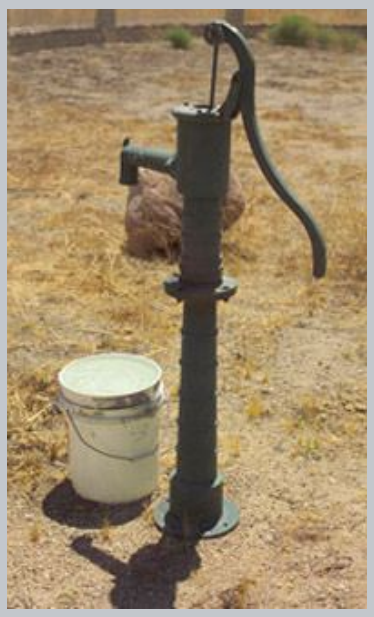
# Photography Exposure Basics: Shutter Speed, Aperture, ISO

by John H. Siskin

Photography is a language; it has syntax and structure like English. As with a language, there are many ways to understand how to use the language. Most people learn something about this structure when they get their first real camera, and immediately forget this information. This tends to be an eyes-glazed-over experience - too bad. Unfortunately, most people never come back to this information when it would make more sense. It is much easier to understand something when you have an application for it.



*Filling a Bucket*

## Sensitivity

A simple way to understand this is an analogy to a faucet and a bucket. The object is to fill the bucket. If you have a small bucket, it will fill quicker. This is similar to ISO, which tells the camera how much light (information) you need to make a picture. Lower ISO numbers require more light to get a good exposure, while higher ISO numbers require less light to get the right exposure. (ISO is part of the exposure "pyramid" that includes shutter speed and aperture, both discussed below.) But before routinely shooting with a high ISO, keep in mind that you will get noise as a consequence of too little information - film would be grainy.

## Shutter Speed

The next thing that would change how much water got into the bucket is how long the faucet was open. If the faucet is open for a small fraction of a second, it will provide less water than if the faucet was open for half a minute. This is the idea behind the shutter. A long shutter speed, say 1/4 of a second lets in more light than a short shutter speed, say 1/500 of a second. The shutter speed changes the way we see time in a photograph - a long shutter speed blurs time and a short shutter speed stops action. In the photo called El Matador Beach is a long exposure - you cannot see the waves! In the photo called Tar Creek Falls the water is almost frozen, despite the fall. One concern is that many pictures are less than optimally sharp because the photographer did not hold the camera completely still. This is why tripods are so useful.

*Tar Creek Falls*

*El Matador Beach*

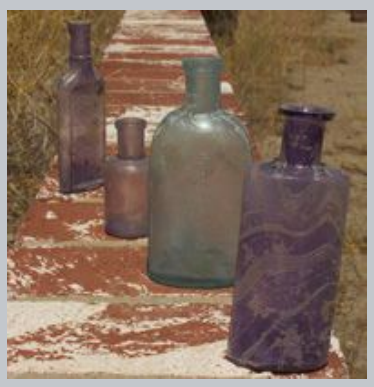
**Aperture and f/stop**

The other control is aperture. This is analogous to how much you open the faucet. If water just drips out you will need some combination of a longer shutter speed or a very small bucket (ISO). The aperture (f-stop) changes your depth-of-field. Depth of field is how much area, measuring directly away from your camera, is in focus. If you are tightly focused on the subject's eyes you have short depth-of–field. If you need a large group all in focus, you need long (or large) depth of field. Wide-angle lenses have more depth of field at the same aperture than do telephoto lenses.

*f2.4 tight depth of field*

**The Stop**

All these light controls are measured in the same unit - the stop. It is extraordinarily unfortunate that this unit is called a stop ... very confusing. A stop is double or 1/2 the light you had before. So if you have a 100 ISO stetting on your camera and you change to a 200 ISO, you need 1/2 the light you had before. You need 1 stop less light. If you have a shutter speed of 1/125 and you change to a shutter speed of 1/250 you would have 1 stop less light. A stop of ISO is the same as a stop of shutter speed or aperture (f-stop). With aperture, or f/stop, unfortunately we are dealing with the math of a circle ... confusing numbers. Rather than doing the math, I will try to make this understandable. First, I should say that there are shutter speeds between 1/125 and 1/250 and there are ISO values between 100 and 200. In the same way the apertures have intermediate values, it is easier to understand the ISO and shutter speed. Second, I should say that a larger aperture number lets in less light than a smaller number - for instance, f4 is much brighter than f16. The largest aperture we most frequently see these days (on DSLRs any way) is f2.8. The full-stop apertures, in order of reduced light transmission, are: f4, f5.6, f8, f11, f16 and f22. Each one of these is one stop less light than the one before.



*F22 long depth of field*

Camera Metering System

The meter gives us information on the overall quantity of light. The program function will make all the choices for us; aperture priority chooses the shutter speed based on the aperture we choose, so if depth of field is critical we use this function. If the way action is portrayed is critical then we will want shutter priority. We would choose an ISO based on the light level of the scene and noise level of the camera.