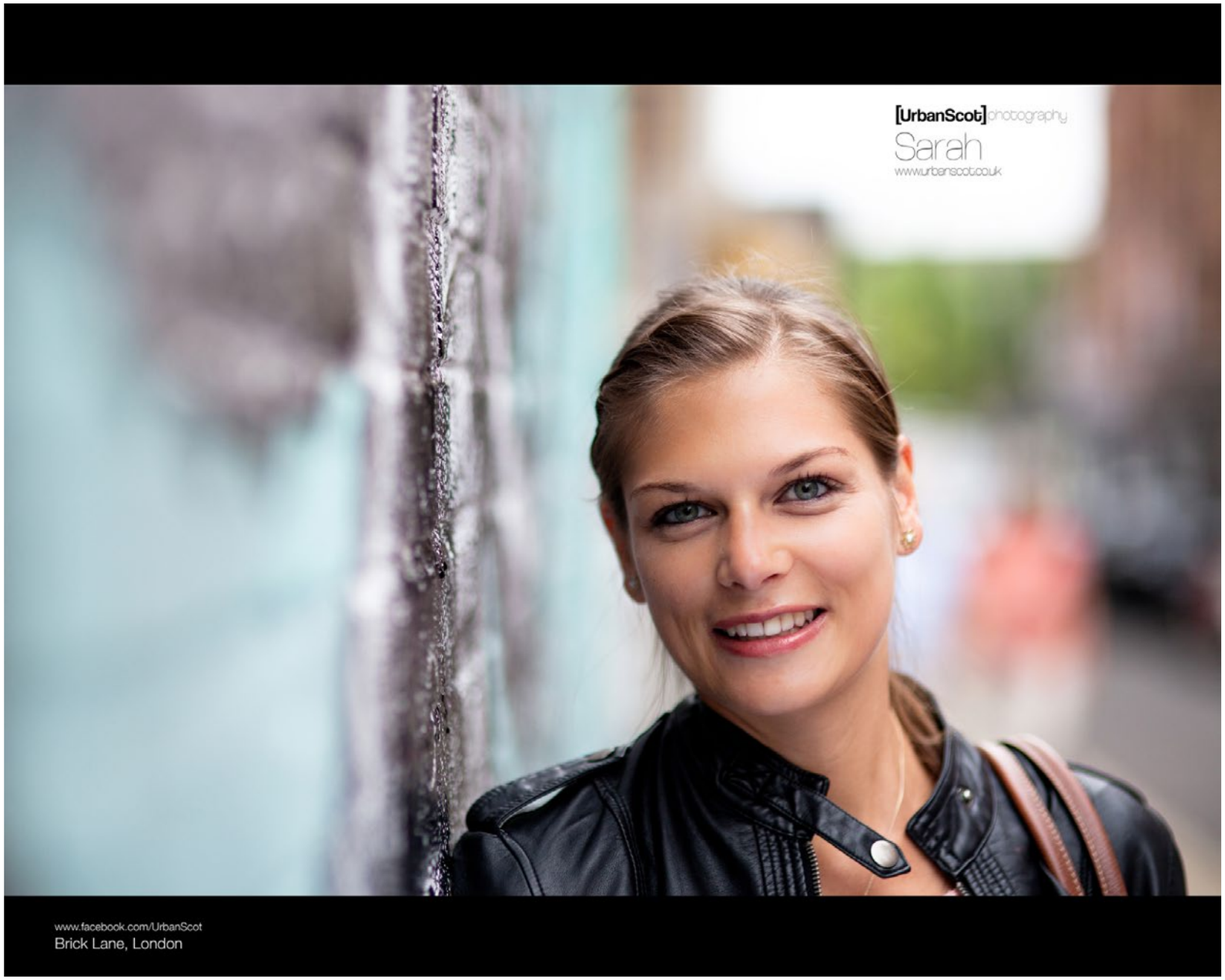


Illustration by Kent DuFault

That's right! The direct light waves are simply being transmitted, refracted, and dispersed. This action creates "soft light". The same thing happens with a softbox or a bounce umbrella.

It's all pretty simple once you get the concept in your head.



Peter McConnochie
https://www.flickr.com/photos/dougliz/9553559887

Study the light on this woman's face. She is outdoors, standing in light coming from a bright overhead sky. Yet, only 2/3 of her face is lit. The other 1/3 is in shadow. Why is that?
The wall has absorbed the light!

ABSORPTION

When light hits an object, some of that light is absorbed into that object.

Are you beginning to see the relationship between all these characteristics? They're all tied together!

Absorption can be a very complicated discussion about photon reaction and whatnot, but we're not going to go there.

Keep these two points in mind:

1. A rough surface absorbs more light than a smooth surface.
2. A dark colored surface absorbs more light than a light colored surface.

It's the property of absorption. Look at the wall. From what we can see, it appears to be a dark color with a rough textured surface.

What does that tell us? This surface will provide high absorption of any light that hits it. High absorption means low reflectance and transmission.

Have you ever witnessed a photographer trying to bounce their flash off of a dark wall, and they can't figure out why it won't work?

It's because the vast majority of the light is being absorbed by the bouncing surface.

Do you wonder why commercially made light reflectors are typically a dense white and have a glossy sheen to their surface?

It's because that will absorb very little light, transmit no light, and have a high reflectance.

Kevin Pack
https://www.flickr.com/photos/cynergy/2485151105

In this photograph you can see how the light passing through a bottle has been refracted. The course of the light has been altered. Near the bottom of the bottle the light has become concentrated. As the roundness of the bottle affects the light rays, they are bent (refracted) further and further.

REFRACTION

Do you remember our earlier illustration that showed how light can be reflected or refracted?

Unless you choose to photograph glass, jewelry, or underwater, refraction will be the least of your concerns. Still, it is tied to the other four characteristics.

There are physics formulas that explain refraction- again; we're not going there.

The simple explanation is this; when light enters a medium at the speed of light, and the medium it enters is vibrating at a different speed, the light will bend toward normal.

Essentially, when light enters some translucent materials such as glass or water, the light rays will bend.

By now, you should have a pretty decent grasp on these five characteristics of light.

Here's what you need to know.

- When moving light waves hit any object, the light waves are altered.
- The characteristics of light waves becoming altered are: reflectance, dispersion, transmission, absorption, and refraction.
- All five characteristics are tied together. For example, if an object has high reflectance, it will have low absorption and transmission. Or another example, if an object has high transmission, it will have low reflectance and low absorption.
- Light colored objects have more reflectance than dark colored objects.
- Objects with a gloss sheen have a higher reflectance than objects with a flat dull sheen.
- Objects with a rough surface create more light dispersion than objects with a smooth surface.

Okko Pyykkö
https://www.flickr.com/photos/data_op/2742194956

Assignment - Study the photograph on the left.

It depicts each of the characteristics of light that we just discussed: reflectance, dispersion, transmission, absorption, and refraction. Identify each one of these characteristics within the photograph. Then I want you to recreate this photograph to the best of your ability. I suggest that you use a hot light instead of a flash, so that you can see the changes in the lighting characteristics with your eyes. You can purchase a work light with a reflector at most home repair stores for under $10.00 USD. For the white tabletop, purchase a large piece of white art board from an art supply store. Purchase one that has a gloss sheen and one that has a dull sheen. Use the gloss sheen for the tabletop and the dull sheen for the background. Set up your shot. Once everything is set: create a portfolio of images where you move the light around, move the subjects around, and exchange the background and tabletop cards. You should study the five characteristics of light as you perform this task.

04

HOW LIGHT AFFECTS THE HUMAN MIND

It’s no secret that light, or the lack of light, or the quality of a light, has a significant impact on the human mind.

Entire industries are built around the concept of lighting and color.

