Photography basics

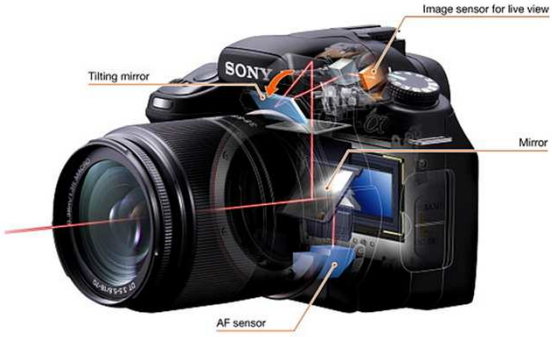
Younes Boudiaf
Sirius Astronomy Association

Digital Camera

A **digital camera** is a camera that takes video or still photographs by recording images on an electronic image **sensor**, instead of a film Wiki

DSLR Camera

Digital single-lens reflex (DSLR) camera is a Digital camera that typically uses a mirror and prism system (hence "reflex", from the mirror's reflection) that permits the photographer to view through the lens and hence see exactly what will be captured on a **Digital sensor.** WIKI

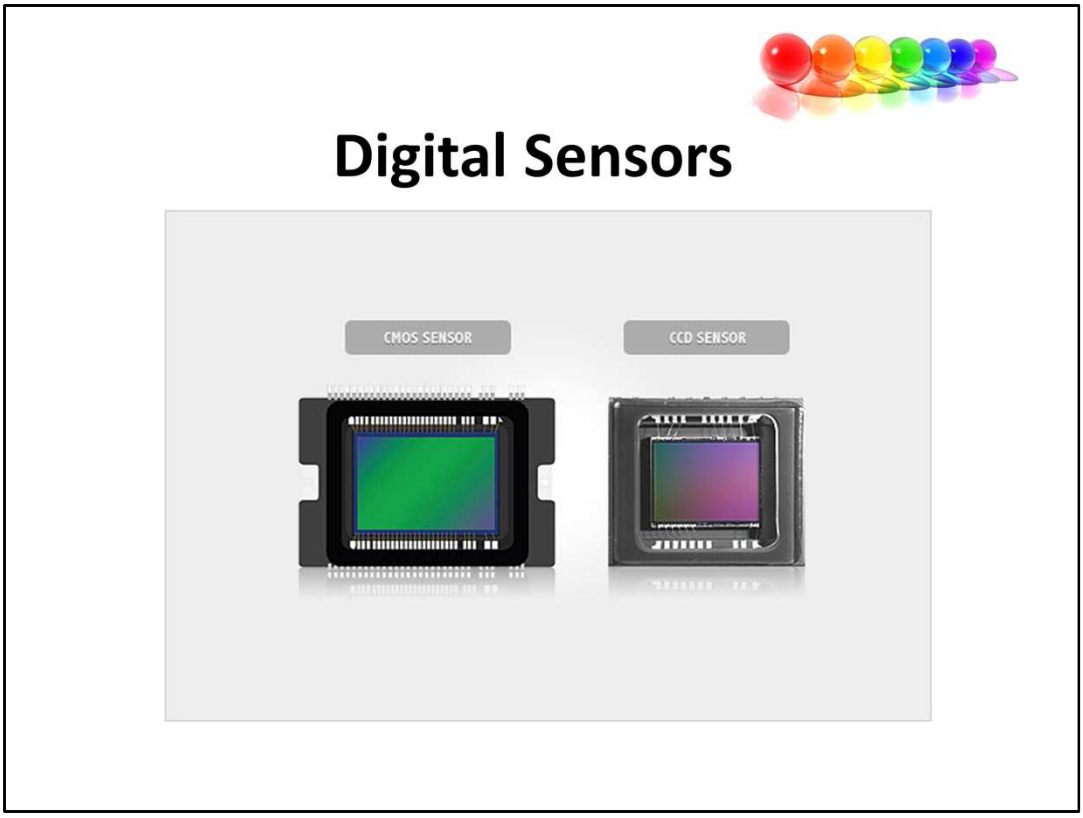


Compact Camera

A **compact camera**, also called a **point-and-shoot camera**, is a still camera designed primarily for simple operation. Most use **autofocus** for focusing, automatic systems for setting the exposure options, and have flash units built in. WIKI

