

Understanding Photography

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Lesson One: Photo Creation Basics

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Nowadays, even some of the most basic cameras provide the user with the ability to adjust settings to help improve their photographs. Even with these options, however, many people find that their photographs turn out too dark, or too light, are out of focus, or have other problems that make them look less than ideal. The average user is at a loss as to what they should do to resolve the problem and often blame the camera for taking poor photos. In the end, they often live with what the camera gives them and basically let the camera make the choices all of the time.

In working with many people over the years, I've discovered that the source of this problem is that most people, even owners of some pretty expensive cameras, don't have any idea what is going on during the picture taking process. It is because of this that they don't know where to start to correct some of the problems they are seeing in their photos. A few trips to the book store showed me that there are many good books on photography. None of the ones I've found, however, begin with simple explanations of basic photographic concepts.

It is to this end that I have created this series of lessons, aimed at teaching people the basics of photography in as non-technical manner as possible. It is my hope that through these lessons, many people will be able to begin using their cameras in a more effective way that will provide them with higher quality photos to enjoy and share.

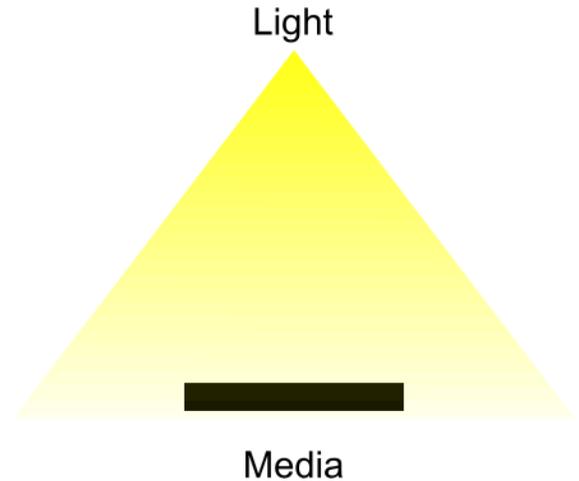
Let's Begin!

How a Photo is Made

In general, a photo is created in a camera when light strikes a light sensitive material, or media, that captures the image. The light sensitive material can be film or a digital sensor. It really doesn't matter, the process is basically the same.

There's a problem with simplifying the photographic process this much, however. If light were to strike the media in an unrestricted fashion, the media would simply continue to record the light until it reached its maximum light recording capability. In the end, you wouldn't have a recognizable photograph, but a photo of the proverbial polar bear in winter, an all white image.

So how does a camera do it? The camera incorporates two basic controls to create the photo. The camera controls how much light the media is exposed to at any given time and how long the light is allowed to strike the media.



Two basic controls are needed to create a photograph:

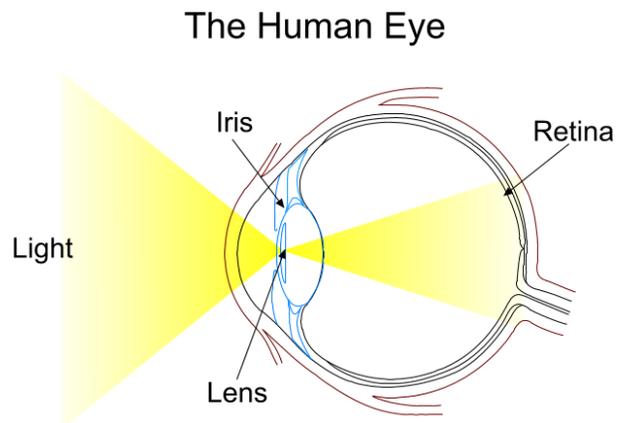
1. Control over how much light strikes the media
2. Control over how long the light strikes the media

Let's consider the human eye for a moment. It's more sophisticated than a camera, but has many similarities.

The human eye allows light to enter. The light passes through a lens and is directed on the retina which captures the viewed image. The amount of light that enters the eye is controlled by the iris. It opens and closes, creating a larger or smaller hole for the light to enter, depending upon where you are and what you are looking at.

In a dark room, your iris dilates, making a larger hole for the light to pass through so that you can see in dim light. In the sunlight, your iris constricts, making a smaller hole so that less light passes through and it doesn't hurt to see.

A camera works in much the same way.