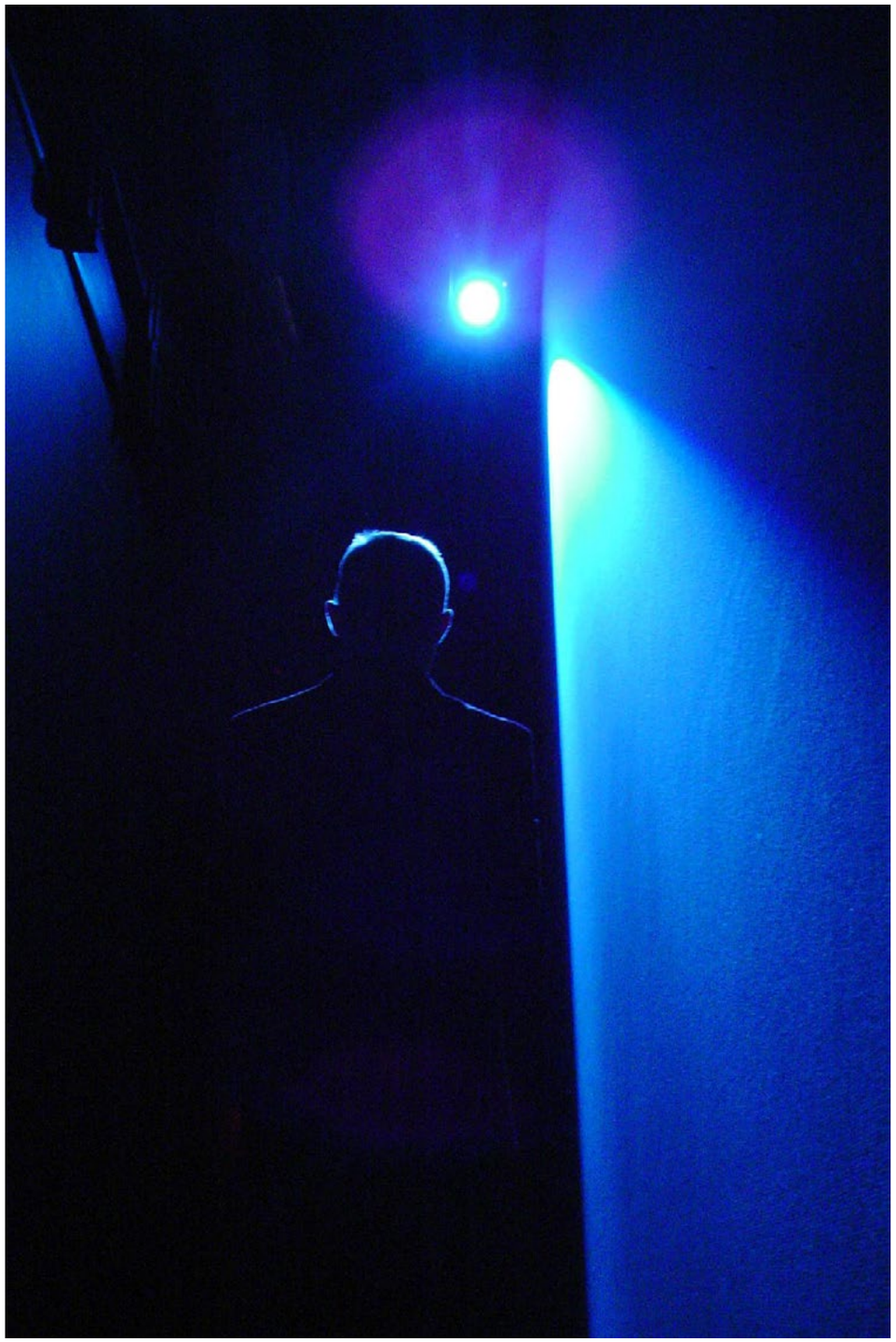
Did you know that without light there is no color? Or is there?

“‘Color’ is important to people because sight is so important to us. The physical nature of different materials causes us to see them as different colors. In one sense, color requires a human to be involved because it is not ‘color’ until we see it. Without people, it is just the wavelength absorption property of a particular material. It takes our eyes to pick out the specific frequencies that people can see, and our brain to categorize them into ‘color’.”

- Burr Zimmerman, Courtesy of Newton, Ask a Scientist

As you can see from the previous statement, without light we cannot perceive color. With light, we perceive color only because of physical properties within the object that we are looking at. We perceive a red apple because, when white light hits an apple, all of the other colors of the light spectrum are absorbed by the properties that make up the skin of the apple. Only the red light is reflected.

But, what happens when an object that has a known color suddenly appears to be a different color?



B Rosen
https://www.flickr.com/photos/rosengrant/51059573

MOOD

Let's apply this knowledge about the color of light to a practical situation.

If you place an object in a dark room and light it with a single light source, and that light source is covered with a blue gel, what color will the object appear in a photograph? The answer is blue. It doesn't matter what the original color the object is. It will photograph as some shade of blue.

Now you're probably thinking- "But you just said all objects have a color based on the elements they are made of, and that's the color that we perceive."

YES! But that statement is true only when the object is lit by multi-spectrum light- light that contains the entire color spectrum (or at least most of it).

In the situation described above, the blue gel has removed all the other colors of the light spectrum: only the blue light spectrum was allowed to pass through the gel and light the object. So, any object touched by that light will appear to have some shade of a blue color.

If that blue color was erased, would all the true colors of the object be revealed? YES, by the introduction of full spectrum white light! This introduction puts all the colors of the light spectrum back into the scene.

In a moment we're going to discuss color and its psychological effect on the human mind.

But, before we do that, look at the picture above one more time.

In the course of your photographic life you may want to use gels to create a mood. Many photographers become confused when they're trying to use gels for color enhancement.

They can't achieve the color that they're looking for.

Plant this vision in your mind- a dark theater (such as the picture above) with blue-gelled light shining down onto the stage. Suddenly, someone turns up the house lights and what happens? The moody blue light suddenly disappears.

We now know why, right? The full spectrum light of the house lights has removed the blue spectrum-only lighting of the blue-gelled spotlights. The blue spectrum-only lighting is still there. The light is still gelled. We just can't see it. The white light has washed it out.

Steward Black
https://www.flickr.com/photos/s2ublack/6113431897

If we shined a bright, white, full-color spectrum light onto this boat anchor and rope, would they appear a different color? No, because they contain physical elements that reflect blue light. Remember, if you put this same boat anchor and rope into a dark room (absent of full spectrum white light) and then lit it with a red-gelled light source, it would appear to be some shade of red color.

R.E. Barber Photography
https://www.flickr.com/photos/39873796@N06/10563347616

When working with singular colored light, think of it like working with paint. You can splash a color here, and it's pure. You can splash a color there, and it's pure. But mix them together… and they're no longer pure.

Now that we know how the color of light works, why is that important to your photography?

Let's return to the theater…

What happens when your scene is absent of white light and you use more than one light and different colored gels? Study the above photograph. Any part of the photograph that is lit by one light and one gel maintains that color. In this case, there are two colors: blue and red. What happens if the two lights hit the same spot? They merge to create a new color. In this case, the new color is magenta.

Christopher Jahn
https://www.flickr.com/photos/cljahn/3124725326

How color and light affect the human mind is so important. In theater, movies, and television, there are entire crews of people dedicated just to that task.

Color creates a mood in the mind. Blue speaks of night or cold. Yellow speaks of happiness and lightheartedness. Why do you think that the iconic smiley face is yellow?

Here are some of the most popular color perceptions.

RED

The color red is the most vibrant of all the colors. It stimulates the adrenal gland and the neurons. This color is ideal to wear for a walk or when exercising as it is an invigorating color. However, too much exposure to the color red can cause stress; it may also cause frustration and provoke anger. The color red symbolizes love; it stimulates the heartbeat and breathing.

YELLOW

Yellow helps to release a chemical in the brain called serotonin, essential for causing a happy mood. Studies have proven that the color yellow enhances concentration and gives the brain and nervous system a "wake-up call". Too much of the color yellow can cause fatigue. Studies show that babies cry more in yellow rooms. It is the most difficult color on the eye and people might lose their temper more often in yellow rooms. It is also beneficial for speeding up metabolism and is a common food color.

BLUE

Blue is believed to have a soothing effect on the human mind as it helps to produce some calming chemicals in the brain. However, too much exposure to this color may cause depression. Blue is used a lot in the corporate sector as it denotes loyalty. It has also been proved that materials in the color blue appear to be light in weight; this is one of the reasons why weightlifters find it easier to handle heavy weights that are painted blue. The color blue is a non-food color as it gives a toxic effect to edibles; moreover research has proven that when people are served food dyed blue, they tend to lose their appetite.

BLACK

Black signifies power and authority, and represents knowledge and intelligence. It is the most popular color in the fashion industry because of its association with style. Plus, it makes people wearing it look thin. A food product packed in black packaging may bring in more profits because it is perceived to be higher in quality. Black is the most aggressive color. Studies have found that hockey teams wearing black jerseys were penalized more for fouls.

WHITE

White is considered to be the most neutral color. Baby products are often white to symbolize innocence and cleanliness. White is also a color used by doctors and nurses to show sterility. In clothes, white is associated with sophistication. Research has shown that people having hand tremors didn't shake much in white rooms.

GREEN

Green represents nature, and it is a popular color used for interior decoration. The reason is its soothing effect on the eyes. Green also relaxes the body and alleviates stress. Researchers have proven that the color improves vision. This could be why classroom chalkboards are usually green in color. Middle-aged brides wear green to signify fertility. Green is thought to have a healing and hygienic affect on the mind, which is why it's often used in hospitals.

People working in green offices tend to be more satisfied with their jobs. Surveys have found that consumers spend more time shopping when a store is painted green.