MILC Cameras

The **Mirrorless interchangeable-lens camera** (**MILC**) is a popular class of digital system cameras. Unlike a compact digital camera, a MILC is equipped with an interchangeable lens mount and unlike a digital single-lens reflex camera, a MILC does not have a mirror-based optical viewfinder. WIKI



An **image sensor** is a device that converts an optical image into an electronic signal. It is used mostly in digital cameras, camera modules and other imaging devices. Early analog sensors were video camera tubes, most currently used are digital **charge-coupled device** (CCD) or **complementary metal–oxide–semiconductor** (CMOS) **active pixel sensors**.

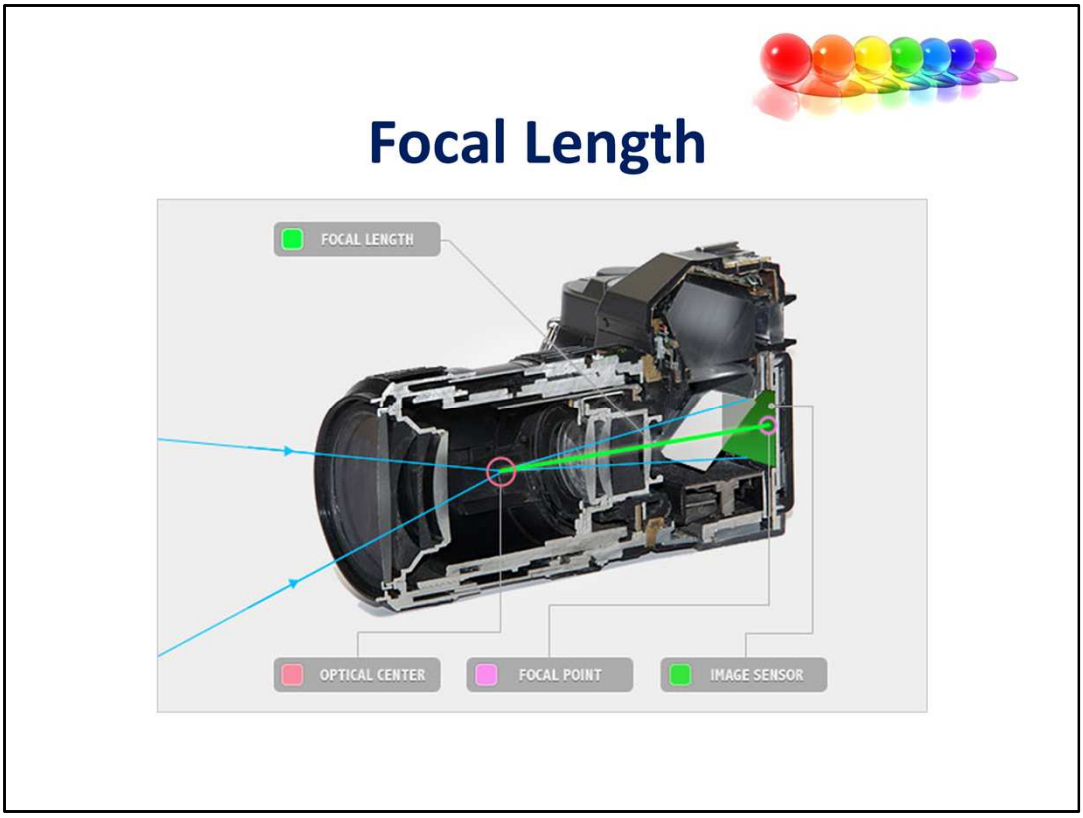
Digital Sensors

An **image sensor** is a device that converts an optical image into an electronic signal. It is used mostly in digital cameras, camera modules and other imaging devices. Early analog sensors were video camera tubes, most currently used are digital **charge-coupled device** (CCD) or **complementary metal–oxide–semiconductor** (CMOS) **active pixel sensors**.

