



by Steve Sonheim

PHOTO SILLY

Technical Guide

*T*his guide is designed to add to your knowledge of some of the more technical aspects of photography. Some of the directions below will not apply if you are using a very simple point and shoot, but the principles are the same and will help you get more out of your camera. This first section we will talk mostly about exposure: what it means and how your camera controls it.

To start with, we need to make a clear distinction between “good lighting” and “good exposure.”

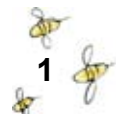
Exposure refers to the overall *quantity of light* it takes to make a photograph. Our eyes are constantly adjusting to the brightness of the world around us so we can see. The camera does the same thing, and when we talk about exposure we are talking about the adjustments the camera makes to adapt to the situation we are in.

Lighting, on the other hand refers more to the *quality of the light* in our pictures. Here we are talking about the direction and color and softness of the light.

Exposure determines whether the overall is photo is too light or too dark. The *Lighting* in the image determines the mood and feeling.

Baking Metaphor

- ▶ *Exposure is like the time and temperature that we set the oven for.*
- ▶ *Lighting is all the good stuff that goes into the dough.*
- ▶ *Bad exposure can ruin a shot but good exposure doesn't always mean the lighting will be good.*



The only thing the camera and the settings can affect is exposure. For now we will just talk about exposure. As the class progresses we will get more into lighting.

Exposure

First, a story:

F-stops and the Bees

Once upon a time there was a princess locked in a tower with one round window and surrounded by magic bees. She discovered that if she opened the window and let just right number of bees in each day that they would make a pot of honey for her.

She also discovered that the window was magic and she could change its size. The trick was to let the exact number of bees in at a time, but the number of bees outside kept changing. For instance, in the evening there were fewer bees so she had to keep the window open longer or make it larger or both.

During the day, there were lots of bees outside so she would make the window small and close it quickly. Sometimes she would like to stand by the window and watch the bees in the evening, so she would make the window small but leave it open for a very long time to let in enough bees.

Well, she loved her bees and she loved her honey but she was a bit rude and as the last bee flew in she would always jump up to close the window and say: "f---stop!"



Likewise, your camera has to let in the same amount of light every time you take a picture. And because the light outside is always changing,

the camera must control how many “bees” get in. And like the tower window it has two ways of doing this:

- 1) **Aperture** which is like the iris in your eye, or the size of the window.
- 2) **Shutter Speed** which is how long the “window” is open.

Every time you press the button, the camera quickly measures the light and picks a combination of shutter speed and aperture to let the right amount of light in.

Your “exposure” is the combination of these two controls and is given as numbers: i.e. f/8 @ 1/200. (Don’t panic.)

APERTURE

The term **F-stop** refers to the size of the aperture. The actual numbers, f/4, f/5.6 etc. are *relative* values. That is, they don’t measure anything directly but just give us a way to keep track of them. Basically, it is just a series of smaller and smaller holes, and each f-stop lets in exactly 1/2 the amount of light as the previous stop.

“bigger”/more light “smaller”/less light
Aperture f/4 f/5.6 f/8 f/11 f/16

Notice it is reverse intuition; as the numbers go up, the hole gets smaller and lets in less light.

SHUTTER SPEED

Shutter speed should really be called “shutter open time” because that is exactly what the numbers are telling us. 1/125 means the shutter is open for 125th of a second. And each number is twice the previous number, but lets in 1/2 the amount of light.

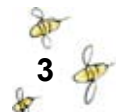
Shutter Speed 1/60 1/125 1/250 1/500 1/1000
slower/more light..... faster/less light

In photography, when we talk about measuring light, we always express it in terms of an exposure. In other words, we don’t measure light in any

Super Tech:

Notice that every other stop number is about double.

The numbers are based on 1.4 which is the square root of 2. This is because the intensity of light drops according to an inverse squared relationship to the size of the hole. If you make the hole 1/2 the size, the light will decrease by a factor of 4.



sort of units like “degrees” as we would for temperature for instance. We just say what the exposure is right where our subject is, or “f/8 at 1/250.” And then you can pick any combination that lets in the same number of bees.

The following chart shows the possible combinations for an exposure or “f/8 at 1/250.” All of these combinations let in the exact same amount of light.

Aperture	f/4	f/5.6	f/8	f/11	f/16
Shutter Speed	1/1000	1/500	1/250	1/125	1/60

Because remember our story above? The camera has to let in the *same* amount of light with every exposure. So, as the *aperture* (window) gets bigger, the *shutter speed* (open/close time) gets faster to maintain the same *exposure*.

Fortunately, the camera on an auto setting does all this for us. So why do we care?

Well, you don’t have to. However, the aperture and shutter speed both affect the image in ways *other* than just exposure. We will talk more about that now.