PINK

Pink is considered to be the most romantic of all the colors. It is the most tranquilizing color and is often associated with femininity. Pink has been found to be beneficial in reducing anger and anxiety; this is why many prisons in the United States are painted pink to help keep the prisoners calm. Dr. Alexander Schauss, from the American Institute of Biosocial and Medical Research, explains that, "Even if a person tries to become angry, or aggressive, in the presence of the color pink, he can't. The heart muscles can't race fast enough."

PURPLE

Purple symbolizes royalty, luxury and sophistication. People wearing purple are perceived to be wealthy. It also depicts a well-developed spirituality and that one has deep thoughts.

The color purple has also been found to be helpful in intensifying sexual activity.

-Information courtesy of humanhealth.com

The above information touches upon color, its impact on the human mind, and MOST IMPORTANTLY, its impact on your photography.

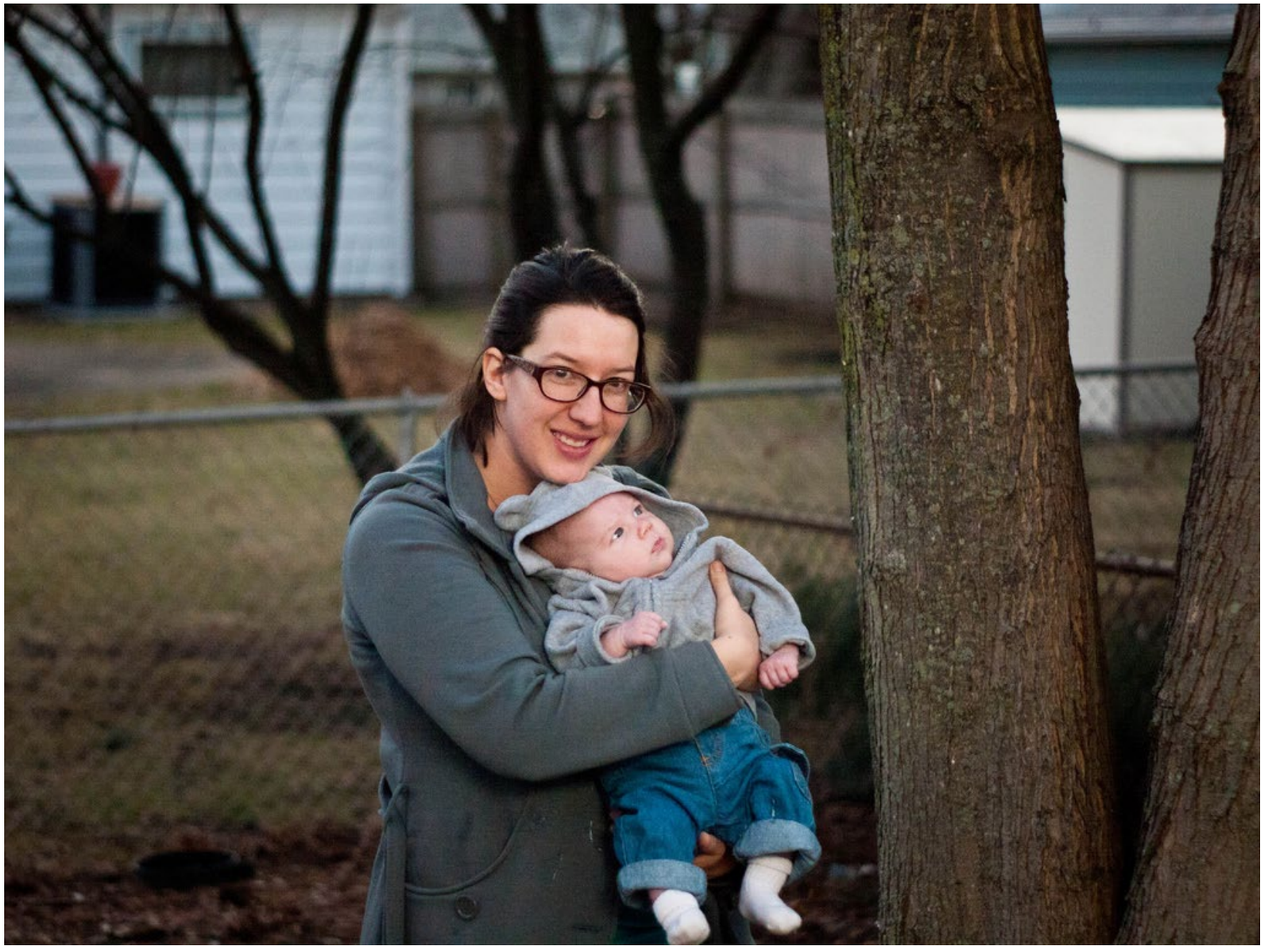
The important point is that by understanding light you will come to understand color, and even more importantly, you'll come to understand how to control color.

Assignment - I want you to find three objects to photograph. One object should be blue in color, one should be red in color, and one should be yellow in color. I would like you to use two hot lights. If you don't own lights, go to your local home repair store and buy two of these clamp style work lights: https://www.amzn.com/B01E9IY6US. Fit them with daylight balanced light bulbs. Then acquire some theatrical or photographic light gels such as these: http://amzn.to/1zfhtmn. Make sure that the kind that you buy are made for theatrical lighting, so they won't burn. Take everything into a room that you can completely darken. Photograph each of the objects using the various gels. Then mix one gelled light and one non-gelled light. Then use two lights gelled with different colors. The idea is for you to get your hands on learning about how the color of light works, how it mixes, and how it cancels itself. Be really creative and vary your lighting as much as you can. You can use an electronic flash if you have two units. But, I discourage it. The work lights won't cost you much, and the ability to see the results as they occur will really be beneficial.

Assignment - I want you to create three photographs where you use the color of light to establish a particular mood or feeling.

05

CHARACTERISTICS OF REFLECTED LIGHT



devinf
https://www.flickr.com/photos/devinf/5489957497

Look at the soft, pleasing portrait lighting on the faces of this woman and her child. Now look at the light hitting the background; it was a very overcast day; there was no pleasing available light. The photographer had a portable flash, which he bounced off of a garage wall to camera right. By learning about the fundamentals of light and how it reflects you can easily recognize opportunities (such as this scene) and put them to work in your own photography!

Reflected light is such an important tool to the photographer. The more you understand it, the better a photographer you will become.

As a beginning photographer, it's even more important for you to understand reflected light because-

1. It's free.
2. It's available practically everywhere.
3. It's easy to produce.

dualdflipflop
https://www.flickr.com/photos/dualdflipflop/7061562737

This is typical of the "quality of light" that you will attain when using your electronic flash outdoors with no bounce. The light isn't nearly as pleasing as in the first example, is it?

So, we all agree. The use of reflected light is important in photography. (Reflected light is often referred to as "bounced light".)

You may be wondering, what's hard to understand about reflected light? The light hits something and bounces back- that seems pretty easy.

At a basic level- you're right.

But, part of your growth as a photographer is the ability to create predictable results.

Would you obtain the same results if you bounced your light off of:

- A round white ball outdoors in bright sunlight?
- A blue wall in a dark room?
- A six foot tall mirror?
- A twenty foot off-white ceiling with large dark brown beams?
- A semi-opaque mottled glass window?
- A green wall, on the exterior of a house, in the shade, on a bright sunny day?

Damien D.
https://www.flickr.com/photos/tsarkasim/3982834050

This photographer's attempt at using reflected light has failed miserably. There could be any number of reasons why: 1. The wall was too far; 2. The wall was too dark in color; 3. The electronic flash was underpowered; 4. The angle of the reflected light was wrong; 5. ETC.

Let's get to it, and study the art of reflected light.

Earlier, we discussed the characteristics of light. Now, we are going to closely examine reflectance. In the previous chapter, we discussed how the characteristics of light are tied together. This means that when you're preparing to bounce a light for a photograph, you must take into consideration: absorption, transmission, dispersion, intensity, and color.

That may seem a little daunting at first. However, as you practice your awareness and the decision-making process, before you know it; it will become second nature.

Michael Himbeault
http://goo.gl/mmb6rc

In the image to the left, the photographer bounced his flash off of a wall and ceiling to the camera left.

The lighting on this couple is quite pleasing (soft) and the exposure is pretty good. The problem is the color of the reflected light.

Look at the wall behind the subjects and to camera left. What color is it? It is an orange-red colored wall.

What have we learned about reflected light?

If the reflecting surface has a distinct color, that surface will absorb the other colors of the spectrum and only reflect colors in the same spectrum as the surface.

In this case it's an orange-reddish color, which is why the couple looks so orange-red in their skin tone.

What have we learned about reflected light?

Now, let's think about this. What if this had been outdoors, in bright sunlight, and the reflecting surface was the red exterior wall of a barn?

Would the image have taken on the same orange-red tone in their skin color?