Common Sensor Sizes

Sensor Type	1/2.5"	1/1.8"	2/3"	4/3"	APS-C	35mm
Aspect Ratio	4:3	4:3	4:3	4:3	2:3	2:3
Diagonal (mm)	7.2	8.9	11	22.5	27.3	43.3
Width (mm)	5.8	7.2	8.8	18	22.7	36
Height (mm)	4.3	5.3	6.6	13.5	15.1	24

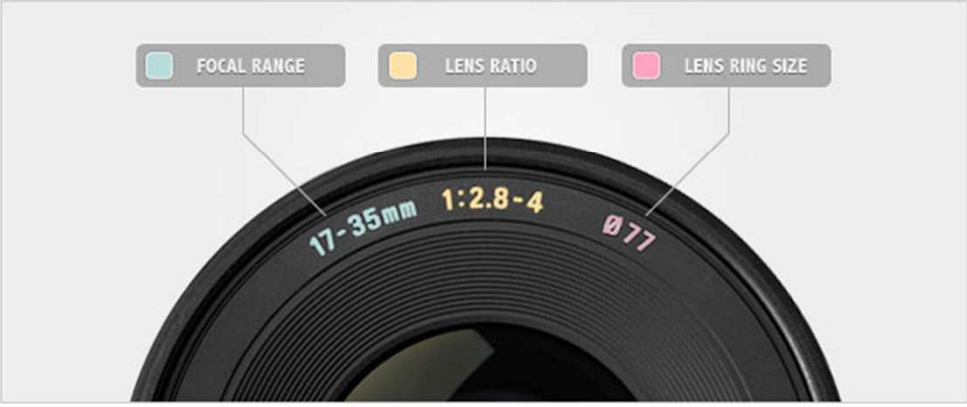
Lenses Basics and Types

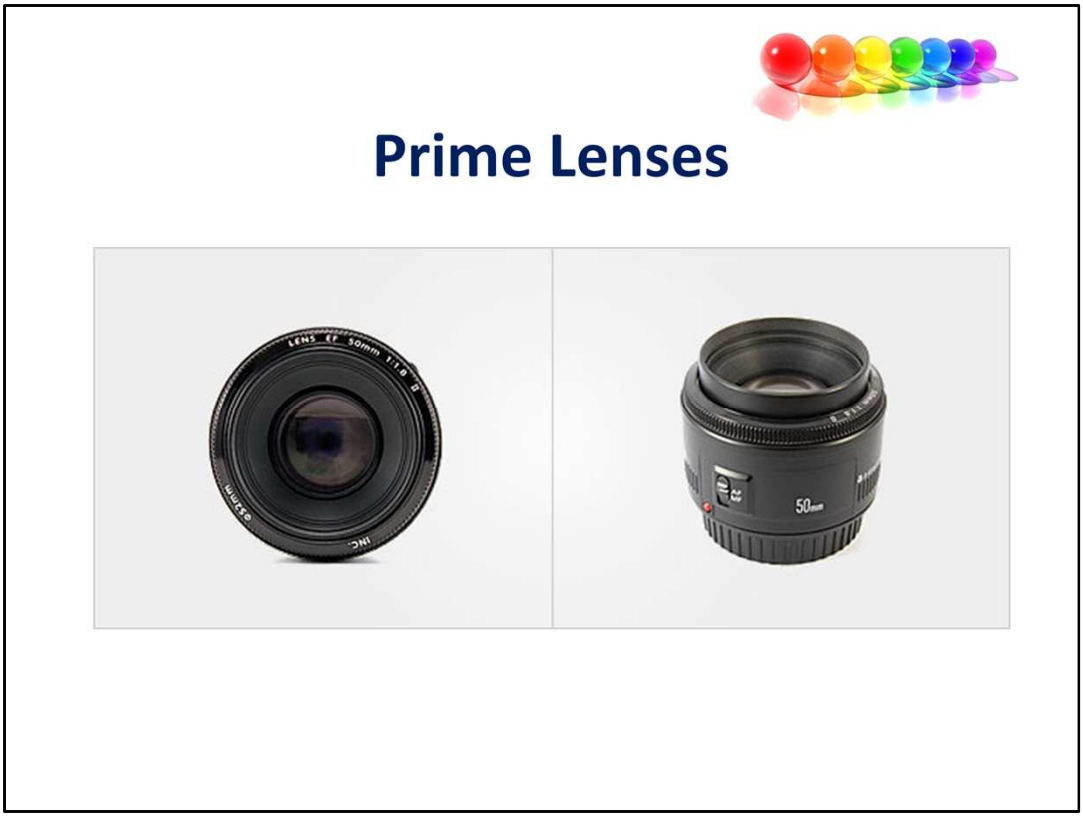


The Focal Length

A primary characteristic of a lens is the focal length. A lens' focal length is defined as the distance between the lens' optical center and the camera's image sensor (or film plane) when focused at infinity. To understand this definition of focal length, we need to define "optical center" as well. A lens' optical center is the point (usually though not always) within a lens, at which the rays of light from two different sources entering the lens are assumed to cross. Shorter focal length lenses provide a wider field of view, but offer less magnification. Conversely, longer focal lengths offer a shorter field of view, but provide greater magnification. On DSLRs, the interchangeable lens' focal length is measured in millimeters. The focal length of a lens is usually displayed on the lens barrel, along with the size of the adaptor ring.

Lens Ratio





The standard lens (Prime Lenses) has a fixed focal length (50mm, 85mm, 100mm), and reproduces fairly accurately what the human eye sees – in terms of perspective and angle of view. For a 35mm film camera or a full-frame DSLR, the 50mm lens is considered standard. At higher focal lengths (85mm or 100mm) you have an ideal lens for portraiture, because when coupled with a wide aperture they thoroughly soften any background detail, thus making it less likely to distract from the main subject.

Wide Angle Lens

A wide-angle has a shorter focal length (10 thru 42mm) when compared to a standard lens. This enables you to capture a comparatively wider angle of view. A wide-angle lens is a natural choice for capturing outdoor landscapes and group portraits. In fact, wide angle can be the only way to capture the complete setting without omitting any important elements in the image. In this manner, you can use wide-angle lenses to capture a deep DOF.

Fish-Eye Lens

A fisheye lens is a specialized, wide-angle lens that provides extremely wide images by changing straight lines into curves. It can sometimes produce circular, convex, or oval images by distorting the perspective and creating a 180° image. The range of focal length varies between 7~16mm in a fish-eye lens.