SHUTTER SPEED (& BLUR)

Your image is only affected by the **shutter speed** when it is dark and it drops below 1/30 of a second. Your hand holding the camera will actually move enough in that time to cause a blur that can look like bad focus. At 1/10 of a second, you start to see real blur.

Many cameras will turn on the flash at this point to try and make the shot work (not us).

Need to Know

If you can tell that the shutter speed is less than 1/30,
use a tripod or find something solid to rest the camera on.
You can still shoot even as slow as 1/4, but it takes practice
holding very still. Better yet, find some light! Last resort: Crank up
your ISO and bring on the grain (see ISO, below).

APERTURE (& DEPTH OF FIELD)

Try this: Hold your hand about a foot in front of your eyes. Focus on your hand but “look” at everything behind it. Now focus on the background and “look” at your hand. You can’t focus on the background and your hand at the same time.

That’s **depth of field**. Our eyes have very “shallow” depth of field (meaning, if you look around the room and take blink photographs with your eyes, the close foreground and background are never both in focus).

When your camera’s **aperture**, which is in the lens, is all the way open, the pictures you take will be like your blink photos. You can focus on something up close, but the background will be blurry. This effect can be useful.

As the aperture gets smaller and smaller, more of the background comes into focus. The *best focus* will still be whatever point you focused on, but at the smallest aperture, everything in the shot will be in pretty good focus. We call this “wide” depth of field. Also a useful effect.

The actual numbers are reverse intuition:

small number = big opening

An easier way to think about it is:

small number = small focus (or a shallow depth of field)

Don’t worry about the actual numbers. There is no right aperture for a particular shot, it’s just a range. You can check what the focus will be using the depth of field preview button if you have one.

Need to Know

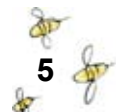
Aperture size determines depth of field.

THE BALANCING ACT

When we take over manual control of our camera, we have to keep track of three simultaneous variables: exposure, depth of field, and potential camera blur. You can’t have it all. In almost every case you will have to choose a compromise between the aperture you ideally want and the shutter speed you ideally want to get the right exposure.

SLR Note:

Check with your owner’s manual for instructions on using different modes. Most cameras will have settings that favor wide depth of field or fast moving subjects.



Taking More Control

So if the camera counts the bees and sets the exposure for us, why are some pictures too light or too dark?

Because the “bee counter” gets fooled. The camera measures the light and takes the *average*. It looks out through the lens and says, “OK, there is this much light area and this much dark area so I will pick an exposure to balance them out.”

-click!-

And then you say, “Why is everybody’s face dark! Stupid cheap camera, time to go shopping!”

Unfortunately, there is no setting that will guarantee perfect exposure every time. You have a limited number of modes on the camera but the possibilities in the real world are infinite. So you have to use your head and anticipate.

Need to Know

Your camera basically measures the average light in your scene and makes a guess at the proper exposure and sometimes gets it wrong.

Camera Settings

There are times when you need to take more control of your camera to get the results you want. For instance, your camera may guess wrong at the exposure and give you a photograph that is too light or too dark. Or, sometimes you WANT your image to be lighter or darker than “normal” for aesthetic reasons.

Let’s talk about a few of the more important settings on your camera.

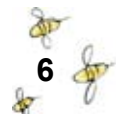
Myth:

The camera will give you a great shot if you just know the trick for setting it correctly.

What’s True:

The only thing the camera does is let in a certain amount of light based on the average. All the modes and settings and complicated programs boil down to one thing: The overall image can be lighter or darker. That’s it.

A great shot needs great light which has nothing to do with the camera.



MODE

The **mode settings** are designed to give the camera a hint about what you are shooting so it can make a good guess at the best exposure. But it's still really a guess and most of the time it gets close enough. If it gets it wrong, your shot is too light or dark, how can you get your camera to make a better guess?

EXPOSURE COMPENSATION FEATURE

Most cameras have an **exposure compensation feature** on the camera or in the menus. Check your owner's manual. It is sometimes called EV override.

This is probably the most useful setting on your camera. It is like a big dimmer switch for your pictures and almost all cameras have some version of it. You just dial it up or down to make all your subsequent shots lighter or darker regardless of which mode you are in. To determine the amount, just do test shots.

Take a shot. Too light? Just dial it down a notch or two and shoot again. If you are shooting an event where you can't "shoot again," do the test shots before the action starts. This will slow down your shooting until you get better at it, but nobody said it would be easy. (Well, OK, the guy at the store might have said that.)

Practice finding the setting in your menu or on the camera so you can go to it quickly.

Since you are shooting, shooting, shooting you will start to recognize the situations where the camera is going to guess wrong.

Need to Know

Exposure compensation is the best feature on your camera because it lets you make your shots lighter or darker.

ISO

ISO stands for *International Organization for Standardization* and goes back to the old days when you would choose your film based on your situation. (It used to be called ASA). If you chose a film that had a high rating (i.e. 1000 ISO), you could take pictures in very low light, like a dark



theater, but the resulting pictures would be grainy and fuzzy.