No. Remember our discussion about the color of light, and how a photographer can call out a particular color by using gels? But, also remember the room had to be dark, so that there wasn't any white light or another color of light to influence the effect.

That's why if this photograph had been taken outdoors, with the light bounced off of a red barn, the resulting light might be slightly biased toward the warm spectrum, but all the white light surrounding the couple would have added back the full color spectrum of light.

What if it was the same scenario, only there was no bright white light?

What if it was a dark cloudy day, or even nighttime?

Would the light reflecting off of the barn create red light?

Yes, because there is no white light returning it to a full spectrum.

Kent DuFault
https://www.flickr.com/photos/35449761@N04/16947456160/

Full spectrum light coming from the electronic flash unit turned yellowish-red. This happened because the light was bounced off of red tile. The red tile absorbed the other colors of the spectrum and reflected only those colors that were near the red spectrum.

Reflecting Light Tip #1

Examine the color of the reflecting surface. The closer it is to pure white, the "cleaner" the light will be that reflects off of it.

Also, take into account the ambient light.

The brighter and whiter the ambient light is, the more likely it will wash clean any color bias in the reflected light. The darker the ambient light is, the more likely that your reflected light will display a tonal shift picked up from the reflected surface.

James Jeffrey
https://www.flickr.com/photos/jjeffreys/1722514084

Photographers love reflected light because it's generally soft light. Part of the reason that the light is soft is due to dispersion.

But there is also another reason.

Reflecting Light Tip #2

Plant this in your mind- The soft quality of light coming from a light source is directly proportional to the size of the light source as compared to the size of the subject. This relationship between the quality of the light, and size comparison, is an inverse relationship, and it is affected by distance.

- Illuminate a person with a straight electronic flash and that light is hard because the size of the flash head is small compared to the subject.
- Shine that same electronic flash into a large bounce umbrella, placed at the same distance to the person as in the previous bullet point, and it becomes a softer light source because the source of the light is now much larger as compared to the person.
- Take that same electronic flash, bounced into that same umbrella, but move it back 30 feet from the subject, and now the light becomes hard once again- because the distance (from light to subject) has reduced the size of the light source as compared to the person.

Look at the photograph to the left. This photograph was illuminated by an electronic flash that was bounced into a white card.

From everything that we previously learned, this light should be soft and pleasing, right? Yet, it's not really... The light is very directional and still somewhat harsh.

Jon Seldman
https://www.flickr.com/photos/jonseidman1988/4730141355/in/photostream/

The card that's being used for the bounce is about 3 foot by 3 foot, and it's being held about 8 feet away from the subject.

If we have nothing else to work with, how can we turn this into a soft pleasing light source?

Move the card closer!

If the card were moved to within 4 feet of the subject (reducing the distance of the light source to the subject), the light source will have doubled in size as compared to the subject.

Always take into consideration the size of the reflecting surface and its proximity to the subject. By reducing the distance between subject and bounce source you soften the light. By increasing the distance between subject and bounce source you harden the light.

Reflecting Light Tip #3

When reflecting light, you must always take into consideration the transmission qualities of the surface that you are going to bounce your light from.

Sometimes I see photographers doing the strangest things when it comes to bouncing light.

I have witnessed wedding photographers who have placed the bride near a window on a rainy day (when very little light was coming through the window anyway) and then try to bounce their flash off of the window.

That won't work. Why?

Because of transmission, glass has high transmission and low reflectance.

Another time I asked a photo assistant to set up a white reflector. At that time, I was using reflectors that consisted of a collapsible frame that you strapped a cloth onto for a desired effect. The frame had multiple uses. It could be a reflector, a scrim, or a flag based on what type of cloth you attached to it. (If you're wondering what a scrim or a flag is, we'll be talking about that in the second book on "Light".)

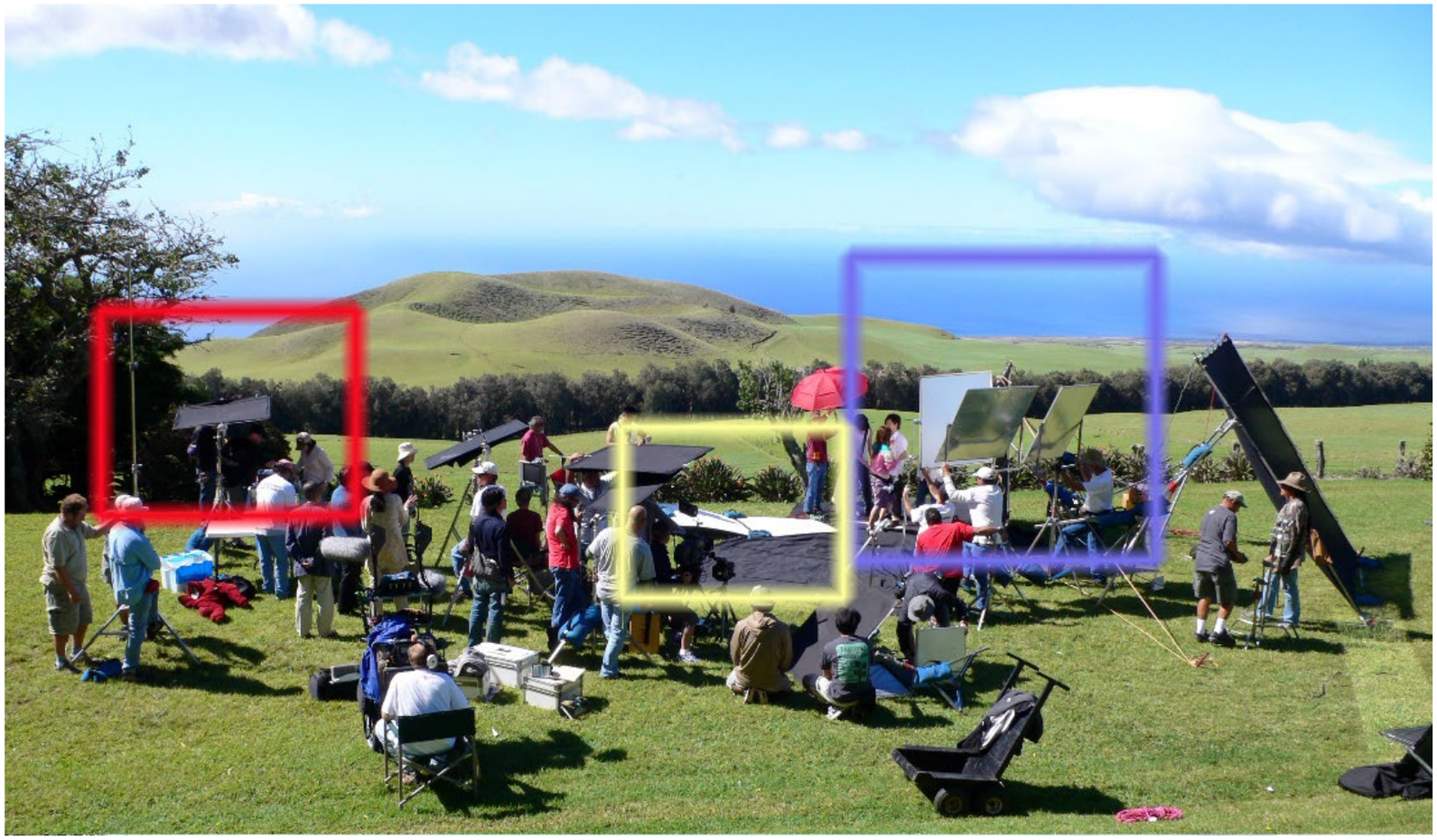
The assistant set up the frame and attached a white cloth. I said to him, "That's the wrong cloth for reflectance." He got this puzzled look on his face and replied, "But it's a white cloth."

I told him to press his face against the cloth and tell me what he saw. He did. "I can see your outline, the lights, and the rest of the room."

That's right. The cloth that he put on the frame was a loose weave cloth meant to break up light waves and allow them to pass through dispersed (that's a scrim by the way). The cloth he had chosen had a high transmission, high dispersion, and low reflectance. It was great for a shoot through situation, but not for a bounce situation.

Which is exactly what I told the photo assistant. When he replaced it with the correct white cloth, which was a dense material that had a gloss coating, I asked him to press his face against this cloth and tell me what he saw.

Of course, he couldn't see anything. This cloth had a high reflectance, high dispersion, and low transmission.



jai Mansson
https://www.flickr.com/photos/75348994@N00/318372454/in/photostream/

Reflecting Light Tip #4

When attempting to reflect light, you must consider the transmission AND specular quality of the surface that you're going to reflect the light from.

Do you see the mirror-like objects in the lavender square on the left? Do you see the white object lying on the ground within the yellow square?

Both of these objects are commercially made reflectors that are used by photographers and filmmakers.