Zoom Lens

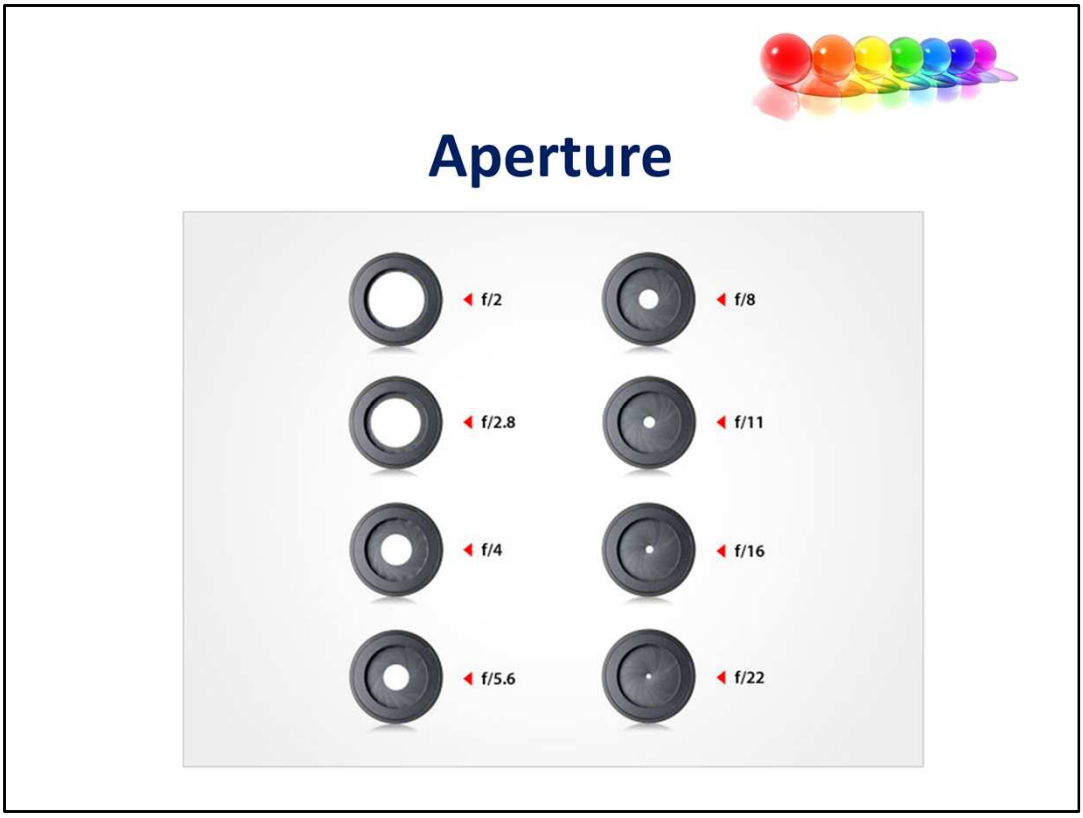
Zoom lenses have variable focal lengths, and are extremely useful. Some can range between a wide-angle and a telephoto (i.e. 24 to 300mm) so you have extensive versatility for composition. The trade off with zoom lenses is the aperture. Because of the number of elements required in constructing these lenses, they have a limited ability to open up and allow in light. So unless you're prepared to outlay a lot of money, you will give up lens speed.

Telephoto Lens