In the digital world, changing your ISO setting is similar to choosing a film and the trade off is the same: If you set the ISO to a high value so you can shoot in the dark (w/o a flash), expect lower quality images.

Here's the princess again:

ISO and the Bees

One night the princess gets hungry in the middle of the night and opens the window. But there are so few bees outside that she stands there (like, forever!) and gets impatient and finally grabs one of the bees. "Look lady," the bee says, "we can make ya a pot of honey with fewer bees but it won't be as good. A bit watery, ya know what I'm saying?" She agrees and lets in the new number of bees and gets her snack, and it is kinda gross but, whatever.



In other words, when you set your camera to a higher ISO value, you're telling your camera it's okay to make a lower quality picture in exchange for being able to shoot when it's darker. The camera will then make a properly exposed picture with a smaller amount of light. (The princess gets her full pot of honey, but it's made with the fewer bees, so the quality goes down.)

Changing the ISO won't make your pictures lighter or darker (that's controlled by shutter speed/aperture). It just means you can squeeze a picture out of a low-light situation, but the resulting image will be grainy, grayish, and fuzzy.

Need to Know

Set your ISO at its lowest setting and leave it there.

Exception: Shooting in a dark place (but don't forget to change it back).

IMAGE QUALITY

Another important setting is **image quality**, also called file size or image size or fineness. This doesn't have anything to do with exposure or ISO, it just tells the camera how big you want the photo to be digitally.

Bigger file = better picture (but fewer shots on the card).

So... you could set the image quality really high when you are about to take a great shot that you will make big prints from and set the image quality really low when you are about to take a really crappy shot that you will just throw away.

Hmm, or do you know that ahead of time?...

Need to Know

Set your image quality to the highest setting and leave it there.

Then go buy an extra card and download your images often.

FLASH

For these assignments the **flash** should be off. Find it in your menu and practice switching it off. If you can't find it, google this: "*your camera model* how do I turn the flash off?" (That's what I will do when you e-mail this question.) Some cameras, like the one I'm using for this class, turn the flash back on every time I shut off the camera; annoying, but I don't know any way around it.

The camera flash is a relatively poor technical solution to the problem of not having enough light. I say poor because the quality of light is so bad: harsh shadows, flat, very little range, colorless, ugh.

Better solution: find some better light. Photography is all about creative problem solving.

Need to Know

Turn your flash off for this class.*

*Note: If you have a camera that won't allow you to turn off the flash, don't worry about it; you can still enjoy all of the silly assignments.

AUTO FOCUS

Auto focus is a great thing. It's fast and very accurate but, like the bee counter, it is easily fooled. What we gain in speed we sometimes lose in making sure the camera focuses on what we want.

Need to Know

Slow down and make sure you know where the focus point is in your viewfinder (little brackets or box), and make sure it stays on your subject.

LENSES AND ZOOMING

Zoom away! But observe your results. Your **lens size** or amount of **zoom** not only make stuff bigger or smaller but change how they look and “feel” in the scene. Forget about the traditional rules and try different things and see what works for your vision.

* * *

These are the main settings on your that deal with the fundamentals of photography. There are many other settings on your camera; most of them are personal preferences and go beyond the scope of our silly little class.

Super Tech:

If your camera will do manual focus, then practice in manual as much as you can. It is a useful skill and will improve your composition (since you won't be chasing your subject all over with the focus point, and can think more about framing).

Glossary of Terms

Best Focus: The exact point that your camera focuses on.

Brightness Range: The difference between the lightest and darkest part of a scene.

Situation: The natural or existing light in the place where you are about to shoot.

Scene: Whatever is in your frame.

Frame: The rectangle formed by your viewfinder or screen.

Exposure: The brightness of an image; the camera settings determine the brightness.

Image: The photograph after it has been recorded by the camera.

Shot: A photograph at any state from conception to final print.

File: The digital information that makes up an image. You can have multiple files of the same image.

Camera Angle: The physical height of the camera for a shot.

Direction (light): Position of the dominant light source relative to the subject as in: behind, or from camera.

F-stop: The unit of measurement or settings for the aperture. Small number = Large aperture.

Aperture: Is like the iris in our eyes and controls the quantity of light reaching the sensor and therefore controls exposure. Also effects depth of field.

Depth of field: Range of focus from foreground to background. Our eyes have shallow depth of field. Small apertures create wide depth of field.

Modes: A setting that tells your camera what kind of pictures you are taking, i.e. people, landscape, close-up.

ISO: Stands for *International Organization for Standardization*. See Technical Guide.

Long Exposure: A shot where the shutter is open for more than 1/4 of a second. Useful for taking night scenes or creating intentional blurs.

Wide Open: When the lens is set at its largest (smallest-number) aperture.