

Exposure

Welcome to our presentations tonight. We have a wide diversity of levels of experience in our club. We want to appeal to members at all levels of expertise so tonight we will cover some basics, but hopefully with enough content that the material will be a good review for MOST of us. Note on LOWCC last week presentation by Ron Mayhew. If you were there you might think this is a repeat.

1. Introduction – Tonight we will be talking about using your digital camera. This is a “mechanics” discussion. Warren, in his presentation will touch on the artistic aspects a bit, but primarily we will discuss getting the most out of your camera in terms of settings and adjustments. My old public speaking class taught me “Tell them what you are going to tell them, tell them, then tell them what you told them. Tonight I am going to discuss the basics of getting the proper exposure with your digital camera.
2. First things first. Read the manual. Have your camera alongside when you do that. Look at the camera and perhaps try out some of the features. If you want to do something with your camera but you don’t quite know how, find it in the manual. Reading the manual is a good cure for insomnia. You might laugh but I am serious. You will remember later that you saw how to do something that you now want to do. In other words, just get familiar with the features of your camera. I read mine while watching TV (during the commercials). Not everything in the manual is applicable to everyone. For example, I print my own images using the computer between the camera and the printer, so the information on connecting the printer directly to the camera, and marking images for printing doesn’t matter to me except for curiosity. If I show my images on the HDTV, I’ll connect my laptop, not the camera. Therefore the information on that doesn’t matter. Read the sections of the manual that deal primarily with taking pictures FIRST. Then if there is something else that you want to learn, you can read that section next.
3. We will first talk about the three components of exposure, ISO, Shutter Speed, Aperture. Light metering and metering modes – many digital cameras have different metering modes. Typically, they are Averaging, Center weighted, and Spot metering.

Digital cameras also allow you to “second guess” the camera’s meter. We will talk about when you might want to do this to adjust for special conditions.

Lastly, Warren will cover the use of the camera’s Histogram to check for the proper exposure.

4. Let’s begin. We are going to discuss exposure, some of the challenges you may face, exposure controls for point and shoot cameras, and how to use the available controls to handle challenges.
5. Exposure is controlled by three factors, the ISO setting, the shutter speed and the aperture. ISO stands for International Standards Organization. In the days of film, they tested and rated each type of film for its sensitivity to light. The higher the number the more sensitive. Today’s digital cameras have sensors that have equivalent sensitivities to light. You can adjust the ISO speed of your camera. However, a sensor has a “native” sensitivity and increasing ISO rating is like turning up the volume on an old A.M. radio. If the signal is weak (i.e. low light), turning up

the volume gives you static (i.e. noise in the image). This noise looks like what film photographers called grain. Later we will see some example images.

Shutter speed is measured in fractions of a second or whole seconds. Digital cameras display the shutter speed in the viewfinder, whether set manually or automatically. Speaking for Canon cameras, fractions of a second are displayed as 200 for 1/200 second. Decimal fractions are displayed as 0.3 for 0.3 seconds, 2.5 for 2.5 seconds and as 6 for six seconds. Most digital cameras can use shutter speeds from about 1/4000 second up to 30 seconds or more.

Aperture is the lens opening; more on this in a moment. Setting the aperture reduces the size of the “window” in the lens through which light enters.

The shutter determines how long the light from the scene reaches the sensor.

The aperture determines how much of the light from the scene reaches the sensor. Smaller aperture decreases the light and requires a longer exposure.

The ISO setting determines the “sensitivity” of the sensor to light.

A good analogy is this. Suppose you have a bucket. You put the bucket under an outdoor spigot and turn the valve on. Now let’s fill the bucket. There are three factors involved,

First, the valve opening (aperture): Open the valve a lot and the water can fill the bucket in a shorter time.

Second, the time that the valve is open. (shutter). Open long enough to fill the bucket.

Third, the size of the bucket (ISO): A smaller bucket fills faster with the same valve opening. Higher ISO means the sensor doesn’t need as much light to fill, the bucket is smaller and so it fills more quickly with the same valve setting.

Here’s the exposure triangle. To maintain a constant exposure, If you increase the ISO you must increase the shutter speed or reduce the aperture by INCREASING the F/stop number.

If you increase the shutter speed (make it faster) you must use a larger aperture (smaller F/stop number), or increase the ISO setting.

If you use a smaller aperture, you must decrease the shutter speed (make it slower) or increase the ISO setting.

6. Here is a photo of an old Speed Graphic lens with the shutter open. The aperture is set to F/4, roughly wide open. Aperture, F/Stop, Lens Opening are all terms for the same thing.
7. At F/8 the aperture is closed about half way. Notice the curved blades that move to adjust the aperture while at the same time keeping it roughly round.