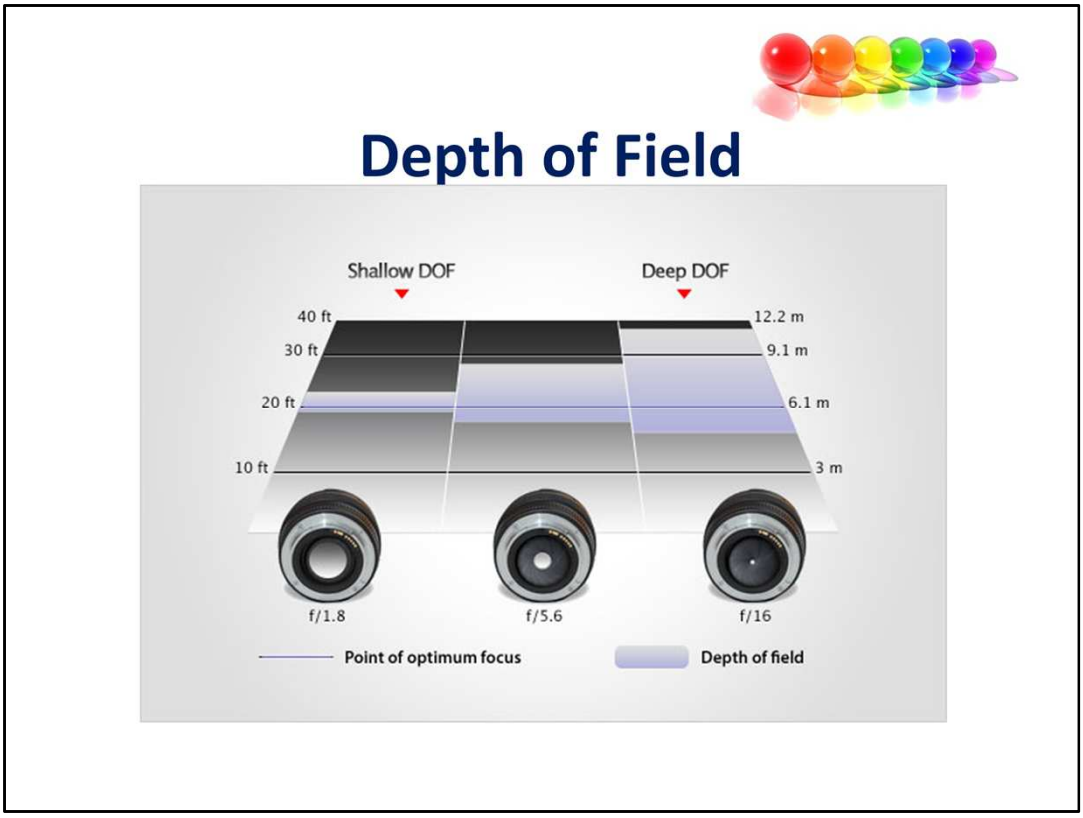
Telephoto lenses (100mm - 800mm) can provide you with a narrow field of view. These long lenses enable you to compress a distance (and compress the sense of depth, as well) and pick out specific objects from far off. They have a strong resolving power and an inherent shallow DOF, where the slightest lateral moment can take a subject out of view. Telephoto lenses are great for wildlife, portrait, sports, and documentary types of photography. They enable you to capture subjects from hundreds of feet away.