The primary difference between these reflectors is what is known as "specular reflectance value".

1. Specular reflection is the mirror-like reflection of light from a surface, in which light from a single incoming direction (a ray) is reflected into a single outgoing direction. – Courtesy of Wikipedia

That's fancy language that means the smoother and glossier a surface is, the harder and more direct the light will be that is reflected off of it.

A specular surface would be a mirror, a piece of metal, and smooth water.

A non-specular surface would be velvet, brick, Styrofoam or disturbed water.

A highly polished mirror reflects almost all of the light that hits it. Black velvet reflects almost no light that hits it.

Everything that you might try to bounce light off of- will fall somewhere in-between these two examples.

In context of the photo above- the square shiny boards are used to reflect a hard direct light onto the subject, and the square white boards are used to reflect a soft even light.

You can't see it in this picture, but if you could look closely at the white board on the ground, it is bright white in color, but with a dull finish. When light waves reflect from it, they are bouncing around in every direction creating soft light.

But remember, it has low transmission. No light is being wasted by allowing it to pass through the material to the ground where it would be absorbed.

Now, if you could look closely at the shiny boards, you would see that one side is highly polished like a mirror, and the other side has a mottled surface. Light reflecting from the mirror-like side is so direct and intense, it's almost like a spotlight. The light that reflects from the mottled side, while far more intense than a white board, it's much less intense than the mirrored side.

And just for your general knowledge, the object inside the red square is what is known as a flag. A flag looks a lot like a reflector doesn't it? Except that it's covered with a flat black material that has extremely high absorption and extremely low reflectance. Its purpose is to stop light waves dead in their tracks.

Consider the specular quality of the surface that you want to bounce your light off of. A highly specular surface will reflect a stronger, harsher, more direct light than a less specular surface. Don't be afraid to experiment when you're out taking pictures. I once lit a portrait by bouncing my electronic flash off of the inside of a metal garbage can cover.

Ryan Johnson
https://www.flickr.com/photos/kmonojo/347260329

Reflected Light Tip #5

Take into account the angle between the light source, the reflector, and the subject. Consider if anything will block the path of the light. Consider if the angle at which the light will hit the subject will be pleasing. Consider that, with the angle that you've chosen, will the reflected light hit the subject at all?

Consider the surface tension and shape of the reflecting surface. For example, a round surface will not direct much light toward a subject compared to a flat surface. Also, a loose surface, such as holding up a white cloth, will not reflect as much light as a taunt surface such as if the white cloth had been pulled tight and mounted to a frame.

Sean McGrath
https://www.flickr.com/photos/mcgraths/2188027041

Light bounced off of a wall at eye level provided a much better ANGLE of illumination for the face of this cat.

Earlier in the book, I made reference to a pool table and reflected light. An expert pool player understands angles, and for you to become an expert photographer, you must also understand angles.

In the puppy photograph above, the photographer bounced his flash off of the ceiling. The decision to bounce the flash was a good decision. Bouncing it off of the ceiling wasn't a good choice.

Direct flash would have provided horrible results for this puppy portrait. But the bounced light wasn't much better.

Why? Because the photographer did not have a firm grasp on the angles.

He bounced his light straight up towards the ceiling, which in turn brought it straight back down onto the puppy's head. This created dark unpleasant shadows all around the eyes.

What might have the photographer done differently?

He could have bounced the light off of a wall, which would have created an angled light at eye level.

David Hilowitz
https://www.flickr.com/photos/dhilowitz/2989741432

Let's say that you wish to create a fashion portrait. You take your model to a car ramp because you're looking for a gritty city feel to your photograph…

You decide that this is the perfect location. You place the model 15 feet in front of you. There's plenty of light on the background, but the model is too dark. You increase your exposure to lighten the model, but… now the background is too bright. You decrease the exposure again, and decide to pull out your flash to light the model. Your first attempt with direct flash provides terrible lighting on the model. So, you consider bouncing your flash.

The photograph to the left is what you're seeing, and you decide to bounce your flash of off the roof above you.

Let's break that option down…

1. It's a solid surface with no issues concerning light transmission.

2. It's a light colored ceiling, so very little of the light from your flash will be absorbed.

3. It's also a flat specular surface. It should reflect a nice, soft, well-dispersed light.

So far, everything is good. Do we have any problems? How about the angles?

Those beams present a problem. If the model is standing 15 feet in front of you, those beams are going to block the path of your reflected light. They are in effect becoming flags (with zero percent transmission) and will create shadows on your subject.

You could fix this problem in a number of ways. The easiest way would be to change your angle of direction so that the beams were running in the same direction as the light traveling from your flash to subject.

Assignment - I want you to make three reflectors: one white, one highly polished, and one mottled. You can do this with art boards and tinfoil. For the highly polished reflector, glue the tinfoil to the board flat and smooth. For the mottled board, crunch the tinfoil up, then flatten it back out, and then glue it to the board. I want you to create three portfolios of images using all three boards. In one portfolio, use the boards to reflect your flash or a hot light. In the second portfolio, use the boards to reflect sunlight. In the third portfolio, don't use the boards at all. Look for natural objects within your setting that you can use to reflect your flash or sunlight. Take your time and play with the angles. Study how the light changes as the angle changes. Study how the light changes as you move your reflective surface closer to, or further from, your subject. You could even try changing materials on your reflectors to see how they affect the light.

06

SHADOW AND ITS RELATIONSHIP TO LIGHT

Ross2085
https://www.flickr.com/photos/9610484@N05/1120079373

Shadows help define shape. Our brain uses shadows to help it also define distance, time of day, and point-of-view.

Many of the wonderful characteristics that are brought to our photographs because of light only work because of shadow.

Light and shadow work hand-in-hand to create perspective and dimension in photography.

Just as you must learn about light to become a great photographer, you must also learn about shadow.

Did you know that shadow has characteristics just like light? But, as often as you might hear a photographer say, "Wow. That light was fantastic," how often do you hear them remark on the shadows?

Shadows can be dense and inky black. They can also be wispy and thin. Shadows can be colored. They can be long, or short.

