

Shutter & Aperture

Shutter speeds are expressed as seconds or fractions of a second so a typical scale on a mechanical camera will look like this:

Slower

4 2 1 1/2 1/4 1/8 1/15 1/30 1/60 1/125 1/250 1/500 1/1000 1/2000

Faster

When the amount of light let in doubles or halves the difference between the two values is 1 EV (often called a **stop**). Digital cameras have the ability to set any desired shutter speed but the same principle applies.

When the subject of your photograph is moving a slower shutter speed will allow it to blur as the movement continues during the exposure. Faster shutter speeds may freeze the motion; depending on how fast it is going.



1/250th of a Second



1/15th of a second

You should also consider that we humans tend not to hold cameras very steady. The subject may be rock solid but if the camera moves during the exposure the picture will still be blurred. This effect is called **camera shake** and is even more pronounced with telephoto lenses. Generally the average person can hold a camera steady at around 1/60 or 1/30 sec or 1/15 or 1/8 with a VR (vibration reduction) lens but these speeds reduce dramatically if you zoom in or use a telephoto lens.

When we set our camera to P (Program) or Auto the camera will select the best (it thinks) aperture and shutter speed.

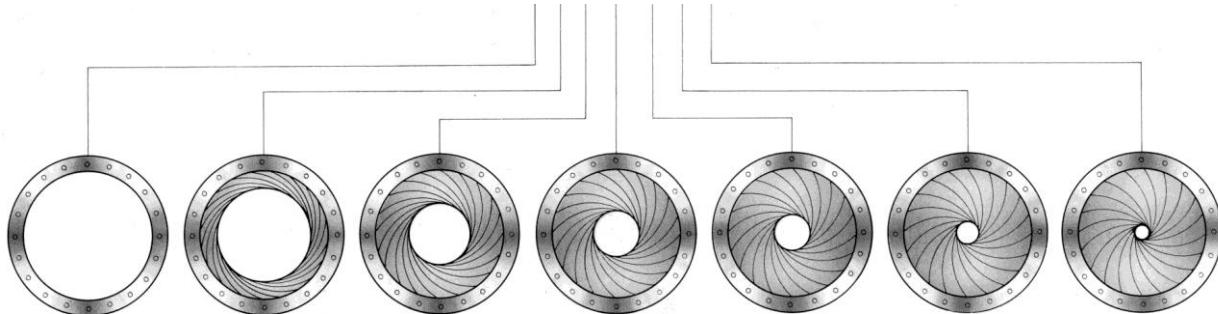
We can set the shutter speed we want by selecting **TV** (Time Variable) or **S** (Shutter Priority) on older cameras. **The camera then meters the light and controls the aperture to maintain the correct exposure for our selected shutter speed.**

Aperture.

This is the second control used to determine the exposure. The wider the aperture the more light enters the lens and the shorter the shutter speed becomes to compensate.

The aperture scale is expressed in *f* stops

f1 f1.4 f2 f2.8 f3.5 f4 f5.6 f8 f11 f16 f22 f32 f45 f64



Aperture values are calculated using a mathematical formula, hence the odd numbers but the difference between each value is one stop or EV

The smaller the number the bigger the aperture = more light

Therefore if we measured our exposure and the brightness of the light required 1/125 @ f8 we could also set 1/250 @ f5.6 or 1/60 @ f11. Each has the same EV

We can set the aperture we want by selecting AV (Aperture Variable) or A (Aperture Priority) on older cameras. **The camera then meters the light and controls the shutter speed to maintain the correct exposure at our selected aperture.**

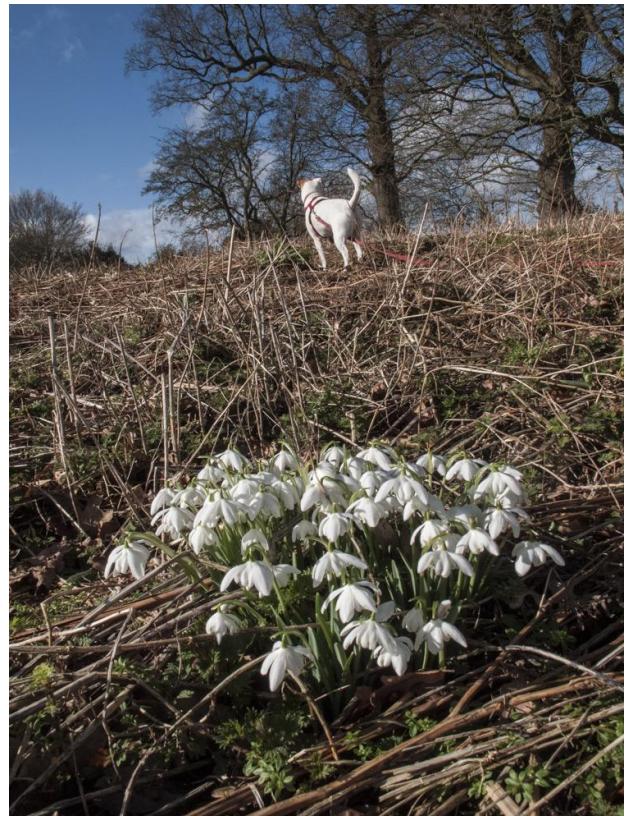
Modern digital cameras can set a wide range of shutter speeds, often anything from 1/2000th of a second to 30mins but have a very **restricted range of apertures**. Often the maximum aperture of a lens designed for amateur use is only f5.6 which means that if we set a high shutter speed the camera may not be able to 'open up' the aperture enough and the photograph is underexposed (too dark). At the other end of the scale if we choose too long a shutter speed the aperture may not be able to close down enough and the picture is overexposed (too light).