Macro Lens

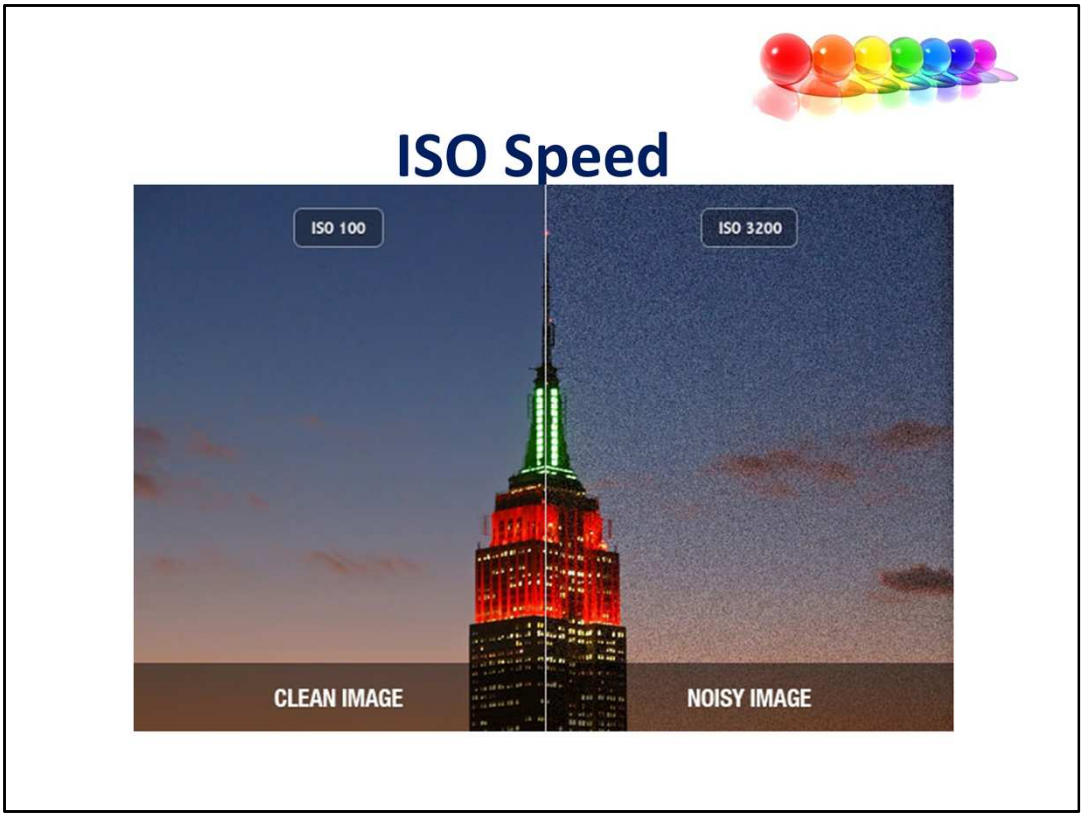
Macro lenses are used for close-up or “macro” photography. They range in focal lengths of between 50-200mm. These lenses obtain razor-sharp focus for subjects within the macro focus distance, but lose their ability for sharp focus at other distances. These lenses enable the photographer to obtain life-size or larger images of subjects like wasps, butterflies, and flowers.



