

Reflex: Shutter School

Aperture and Depth of Field

What is Aperture?

When you press the shutter on your camera to take a photograph, light passes down your lens, past several blades which form a hole, and onto your camera's sensor.

This hole is known as the aperture, and looks something like this:

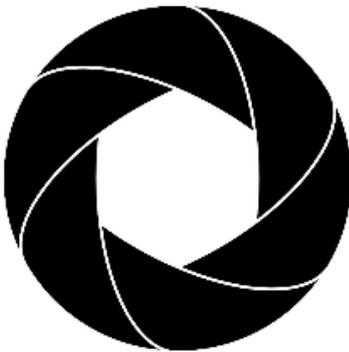


Diagram of the blades forming the aperture

In many senses, it is much like the iris of your eye. In dark situations, the iris opens fully, and in bright light, it closes to a much smaller size.

How does this affect my image?

The size of the hole can be adjusted; by the camera if you are in an automatic mode, or by yourself, if you are using a semi-manual, or fully manual mode.

A small hole will obviously let in very little light, and a wide hole will let in a lot of light.

Roughly speaking, a small hole will keep more of your image in focus. A large hole will have a smaller area of your photograph sharply in focus. This is known as **Depth of Field**.

How is the aperture size measured?

By aperture size is indicated by an 'f number', such as f11. Confusingly, a small number, such as f5.6 indicates a large hole, while a large number, such as f22, is showing a very small hole.

It helped me to picture the number as a measure of the thickness of the blades, from the edge of the lens, although this is not technically accurate.

The f number is typically shown on the lens, to indicate the minimum hole size your selected lens is capable of. This is a key consideration for many photographers when purchasing a lens.



The f number is also shown on the barrel of this Canon lens, after the 1: (thus f 1.8)

Tell me more about Depth of Field

Your camera can precisely focus at only one distance at a time; thus, there is actually a very small area which is *truly* in focus. Whilst the rest of the image may not *technically* be in focus, non-sharpness is imperceptible under normal viewing conditions. This is generally known as acceptably sharp.

The distance from the nearest to the furthest which is sharp, is known as your Depth of Field.

Controlling this gives you certain artistic control over your images. A shallow depth of field is common in portrait images, as it allows the viewer to focus on the main subject within the image. A large depth of field is beneficial in landscapes, where the viewer would normally want to see all of the image in focus.

Look at the following two images, taken via CameraSim.com (a great tool for practicing, by the way). Which image do you find sucks you in?



This portrait has a shallow depth of field. Notice the blurred background. ISO 100 · f2.8 · 43mm · 1/400 sec



This portrait has a large depth of field. Notice the sharp background. ISO 800 · f22 · 43mm · 1/1000 sec

Is there a trade-off?

You bet! Photography is always a compromise.

First, a large aperture. Because the large hole lets in more light, it's easier to over-exposure your image. For example, imagine a bright summer's day, you're outside taking a portrait. In these circumstances you could quite easily get too much light.



The large aperture has let in too much light, leading to an overexposed image. ISO 800 · f2.8 · 43mm · 1/4000 sec

And with a small aperture, you're letting in a lot less light. This can cause the shutter speed to lengthen, which may in turn produce camera shake.



Now we have a small aperture, which has reduced the light, but caused a knock-on effect with the shutter speed. ISO 200 · f22 · 43mm · 1/10 sec

In both cases, adjusting the ISO may help.

If you are shooting in bright daylight, perhaps moving the subject into a shaded area, or waiting for the sun to move behind a cloud, may help. In extreme cases, buying an ND filter may be beneficial – this screws onto the front of your lens and reduces the amount of light coming into your camera.

If you want a large depth of field, and are struggling with camera shake, using a tripod will probably almost certainly help. Most landscape photographers won't go anywhere without one!

Not every lens will be capable of opening the aperture as wide, or as small, as other lenses. Typically the lens which comes with a Canon camera, will open to a maximum of f3.5 – and even this is only at certain levels of zoom.

How do I adjust the aperture?

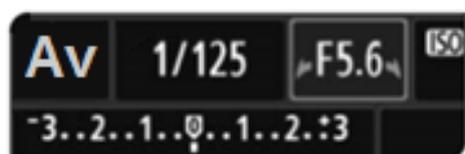
Many photographers will keep their camera in Aperture Priority mode (marked as AV on Canon cameras, and A on Nikon), as this gives quick control over the depth of field, whilst the camera automatically sets the shutter speed.

On a Canon camera, you can select AV on the mode dial. Then you can turn the Main dial left or right, to change the aperture.



The mode dial on a Canon camera

Your selected aperture will be displayed on the LCD display, and in your viewfinder.



The LCD display on a Canon camera shows your selected aperture size (f5.6). The bottom image replicates what you see in your viewfinder; this has an aperture of f16.

Anything else?

Depth of field can also be affected by your **focal length** (ie zoom of your lens). If you are zoomed into your subject, you will magnify a shallow depth of field.

Also, if you want a shallow depth of field, move the subject further away from the background.



Here the subject of the image is stood 10 feet away from the photographer. Notice how the background appears perfectly sharp.

Other considerations

Apertures are at their sharpest somewhere in the middle of their range (ie not the very widest, and not the very smallest). Typically, this will be f8-f16.



To illustrate the effects of zoom, we've moved the subject back to 10 feet away, but we have a focal length of 55mm. Notice the slight blur in the background.



This time the subject is much closer to the camera (3 ft.), and this has created a nice blurred background. The settings are exactly same as above, f2.8, 1/500 sec, ISO 100.



Finally, we have the shallowest depth of field we can achieve. Subject is close to the camera, focal length is 55mm, and the aperture is 2.8

How can I practice?

It's quite easy to practice setting the aperture on your camera. If the weather is nice, why not take your



partner, child, or even pet outdoors. If you'd rather not trouble a member of the family to act as a model, you could still pop outside and practice with flowers.

Put your camera into Aperture Priority mode (remember, this is marked AV on Canon, and simply A on Nikon's). Set your aperture to its widest setting (in many cases this will be f5.4). Focus on your subject, and press the shutter button. Try varying the focal length (zoom) and aperture. If the image is too bright, or too dark, try adjusting the ISO to compensate.

If the weather hasn't been kind, this is an ideal subject to practice indoors. Set up a number of objects an equal length behind each other, on a diagonal line rather than directly behind each other. Again, set the aperture to be as wide as possible, and focus on the closest object. Remember to experiment by changing the focal length and aperture value.

Want to learn more?

Other areas you may wish to explore include:

Hyper Focal Length This allows you to focus approximately $\frac{1}{3}$ into your image to achieve the maximum depth of field.

Focus Stacking Is a post-production tool. You can take several images with various different points of focus. Software such as Adobe Photoshop will merge these images to give you a larger depth of field than would normally be possible.

Bokeh This is the name of an effect, which typically blurs light sources in the background of your image. Creating bokeh in your image involves the same steps as achieving a shallow depth of field.



This image has a bokeh effect on the lights in the background

Useful Tools

The Reflex website has links to the Camera Simulator, which has been used to provide the screenshots here, and a Depth of Field Simulator