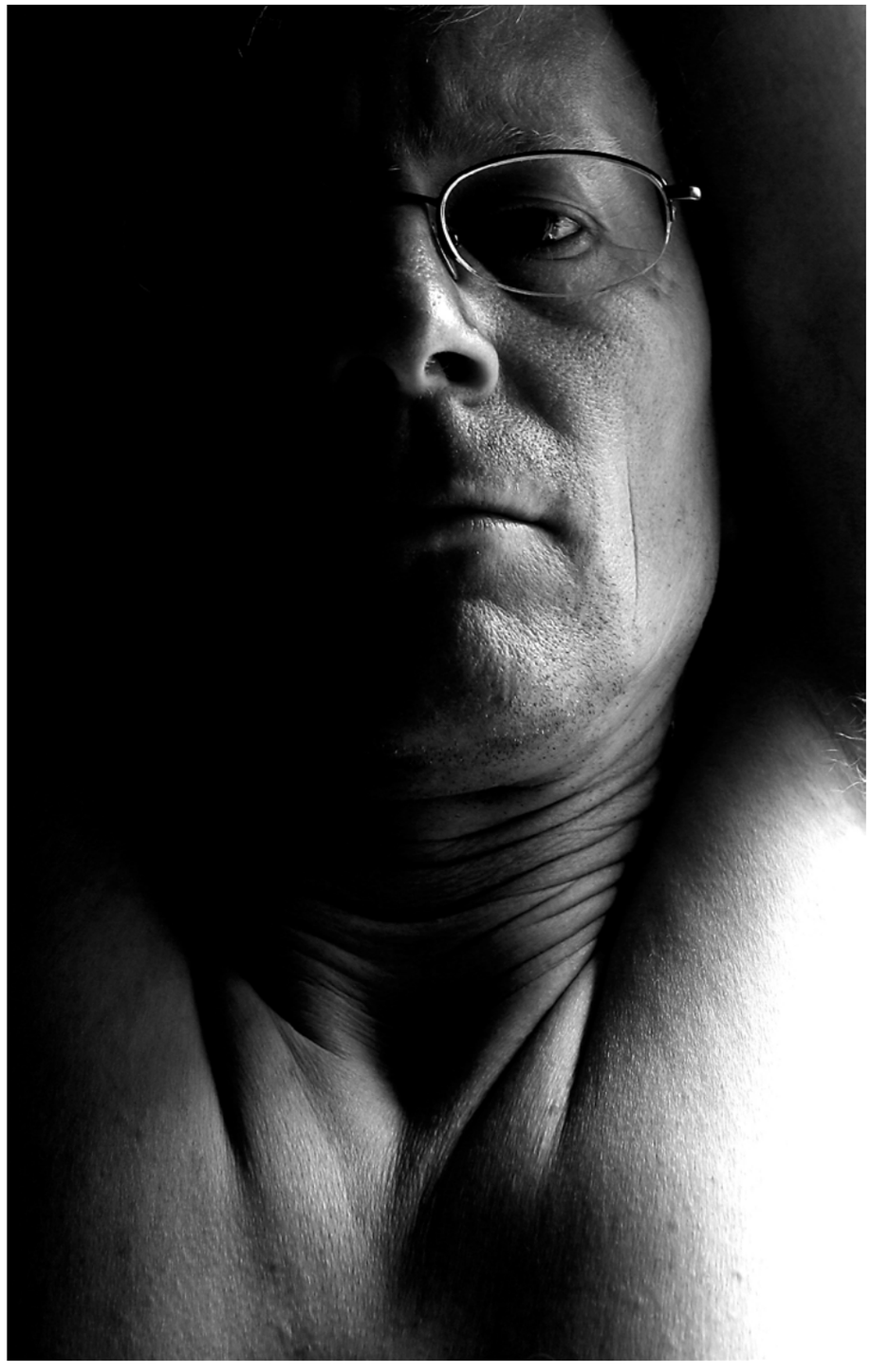
THE CHARACTERISTICS OF SHADOWS

synestheticstrings
https://www.flickr.com/photos/63388652@N07/8675746405

Examine this photograph. What do the shadows tell you? Do you think this was a late afternoon shot? Do you think this was direct light? I think this was reflected light- most likely off of a glass building. The shadows are fairly dense, which would indicate a direct and hard light source. However, the shadow is also short, which indicates that the light source isn't that low on the horizon.

rablem22
https://www.flickr.com/photos/rabiem/14949704876

This image has very similar "light" to the previous example. The shadows, however, are very long- much longer than the previous shot. Our brain records this as late in the day. If you were attempting to photograph a subject and you wanted it to feel late in the day, would the first example work? No, the shadows do not give the indication of late in the day.



Scott Robinson
https://www.flickr.com/photos/clearlyambiguous/1253634060

Hard, dark shadows are often used to convey drama. Would this photograph have the same chilling effect if the shadows were light and wispy?

Jin Choi
https://www.flickr.com/photos/openuser/5858720027

In this example, we have soft, light shadows. They lend a sense of elegance to the curved shapes.

Rosino
https://www.flickr.com/photos/rosino/45787261

This is a perfect photograph to study as you develop your eye for shadows. In this example, we have at least three different colored shadows. We also have light shadows and dense black shadows. Finally, we have long shadows and short shadows. This is pretty interesting when you think about it because the same light source is illuminating the scene. So, why are the shadows different?

Rosino
https://www.flickr.com/photos/rosino/45787261

When the shadow is removed; it becomes almost impossible to tell if the trashcan is sitting in front of the wall, or if it's actually painted on the wall.

Why are Shadows as Important as Light?

Throughout our lives, our brain is trained to recognize certain visual stimuli and ascertain the elements of depth, shape, and distance based upon those stimuli.

Shadows tell our brains a lot of information, which is why they're so important to you as a photographer. We have to look for ways to fool the brain into believing that a two-dimensional photograph represents a three-dimensional scene. Photographs that don't do that very well tend to look flat and uninteresting.

For example, in the photograph above, our brain registers that the yellow trash bin is close to the wall. The shape, angle, and density of the shadow tells us this. However, what happens if the shadow from the trashcan is removed?

Alter the Light, and you Alter the Shadow

The shadows in the photograph of mother and daughter have different shapes, density, and even color. Why is that?

Anytime - let me repeat that - ANYTIME a light source is altered, the resulting shadows will also be altered.

This means if the light source is made harder or softer, the resulting shadow will become harder or softer.

If the angle of the light to the subject casting the shadow is changed, the shadow will also change by becoming longer or shorter. It could also become denser or lighter.

The distance between the subject casting the shadow and the shadow itself also affects shadows.

If you look at the photograph above of mother and daughter, why are the shadows across the red door very dense and with highly defined edges, while the shadows on the blue and teal walls are not?

It's because the object casting the shadow on the red door is very close to the wall. The object casting the shadows on the blue and teal walls is much further away.

Assignment - Learning to identify and alter shadows will help you to create better photographs, and it will help you to create photographs that you envision in your mind. There are two parts to this assignment.

Part 1.) I want you to take a subject outside and photograph that subject under varying light conditions and with varying backgrounds. In the beginning of this assignment, I want you to change the shadow as much as possible. Once you understand how your actions change the shadow, I want to you to put that knowledge to use to create a particular mood with your subject.

Part 2.) I want you to take a ball (any ball will work) and photograph it while creating different shadows. I want you to set up a table somewhere in your house where two sides of the table butt up against walls. I want you to gather three light sources. They could be a table lamp, a flashlight, and a work light. I want you to light the ball with each light source. I want you to vary the light to subject distance and vary the subject to wall distance. Also, see if you can color the shadows. After lighting the ball with each source individually, I would like you to light the ball with two of the three sources. Then, light the ball with all three light sources.

In all cases, take lots of photographs and study how the shadows change. Can you establish strong shape? Can you eliminate the shape of the ball? Can you create multiple colors in the shadows? Can you make multiple hard shadows and then multiple soft shadows? Can you create hard shadows and soft shadows within the same photograph?

07

HOW ALL OF THIS APPLIES TO YOUR PHOTOGRAPHY

We both know that anyone can pick up a camera and start snapping pictures. Some of us might get lucky and create some interesting photographs like that- but most of us won't.

It's up to us to develop the skills that allow us to spot, analyze, and create interesting photographs. Often times, these three things must be decided in a matter of milliseconds.

And, like anything else in life (that has intrinsic value), these skills will only be developed by practice.

Knowing how light works, how light influences color, how it creates shadows, and how light and shadows can be altered to create a mood is the first step toward becoming a photographic artist.

Train Yourself to SEE the Characteristics of Light and Shadow

You probably realize by now that everything in this guide is geared toward helping you learn to see the characteristics of light and shadow.

I've been involved in photography for decades. There isn't a moment in the day that, whatever I'm looking at, I'm seeing (and evaluating) the light and the shadows. It comes to me like breathing air.

It can come to you like that as well. But it does take time and practice.

Learn to slow down, especially when you're out taking pictures.

When you see a subject that interests you- take a moment to evaluate the light and the shadows.

Are they going to assist you in telling the story that you want to tell with your photograph?

Ask yourself; can you change your position for better light or better shadows?

Can you alter the light or the shadows to create a better image?

In the next guide we're going to dig deep into the skills of altering light and shadows.

Here is some of what will be covered in Book Two-

- Using light to establish mood
- Coordinating subject matter to available light
- Adjusting available light to establish mood
- Creating light with known characteristics
- Mixing light sources with different characteristics
- Squeezing light
- Bending shadows
- Tools of the trade for altering light
- Tools of the trade for altering shadows

Let's finish up this book by looking at some photographs and identifying the light and shadow. Let's see what we can learn through this simple assignment.

Study the photographs and answer the questions. The correct answers will be listed at the end of the quiz.

Jay DeFehr
https://www.flickr.com/photos/jay_defehr/8727167096

1. How many light sources were used in this image? Are the light sources hard or soft? Do the shadows indicate a small light source or a large light source?

Alice Popkorn
https://www.flickr.com/photos/alicepopkorn/2185303759/

2. Is the light source in this image natural light or artificial light? Does the color of the light reflecting from the wall and chair tell us anything? Based on the shadow, what do we know about the distance from the chair to the wall?

BMiz
https://www.flickr.com/photos/benmizen/12193289735/

3. Compare this photograph to the previous one. The shadow tells all. Is this artificial light or natural light? Is the light source hard or soft? What does the shadow tell you about this photographic situation?

woodleywonderworks
https://www.flickr.com/photos/wwworks/2885862087/

4. This photograph encompasses almost everything we've discussed in this book. How many characteristics of "light" can you name here? What does the shadow tell us about the time of day and position of the light source? Why is part of the shadow pink? Why does the boy have a pink skin tone?