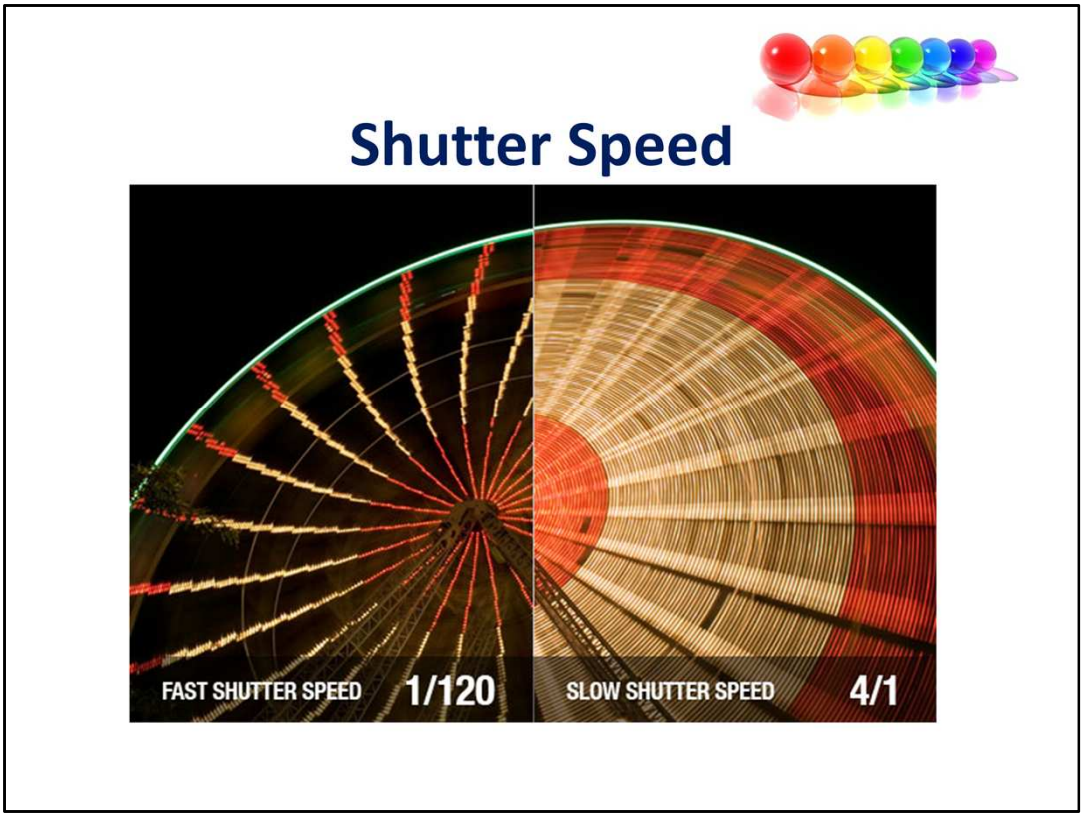
A lens's aperture is the opening in the diaphragm that determines the amount of focused light passing through the lens. At a small f-stop, say f/2, a tremendous amount of light passes through, even at a fraction of a second; but at f/22, when the diaphragm is perhaps at its smallest, only a tiny amount of light is let in (even at longer shutter speeds). An interesting thing about the aperture and the f-numbers is that it doesn't matter the focal length of the lens as long as the f-number is held constant. This is because the arithmetical equation that determines the f-number indicates that the same amount of light passes through the lens on a 35mm lens as on a 100mm lens, with a shutter speed of 1/125s. The size of the diaphragm is unquestionably different, but the amount of light passing through is the same.



