

What Aperture Affects

Last month we read about Aperture, the first pillar of photography - an opening whose size can be altered, which in turn varies the amount of light that reaches the camera sensor. Aperture has many effects on images with the two significant being the brightness or *exposure* of the image and the level of sharpness or *depth of field* (DoF) of the image. You know these already, but have you wondered how else aperture affects our photos?

Let us look at five aspects that aperture affects. Each of them matters and can be mitigated, but it is important for a photographer to understand these to apply them on the field.

1. Aperture affects shutter speed

Shutter speed is the amount of time that the light needs to be allowed into the camera for optimal exposure. In a wide aperture opening, more light enters the camera, hence allows a faster shutter speed. When the aperture is narrowed down (bigger F-number) the amount of light entering the camera reduces, hence affects the shutter speed, making it 'slower' or 'longer' to yield an image with the same brightness. This is a fact that one needs to work around while setting the parameters on the camera.

2. Aperture affects sharpness

The amount of aperture opening could reduce the sharpness of the image if it causes either diffraction or lens aberration.

Diffraction: When shooting landscapes, one wants everything as sharp as possible and hence small apertures like $f/16$, $f/22$ or $f/32$ are used. But at times when we look at the image closely, we see a problem with the loss of details. This is the effect of 'diffraction'. When we use tiny apertures such as $f/22$, we literally squeeze the light that passes through the lens and thus the image grows progressively less sharp and the finest detail in the image begins to blur.

Diffraction is not a huge issue, but it exists. It depends on many factors including the camera sensor size. Yet, it does not mean we cannot take photos at $f/11$ or $f/16$, but for anything beyond, this is the trade-off one must be aware of.

Lens Aberration: Everyone wants to take sharp photos. But there can be issues with image quality due to 'lens aberration'



Green Lynx Spider © Goutham Ramesh

caused by the lens, the equipment. Aberration in optical systems is the deviation of light rays through lenses, causing images of subjects to be blurred. Light spreads out, over some region of space rather than staying focused at a point.

When wider aperture is used, the weakness of the lens's optical design can surface, making the image lose sharpness. This visible problem of lens aberration can appear in different forms, whereby the image can be blurrier at certain apertures or in the corner of the image.

However, at a small aperture we not only get higher DoF and more sharpness, but it also typically can hide lens aberrations in the image, which is good news for us.

3. Aperture affects focus

While on field, this happens to us often. We focus on a subject at a wide (maximum) aperture but then actually shoot with the narrow aperture (lens stopped down). We do this as per the need of the scene in front. But this can lead to blurry images and focus errors, more so when we work with subjects at closer distances and are using fast aperture lenses. This is due to 'focus shift'.

Focus Shift is an optical problem that occurs when we focus at a maximum aperture but capture at a narrow aperture when subjects are close or when lens is faster. This problem occurs due to spherical aberration.

Here are couple of recommendations to manage this problem.

- Stop down (narrow) the lens to the desired aperture value before focusing
- Use the 'Live view' on DSLR camera to focus with the desired aperture in order to reduce the negative effect of focus shift.

4. Aperture and Bokeh

As photographers, we love bokeh and the magic it brings to our photos. I remember having tried hard to create my first bokeh, but over time I figured the math behind it. 'Bokeh' refers to the quality of out-of-focus highlights of the image as rendered by the camera lens. How does aperture affect bokeh? Typically:

- Wide aperture results in circular background highlights of big size.
- Narrow aperture gives highlights looking smaller and taking different shapes, like a heptagon or such.

Shape of the bokeh depends on the number of aperture blades and their roundness. This is how aperture matters.

5. Aperture's role in Starburst

Every starburst photo brings a twinkle in our eyes. Such is the aura of starbursts, also called 'Sunstars', which are beautiful elements seen in photographs. Starburst is created by the aperture blade of our lens. With every blade, we end up with a sunbeam and this occurs only if we shoot a



Saadu at Varanasi © Goutham Ramesh

small bright point of light, such as the sun when it is partly blocked.

Commonly sought after in landscape photography, for a strong possible starburst, use a small aperture (f/16 or more), which helps to create this effect.

Also, starburst varies from lens to lens and is dependent on the aperture blades. There is an interesting math though - even number aperture blades give same number of sunbeams while odd number blades give double the amount!

In Summary

Aperture is clearly a powerful and crucial setting in photography and possibly the single most important setting of all. Knowing more about how it affects relevant aspects can enable you to put them to right use. The more photos you take, the more you demystify the effects of aperture.



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