@petra
https://www.flickr.com/photos/brartist/137732271/in/photostream/

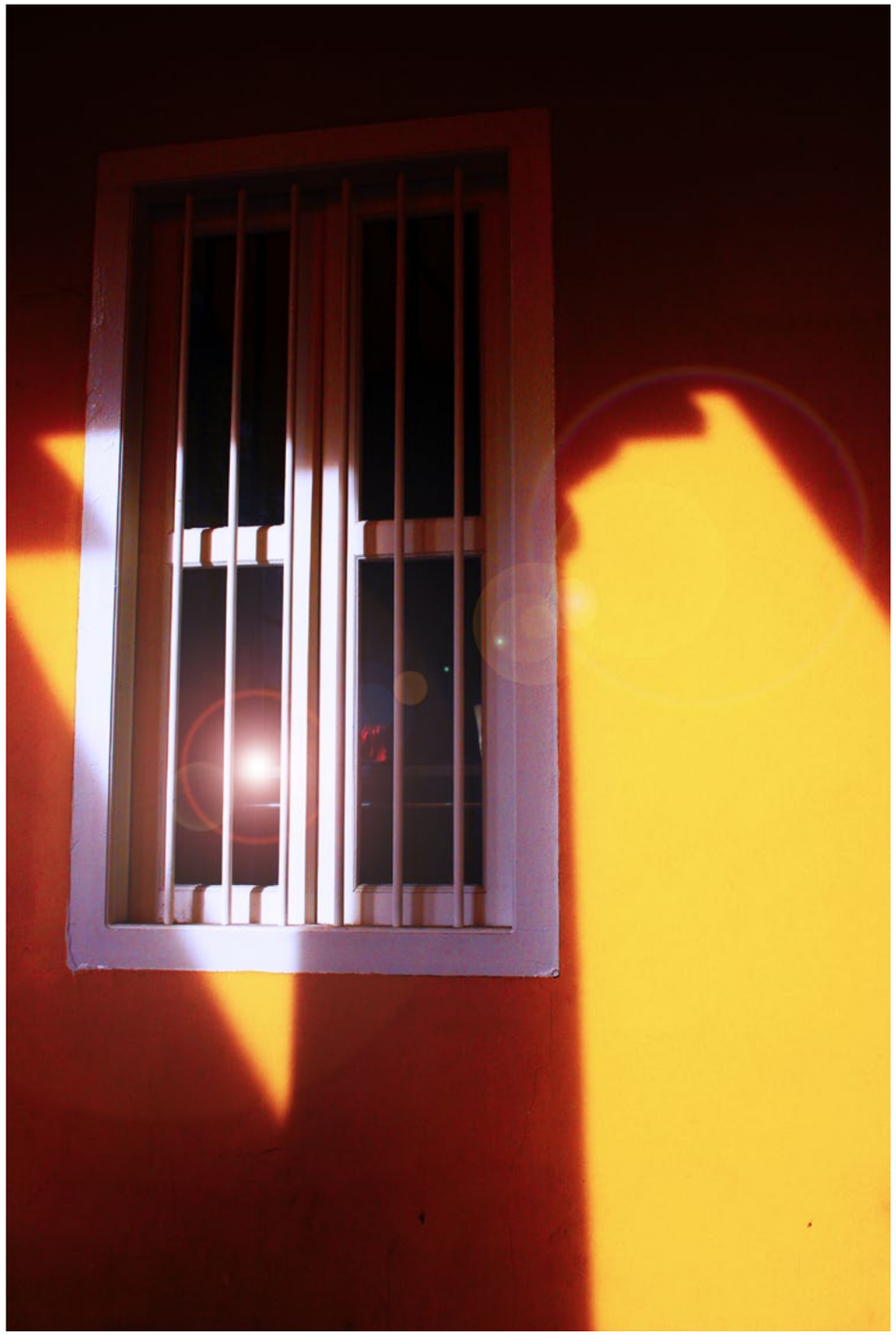
5. What type of light source is this?

PLUS||ULTRA
https://www.flickr.com/photos/plus_ultra/8489259170/

6. Looking at this photograph: what can you tell me about the light?

PLUS||ULTRA
https://www.flickr.com/photos/plus_ultra/8483170575/in/photostream/

7. What type of light sources are visible in this image? Did the photographer choose the best light under which to photograph these boys playing?

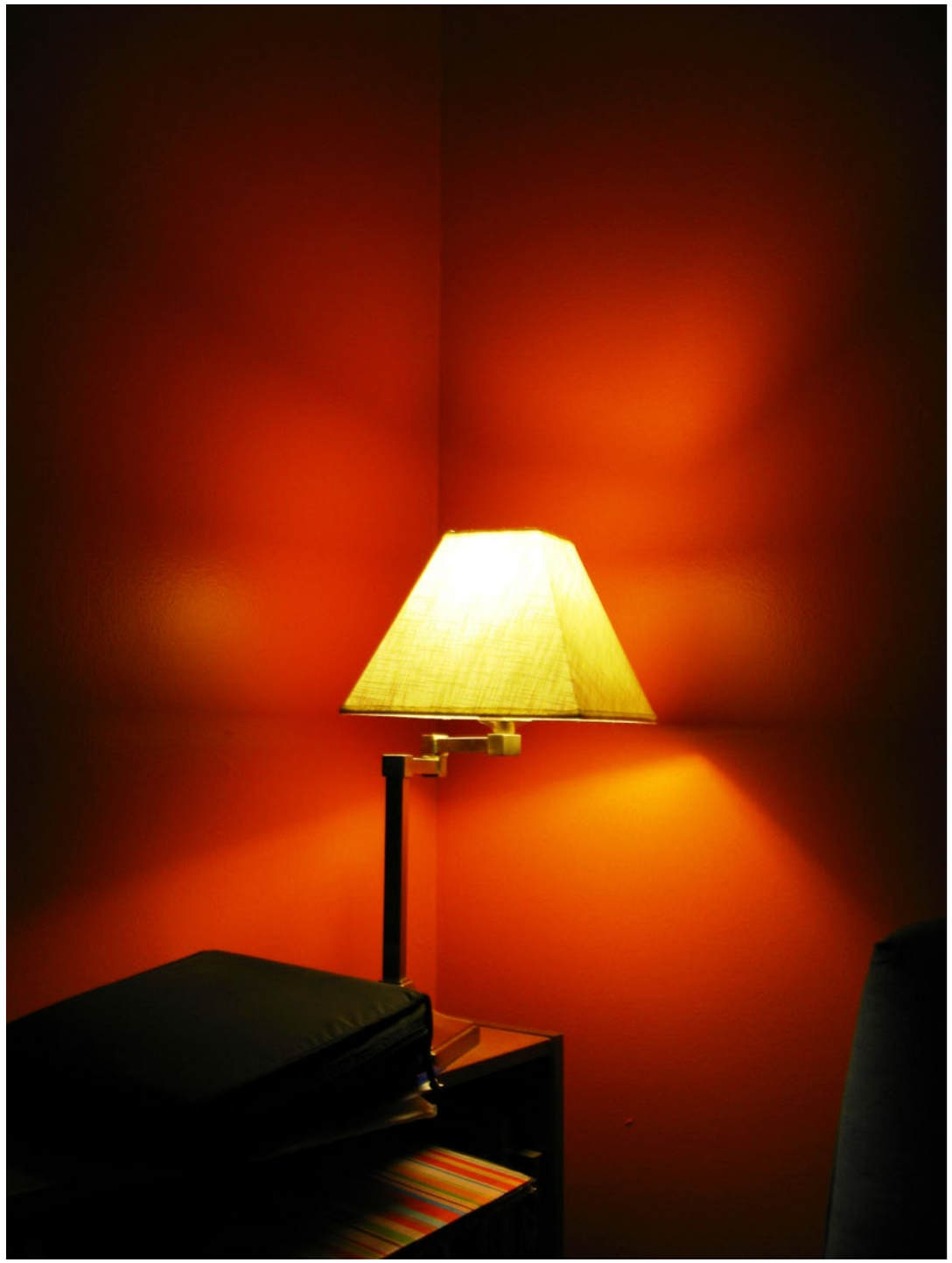


Debble Wee
https://www.flickr.com/photos/46385862@N08/4253983468/

8. The characteristics of light are so important that they can completely change what a scene looks like. What is the color of the wall in this image?

Wesley Fryer
https://www.flickr.com/photos/wfryer/7183618180/

9. When you are evaluating light and shadow you are doing so for two reasons. One is to determine if you believe the light hitting the subject will produce the type of photograph that you wish to create. The second reason is to provide you with information that will help you set up your cameras settings. When we look at the image of the singer (above), it's clearly evident that the light is coming from a harsh direct light source. The picture didn't turn out very well. Can you tell me why? What was wrong with the camera settings?



David Antis
https://www.flickr.com/photos/urbanwoodchuck/3305212225/

10. Observe this photograph. What can you tell me about the ‘LIGHT’ in this photograph?

ANSWERS

1. There are two light sources. One is shining on the woman, and the second is shining on the background. The light illuminating the woman is a small source, with a hard direct light. The light illuminating the background comes from a large soft light source. How do we know the background light has these characteristics? We know this because the line of demarcation from the 'light areas' to the 'dark areas' is broad, smooth, and even. We know the light source on the woman is hard, direct, and close because the shadows are dense, and there is a quick transition from the light areas to the dark areas.