8. At F/16 it is very small. Doubling the F number decreases the amount of light by a factor of 4. Full F stops follow the series: 1, 2.8, 4, 5.6, 8, 11, 16, 22, 32, 45. Each of these numbers in increasing sequence allow half as much light as the previous one. Digital cameras can adjust fractions of a stop in auto mode.
9. The meter assumes your subject is of average brightness and exposes so as to produce medium gray. If you are taking a snow scene, the meter will make it medium gray, so you need to compensate and overexpose to compensate. If you are taking a black cat in a coal pile, the meter will cause the camera to overexpose so the cat and the coal are medium gray. Here you need to underexpose to make the cat black again. It may well seem backwards that you want to overexpose a bright scene and underexpose a dark one. You are just undoing the lack of intelligence of the camera's metering system. Some point and shoot cameras have only automatic mode and you can compensate only by using the exposure compensation controls on the camera.
10. This is what the photographer sees.
11. This is what the meter sees, not a sharp image but the brightness values over the different parts of the image.
12. The meter exposes for middle gray. If you set your camera to automatic and take a picture of a white card, a middle gray card and a dark gray card, the images will all look alike because the camera will automatically make them all middle gray.

The Iso sets the sensitivity but can also increase the noise in the image.

The shutter speed controls motion blur. A race car, bird in flight or water over a waterfall can be stopped dead by using a fast shutter speed. Sometimes that is what you want, and sometimes you want some blur to indicate motion. Many waterfall photographers like to use a slow shutter so the water looks a bit like milk. When you hand hold your camera, some motion is inevitable. We older folks in particular are not as steady as we used to be. A higher shutter speed reduces the effect of camera shake.

The aperture controls the depth of field, that is, the relative sharpness of the background and subject. A large aperture singles out the subject and blurs the background. A smaller aperture puts more of the image in sharp focus.

Most professional photographers use a tripod always. There is a rule of thumb that the slowest shutter speed that you can use is the reciprocal of the focal length of the lens. Set your zoom lens way out to 200mm and you can safely hand hold the camera (being careful not to move) to 1/200 of a second. The new image stabilization lenses let you get away with perhaps an exposure four times that long or 1/50 second at 200mm. For any creative setting where you want blur, as in a waterfall image, where you want to use a long exposure time, longer than this rule indicates, USE A TRIPOD! There is some discussion that this rule applies to cameras with

sensors smaller than full frame 35mm only if you use the equivalent focal length with reference to 35mm.

13. Exposure Challenges -- Bright skies can be a problem. One possible cure is a graduated neutral density filter. We will talk about that shortly. A blue sky can be tamed by using a polarizing filter. Warren will discuss that later. An overcast day can be a difficult problem because the meter will expose for the sky and the landscape will get dark and underexposed. Since the sky will be white whatever you do, point the camera down and lock in the exposure on the subject without the sky. The subject will be properly exposed and the sky pure white. There are remedies to this that will be mentioned later, involving “post processing” of the image. You can change camera position and avoid direct reflections of the sun or a very bright sky. Deep shadows and bright highlights can be a challenge. A highlight that is pure white, for example a cloud, looks much worse in a photo than a deep shadow that has gone black and has no detail. Look at your image on the camera’s display and decide whether the exposure is what you want. You can check for this using the histogram available on most cameras. Warren will have more to say about this later. You can use the exposure compensation feature of your camera to set in increments of 1/3 stop or ½ stop or either on some cameras, depending on a menu selection.

Waterfalls can be made to look silky by using a long exposure. Set the ISO to minimum, use a small aperture, F/16 perhaps, and maybe a neutral density filter, which reduces the amount of light by a factor depending on the density of the filter. Use a tripod of course. The shutter will be open a long time and the motion of the water will make it look silky. Exposures of, say 1/5 of a second to a few seconds may be used for this effect. Some scenes are beyond the sensor’s brightness range. In this case you can take multiple exposures, under and overexposing images, and put them together using photoshop or software specially made for High Dynamic Range photography.

14. Exposure solutions – Decide what you want the image to look like. Use the camera’s controls. The metering mode (read the manual) can help. If you have a subject such as a portrait with a bright background, use the center weighted metering mode or the spot mode. It will bias the exposure toward the subject. Use exposure compensation (read the manual). Snow or beach scenes make it necessary to increase the exposure. Set the compensation to plus a stop or more. Dark locations such as deep shade might necessitate decreasing the exposure. Set the compensation to minus a stop or more. Experiment and look at the image in your camera.