Depth of Field (Focus).

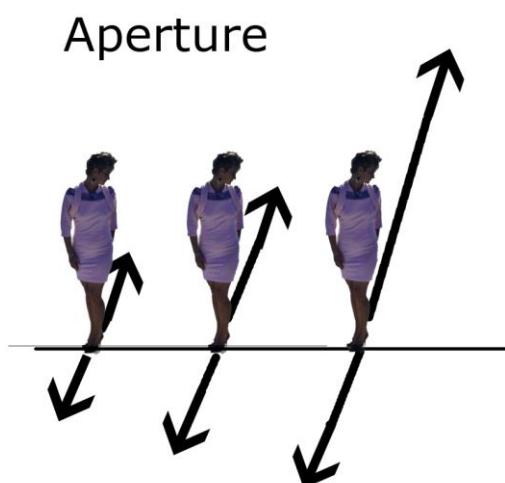
The aperture has an effect on the depth of field in our photograph. This refers to how much of the image in front of and behind the point at which we focus is in focus. Larger apertures (smaller numbers) give less depth of field than small apertures (big numbers)



Left: At a wide aperture the flower is in focus and the background is out of focus.



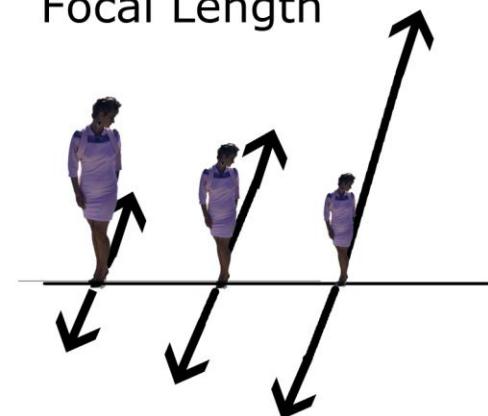
Right: When a small aperture is used more the foreground and background are appear sharp



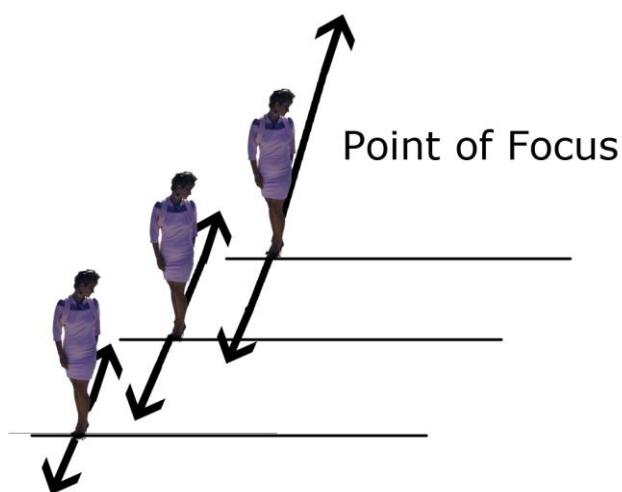
As the aperture is stopped down (made smaller – bigger number) the depth of field (focus) increases.

To make life even more complicated the closer you are to your subject the less the depth of field for a given aperture. The longer a the focal length of the lens you use the less the depth of field for the set aperture. Example f8 on a wide angle lens may mean that the foreground to the distant mountains appear in focus whilst with a long telephoto the depth of field is a few feet.

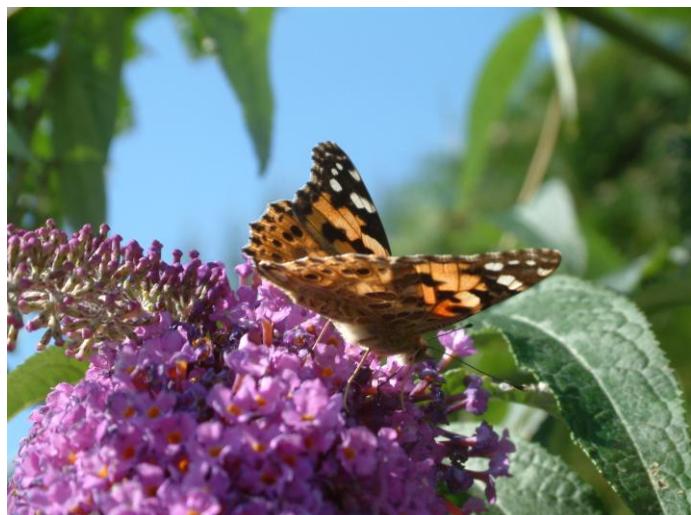
Focal Length



As the focal length increases (you zoom in) the depth of field decreases.



The closer you get to a subject, or the closer you focus, the less the depth of field



Working close to a subject or with a long lens you will need a small aperture to get the required depth of field. If your subject is moving the low shutter speed required may cause blur.