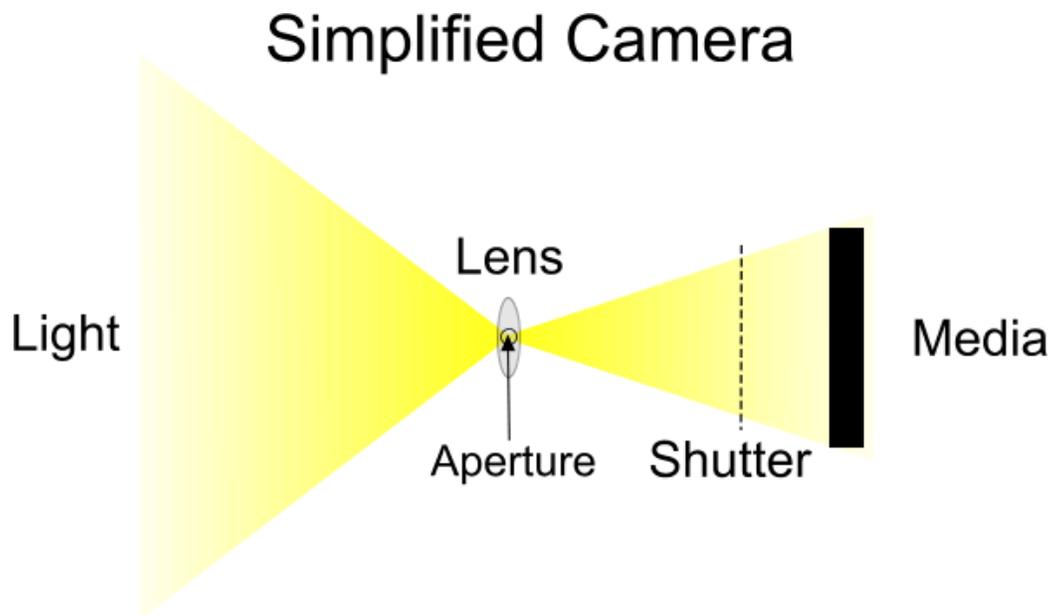


A camera has an aperture that is like the iris in the human eye. It is a hole in the lens mechanism that can be made larger or smaller to vary the amount of light that enters the camera. Many modern cameras allow the user to adjust the size of the aperture. Alternatively, the camera's computer adjusts the aperture automatically to control the amount of light.

Remember that a camera must control two things in order to get a usable photo. It must control how much light enters and how long the light enters.

To control how long the light enters the camera, it uses a mechanism that the human eye does not have. Modern cameras incorporate a shutter that is like a very precise window shade that can be opened and closed for the specific amount of time needed to create a photo. Like the aperture, many modern cameras also allow the user to adjust the speed of the shutter or let the camera's computer adjust it automatically.

Adjustable aperture, adjustable shutter speed, what does this all mean to me and my photos? We'll look at that in a little bit. For now, you must remember that a camera uses the aperture to control how much light enters the camera and the shutter to control how long the light enters.



Two basic camera controls are used to create a photograph:

1. The Aperture controls how much light strikes the media
2. The shutter controls how long the light strikes the media

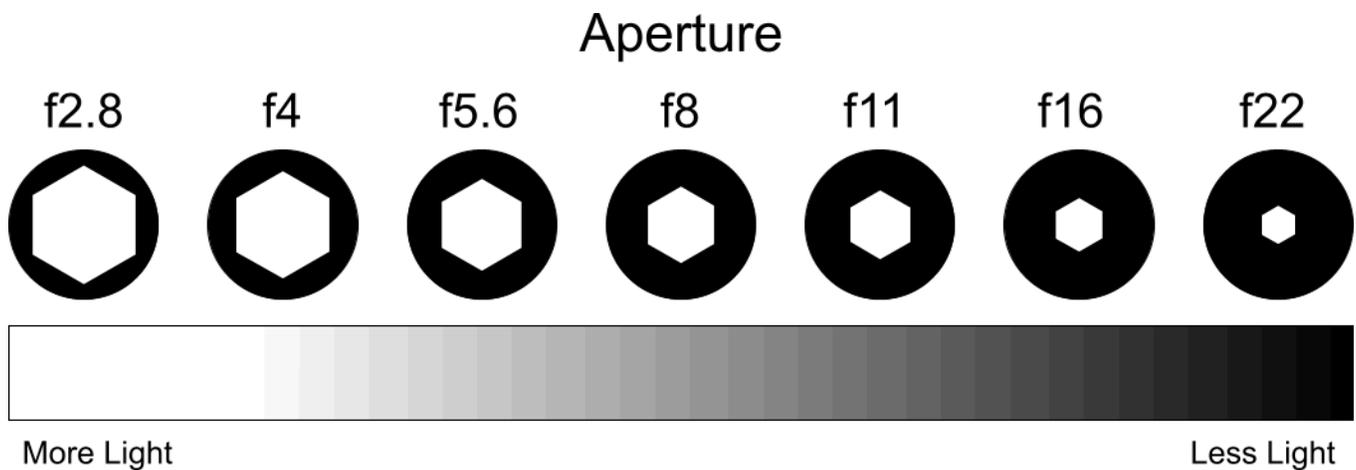
Now we'll take a look at the aperture and shutter in a little more detail and then explore how they relate to each other in the photographic process.