We have not mentioned White Balance yet. Color film was available with different characteristics for daylight and “tungsten” exposure. Daylight film used under incandescent lighting produced very orange images. Tungsten film used outdoors produced a very blue image. Filters were available to allow use under the wrong lighting conditions. Digital cameras have a White Balance control... Usually Automatic works nicely, but for best results, set this adjustment to Daylight for outdoors. Your camera might also have an overcast or shade setting. In addition it will have Incandescent and Fluorescent illumination settings. Use these settings BUT don’t forget to return the setting to Auto or Daylight when you are done shooting in different lighting. I know how easy that is, I’ve done it, taking some tungsten indoor pictures and then forgetting to set the camera back to daylight. I got some very blue looking images of Gatlinburg and some Trillium in the GSMNP. If you shoot images in RAW mode the setting of

the white balance is only a “suggestion”. You can alter it when you process the image and convert it to a JPG or TIFF.

Review camera’s controls in your manual. Post processing images on your computer can be done with a number of image editing software packages. Picassa is free and can be downloaded from google.com. Photoshop Elements costs about \$90 and can do much more than Picassa. Photoshop CS in various versions is quite expensive. Using these software packages you can adjust the brightness range of the image, correct at least in part for under exposure, correct the color, reduce or intensify the color saturation and sharpen your images. You can also put together composite images using parts of images taken with different exposures. That is a subject for an entire meeting or several tutorial sessions in the future.

15. We are going to look at a typical point and shoot camera with a lot of exposure controls. It has scene modes, automatic, aperture preferred, shutter preferred, and completely manual modes. It has exposure compensation and white balance adjustments, contrast and color saturation adjustments, and histogram diagrams with “blinkies”.
16. Note the exposure dial. It has Auto mode. In this mode the camera does all the “thinking” for you. Don’t use it unless you are just snapshotting and want record images. P for Programmed mode is a bit smarter. On the Canon, auto mode will use the flash if it thinks that is necessary. In the Programmed mode, you can use the flash if you want to use it. It becomes your choice. Then you have the “Creative Zone” and the “Image Zone with various preset scene modes”.
17. The Scene modes might be useful at times. All adjust the exposure parameters to try to optimize the image. For example, Portrait mode will use a large aperture so the background is out of focus. Landscape mode will use a small aperture so the foreground and background will both be in focus. The other scene modes will optimize the ISO, Shutter speed, metering mode and Aperture for the various conditions. The scene modes on different cameras vary somewhat. If you haven’t caught on yet, READ THE MANUAL.
18. This is pretty self explanatory. You might use programmed mode for snapshots of an event such as a parade. You would use shutter priority for events where you want to stop motion as in an auto race or sporting event. Freeze that basketball player in mid air. Or conversely NOT to stop motion as in a waterfall image. You would use aperture priority to control depth of field, to throw the background out of focus, for example, in a close up of a flower or a portrait. Manual mode could be used if you want to compensate and not use the camera’s metering decision directly. You would more likely use Aperture or Shutter preferred, and dial in compensation.
19. Many point and shoot cameras only have Programmed or Auto modes. In this case your creativity is limited a bit but you can still use exposure compensation. Most allow you to compensate up to two full stops (from $\frac{1}{4}$ of the metered exposure to 4 times that exposure). The details of how to set the compensation vary from camera model to camera model. The manual will tell you how to do it.

20. Now for some example images. Slides 20 to 26 show the use of exposure compensation and the fact that using Av mode allowed the photographer to select a smaller aperture than Programmed, so the depth of field is larger and the water more blurred from motion.
27. Composite images slides 27 through 31 show a waterfall image with different exposures, put together with an image editor. 32 through 35 show a different image.
36. I mentioned white balance earlier. A good point here is that it is important to use it for JPG/JPEG images. It is not necessary for RAW captured images. When you process a RAW image file you can set the white balance. More on this later.
37. Examples of the use of neutral density filters will follow. A neutral density filter has no color. It will not change the color of the image, only reduce the light reaching the camera. You can obtain “graduated density” filters and holders to mount on your lens so you can move the graduated area up or down, left or right or even diagonally.
38. This is what a graduated neutral density filter would look like if placed in front of a light.
39. For an example of what it can do, here is a shot of the grand canyon with a rather light sky.
40. Now with the neutral density filter applied you can see that darker sky. You might be interested to know that I don’t have a neutral density filter. I cheated by means of Photoshop
41. It is more work if the camera doesn’t have all of the manual controls, but it is still possible. You can compensate with Exposure compensation, Filters, and/or composite images.
42. Some advice. We have a lot of waterfalls in this area and we all want to take pictures of them from time to time. Waterfalls are best taken in shade or on overcast days. Av mode with a small aperture, (or Tv mode with a slow shutter speed), Programmed or Auto mode with a polarizer or a neutral density filter. A tripod is not optional but mandatory. Multiple exposures for a composite are possible.
43. It is all a matter of your vision and time. Practice and Experiment. Above all, Read the Manual.

Don’t expect every word to sink in and make sense. Just look at the various features of the camera and see what you can do. Later you will recall reading about some feature that now might be helpful for you to get a better image. Then you can find that subject in the manual and refresh your memory.