Depth of Field (DOF) is the front-to-back zone of a photograph in which the image is razor sharp. As soon as an object (person, thing) falls out of this range, it begins to lose focus at an accelerating degree the farther out of the zone it falls; e.g. closer to the lens or deeper into the background. With any DOF zone, there is a Point of Optimum focus in which the object is most sharp. There are two ways to describe the qualities of depth of field - shallow DOF or deep DOF. Shallow is when the included focus range is very narrow, a few inches to several feet. Deep is when the included range is a couple of yards to infinity. In both cases DOF is measured in front of the focus point and behind the focus point. DOF is determined by three factors – aperture size, distance from the lens, and the focal length of the lens. Let's look at how each one works.

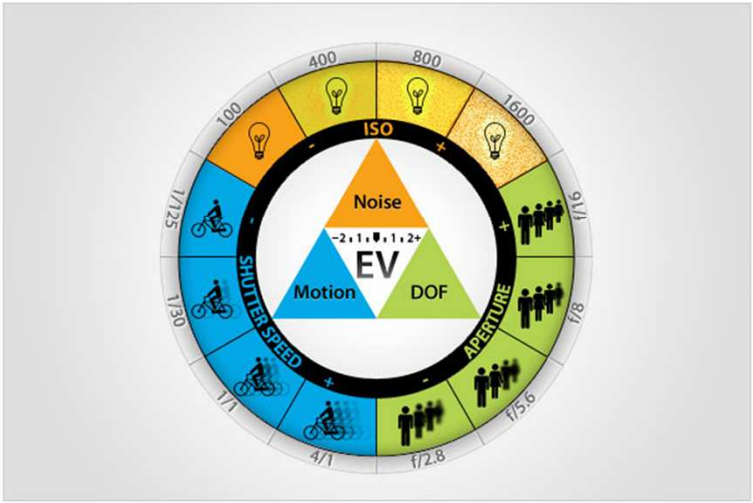


ISO is actually an acronym, which stands for International Standards Organization. The ISO rating, which ranges in value from 25 to 3200 (or beyond), indicates the specific light sensitivity. The lower the ISO rating, the less sensitive the image sensor is and therefore the smoother the image, because there is less digital noise in the image. The higher the ISO rating (more sensitive) the stronger the image sensor has to work to establish an effective image, which thereby produces more digital noise (those multi-colored speckles in the shadows and in the midtones). So what is digital noise? It is any light signal that does not originate from the subject, and therefore creates random color in an image. The digital camera engineers have designed the image sensor to perform best at the lowest ISO (just like with film). On most digital cameras this is ISO 100, although some high end DSLRs have a mode that brings the ISO down to 50 or even 25.



Shutter speed is measured in fractions of a second, and indicates how fast the curtains at the film plane open and close. The shutter speed controls how long light enters the lens and hits the image sensor or film plane. The shutter speed enables you to capture the world in split seconds, but it can also absorb the world at speeds upwards of three and four seconds (or remain continually open up until the photographer wants to close the curtain). Snapping the shutter in a fraction of a second, also gives you control on how motion is recorded. If the shutter speed is faster than the object or background, then the image will be tack sharp. If the shutter speed is slower, then you'll get blurred objects. Think about the rain in a rainstorm, how fast is that water falling? Well, at 1/30th the raindrops are streaks of undistinguishable white. But at 1/250th, the raindrops hover in mid air and you can see the full swell of each water drop.

Exposure


ISO
100
400
800
1600
Noise
EV
Motion
DOF
SHUTTER SPEED
1/125
1/30
1/1
4/1
APERTURE
f/16
f/8
f/5.6
f/2.8

THANK YOU