2. It's impossible to know for sure if this is natural light or artificial light. It could be natural early morning light or late afternoon light coming through a window. But the intensity is so warm and strong that I believe it to be an artificial light with an amber gel. This gives you an opportunity to consider how you might use colored gels on a light source to create a mood. The shadow of the chair is very hard. This would indicate that the chair was close to the wall and the light source is small, hard and direct. The shadow characteristics also point to the probability that this was artificial light and not window light.

3. This is most definitely natural light coming through a window. Study the shadows in images 2 and 3. In image 2, the shadow has no bend. It's extremely dense and has very little variation. In image 3, the shadow bends because the light source is much further away. There are also variations with the density of the shadow indicating that the light source is much further away. Is this a soft or a hard light source? I would say that this is closer to a hard, direct light source than a soft light source. But why is that? This is window light, and window light is supposed to be soft. Window light is soft when the light coming through it is indirect light: in other words, if the sunlight shines directly through a window, that will be

a hard light source. If the sun is shining, but not directly through the window, the light emanating from the window will be a soft light source.

4. The long shadows and warm color temperature of the light coming through the window indicate that this is late afternoon light: (remember how our brain evaluates light and shadow to determine time of day). The characteristics of light that are at work in this photograph are: reflectance, transmission, absorption, and refraction. All of this "activity" is occurring around the pink ball. What about the dispersion of the light? There is minor dispersion of the light coming through the window. However, the shadows indicate that this was still a hard light source. The ball is dispersing some of the light (that passes through it) onto the floor. The pink light hitting the boy's face and body shows the reflectance of light. The pink shadow on the floor shows the transmission and refraction of light. How do we know the light was refracted? We know this because the pink shadow is at a different angle than the light coming through the window. Can you tell me why the boy is illuminated with pink light? The ball has absorbed the other colors of the spectrum, and it only reflected the colors near the red-pink spectrum. In addition, the full spectrum light (such as this was) is coming from behind the boy. Without the ball he would have been in silhouette. His face and body would have been dark, completely in shadow, and devoid of detail. The silhouette was avoided because of the light reflecting from the ball. What would have happened if the photographer had added a flash unit onto his camera to add illumination from the camera position? The full spectrum light coming from the flash unit would have wiped out the pink color on the boy and on the floor. Finally, absorption is indicated because of the pink shadow as well. The light that was transmitted through the ball absorbed all the other colors of the spectrum and only allowed the "pink" light to continue on to the floor.

Ally Mauro
https://www.flickr.com/photos/ally_m/5964809893/

5. This image has very hard, direct light. Whenever you see hard-edged shadows with dense black tones, you're looking at hard light. Let me ask you a question- is hard light bad? No. However, knowing the type of light that you're looking at will help you to determine what type of image you're going to create in that situation. Let's imagine a scenario. What if you were attempting to shoot a bridal portrait in that room with that light? You decided to sit the bride in that chair with her flowers. Would that image look good? No. The hard light would be terrible on her face, and the extreme contrast would wreak havoc on the image. Does this mean your plan is caput? No. Think.

   What can you do with the light source that's available to you? How about a silhouette? Place her in a perpendicular position, against the window. The hard light now plays in your favor.

   Learn to recognize light and shadow and play it to your advantage.

6. This was a very overcast day, which produced a wide, soft light source. Look at the base of the pillars and the person standing next to the pillar. There are almost no shadows at all. This indicates a very soft light source. What kind of photography might be well suited for this day? Most definitely, you would want to consider portraits- or any type of people photography. This soft light would not be as well suited for architecture or landscape work.

7. This image has hard direct sunlight illuminating the background. The light where the boys are playing is soft. How is this possible when these two locations are right next to each other? There is a lot that you can learn from this image in how you might set up a shot. There are overhanging trees where the boys are located. These trees broke up the direct sunlight and created the soft indirect light of open shade. However, sometimes strictly open shade isn't the best light for photographs of people- it can become too flat and soft. The photographer recognized the value of the large light colored wall. The wall (in effect) became a giant reflector pushing light back into the faces and bodies of the playing boys.

   Not only do you want to learn to recognize light and shadow, but you also must learn to spot natural elements around you that will influence the light in your favor.

8. The color of the wall was actually a yellowish tan. The late afternoon light has been filtered through the atmosphere. Only light rays in the yellow-red spectrum were being transmitted to the scene. Where the light hit the wall directly, the yellow spectrum light beams were strongly reflected. In the shadow areas there was a lot more absorption of the light and only some of the reddish light beams reflected. At a different time of day this wall would look nothing like this.

   Photographers often talk about the Golden Hour, which is that hour right around sunset (or sunrise) where the light is filtered through the atmosphere to a reddish-yellow color. While this light can be very pleasing for landscape photography, sometimes it can be too warm- especially when photographing people.

9. The photographer had the incorrect setting for the metering pattern. It was most likely set for the "evaluative" or "matrix" pattern. This is evident because the camera tried to increase exposure to bring up detail in the shadows. That action grossly over-exposed the singer (where the majority of the harsh direct spotlight was

positioned). The correct metering pattern would have been “center-weighted” or “spot”. This would have directed the camera’s meter onto the singer and left the dark background out of the exposure calculation.

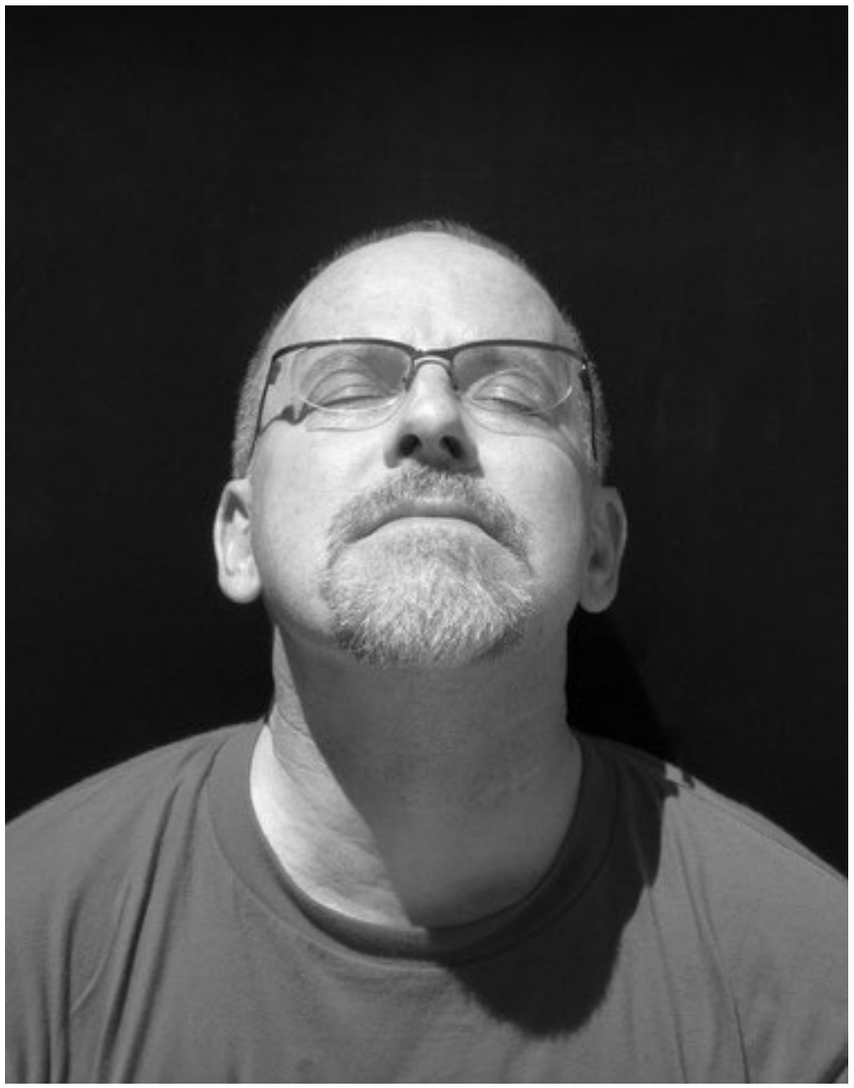
By training yourself to recognize light and shadow, you gain a side benefit. You’ll learn how to better utilize your camera.

10. The shadows indicate that the light is soft. There is most likely a frosted soft-white light bulb in that fixture. The light emanating from the light bulb is on the low end of the Kelvin color temperature scale. That’s why the camera recorded a lot of red and yellow color. Would your eyes perceive this color shift? Yes, to some degree. However, our minds have been trained to ignore color temperature shifts in indoor lighting. Cameras accentuate color temperature shifts. By recognizing the “warm” color temperature of light that was emanating from the light fixture, could you have changed your camera settings to correct for this? Yes! You would change your white balance setting to “incandescent”.

Recognizing the characteristics of light will help you make better decisions as a photographer!

I hope this guide has helped you recognize the importance of light and shadow in your photography.

About the Author



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