The Camera Aperture

As mentioned before, the aperture is an adjustable hole in the lens that controls how much light can enter the camera. Most modern cameras allow the user to adjust the aperture size. The various aperture sizes available on your camera are referred to as “stops” or “f-stops” and are referred to by number. Here’s where it gets confusing. Large apertures (bigger holes) are referenced by smaller numbers. Smaller apertures (smaller holes) are referred to by larger numbers. You need to remember that. If you want to know why it’s that way, you can refer to the sidebar for more information, but in the end, you really only need to remember that smaller numbered apertures let in more light, and larger number apertures let in less light. The size of the aperture has other optical effects on your photos too, but we’ll look at that in the next lesson.

Confusing Numbers?

Aperture numbers are backwards from the way you would think they should be. This is because they express a ratio of the size of the aperture hole relative to the length of the lens (known as focal length). Ratios are like fractions. Fractions are a pain, but we all know that 1/4th of a pie is a bigger piece than 1/16th. That’s why f2.8 is a bigger hole than f22. It’s actually 1/2.8 compared to 1/22. 1/2.8 is a bigger number. It can make your brain hurt.



Aperture Reminder

Smaller number = Larger aperture

Larger number = Smaller aperture

The Camera Shutter

As mentioned before, the shutter is the precise mechanism that the camera uses to control how long light will enter the camera. Most modern cameras allow the user to adjust the length of time that the shutter is open. This duration is known as shutter speed. The various shutter speeds available on your camera are referred to by number. Modern film and digital cameras need so little light to record a photo, that the shutter needs to only be open for a fraction of a second. Longer shutter speeds are usually used for very low light situations or nighttime photography. The shutter speed has other optical effects on your photos, but we'll look at that in the next lesson.

Confusing Numbers 2?

Your camera uses shorthand to show the shutter speed. Rather than the whole fraction, it shows only the denominator for any speed faster than one second.

1 second = 1
1/2 second = 2
1/60 second = 60
1/250 second = 250
1/1000 second = 1000
Etc. Etc.

Shutter Speed

1 second 1/2 1/15 1/30 1/60 1/125 1/250 1/500 1/1000



More Light

Less Light

Shutter Speed

The length of time that the shutter is open to admit light into the camera

Let's move on and see how the aperture and the shutter speed relate to each other in the photographic process.

What is Exposure?

On our way to discussing aperture and shutter speed further, we need to define what the term exposure means. Exposure is the term used to describe the amount of light necessary to expose the media in a camera to produce a photo. Proper exposure refers to the exposure that is needed to create a photo that looks the way you intended it to. Improperly exposed photos are typically too dark or too light.

We've learned that both aperture and shutter speed are used in a camera to control the amount of light that enters. It is in this way, therefore, that aperture and shutter speed are the primary variables used to control exposure. We're going to discuss how aperture and shutter speed are related to each other. For purposes of this lesson, we are going to assume that you are attempting to create a photo that is properly exposed to represent a scene exactly the way you see it.

As you will learn in later lessons, exposure can be manipulated to create different photographic effects or to accommodate unusual lighting situations that are difficult for the camera to record. Before you can successfully do that, however, you will need to understand the relationship between aperture and shutter speed in its simplest form. Later on we'll add another variable to the equation, but that will be in lesson two.

The Camera's Light Meter

All modern cameras incorporate a built-in light meter that reads the light entering the camera and tells the camera's computer or assists the user in setting what it thinks is the proper exposure for a given situation. Later on, we will discuss the different types of metering available in cameras and how they can help you make adjustments for various lighting conditions. For this lesson, we will only consider that the camera can determine proper exposure and that it uses this value in an equation that involves both the aperture and shutter speed.

Finally, the Relationship Between Aperture and Shutter Speed

To explain the relationship between aperture and shutter speed, we're going to talk math. Don't worry, this will be a simple equation to help you understand.

If we give aperture a numeric value, shutter speed a numeric value and express our perfect, proper exposure as 100, we end up with the following simple equation:

$$\begin{array}{ccc} \mathbf{10} & \mathbf{x} & \mathbf{10} & \mathbf{=} & \mathbf{100} \\ \text{Aperture} & & \text{Shutter Speed} & & \text{Perfect} \\ \text{Value} & & \text{Value} & & \text{Exposure} \end{array}$$

What happens if we change the aperture value? In order to keep our perfect exposure, the shutter speed value must change too.

$$5 \times 20 = 100$$

Aperture Value Shutter Speed Value Perfect Exposure

or how about...

$$2 \times 50 = 100$$

Aperture Value Shutter Speed Value Perfect Exposure

The point of this illustration is to demonstrate that there are many ways to achieve a proper exposure. Right now, you may be using your camera in automatic program mode. On automatic, the camera makes the aperture and shutter speed selections for you. As you start to understand how different aperture and shutter speed settings affect your photos (Remember we mentioned that they each have other optical effects?) you will be able to take control of your camera. Even in program mode you will be able to make your photos more of what you want them to be.

Technical Term

For those of you who really want to know, and like to have words to throw around during conversations...

The technical term for the relationship between aperture and shutter speed is known as

Reciprocity

Next Lesson...

Adding light sensitivity to the exposure equation

The effects of different aperture settings - Depth of Field

The effects of different shutter speeds - Freezing or Expressing Movement