

Exposure

Exposure is the total amount of light allowed to fall on the sensor or film, when we open a shutter on a camera.

There are two things that control the amount of light entering the camera, these are:

- Aperture (opening)
- Shutter Speed

Aperture is the size of the opening in the shutter, when you take a picture

Shutter speed refers to the amount of time, the shutter is open when the picture is taken.

Aperture – Speed Relationship

Imagine filling a glass of water from a tap, there are two things that control the amount of water in the glass, there are:

- How big the opening of the tap is
- How long you leave the tap on for

- Clearly the larger tap fills the glass quicker
- However, the smaller tap will fill the glass just as well but in a longer time



Measurement of Aperture

Measurement of Speed/Aperture is done in Stops

(Not a real measurement with units)

Aperture is measured in f-stops, so for example, you can set the lens to f2.8, f4.0, f5.6, f8.0, f11, f16, f22

For each increase in stop, we double the amount of light entering the shutter.

Luckily these have a nice easy relationship between them, so ignore the Maths in brackets if it scares you.

(Stops are fractions, eg f2.8 on a 50mm lens means the opening diameter will be $50/2.8 = 17.85\text{mm}$)

Note that the larger the number, the smaller the aperture

This is easy, $\frac{1}{4}$ of an apple is smaller than $\frac{1}{2}$ an apple

Effect of Aperture on Picture

At this point it is important to understand what effect changing aperture has on your photograph

- Smaller apertures have a larger depth of field (meaning a larger area will be in focus)

It should also be noted that the sharpest image you can produce will never be when using the lens at its largest aperture. My rule of thumb is 1.5 to 2 stops from the maximum, but this varies from lens to lens.

(More of this will be taught in another tutorial)

Effect of Aperture on Picture

For example, Taking a photo of my dog (Horatio) with the cliffs in the background, I should use a small aperture (say f11 to f18), if I want them both to be in focus.

Taking the picture at f2.8 and focusing on Horatio would have meant that cliffs would be out of focus.



Measurement of Speed

Measurement of time is obviously in seconds

So timing shutter speed is usually in fractions of a second

If we double the time a shutter stays open, will double the amount of light that entering the camera

i.e. If I can fill a glass of water in 2 secs, in 4 secs I can fill 2 glasses

This doubling of shutter speed is also called a stop, and corresponds exactly to the stops in aperture

Shutter speed in stops

4, 8, 15, 30, 60, 125, 250, 500

(meaning ¼ sec, 1/8 sec....1/500 sec)

ISO - Sensitivity

- There is another factor in the exposure conundrum, ISO
- This is the sensitivity of the film/CCD to light
- Luckily, this is also adjusted in stops
- Doubling the ISO, means its will take $\frac{1}{2}$ the time for the media to react
- Unfortunately there is a cost for increasing the ISO, higher ISOs mean more noise

Setting an Exposure I

Setting an Exposure involves setting

- The Aperture
- The Speed
- The ISO

For a given lighting, we normally fix the ISO

(For Now lets say ISO 100)

On most cameras, this usually entails fixing either the Aperture or Speed

Usually, they offer a “P” (meaning Plonker! Mode) which will set everything automatically, except the flash

Usually, photographers set Aperture (Av Mode) and in a smaller number of situations, will select Speed Priority (Tv or S Mode)

Setting an Exposure II

- The lighting situations may dictate what aperture to select, eg low light situations may mean that you need all the light you can get, so maximum aperture is use
- The subject may dictate the aperture, so a landscape requiring maximum depth of field may cause me to select f11
- The camera will then select a corresponding speed to give me what it thinks is the correct exposure
- I can take the image (but it may not be right!)

Exposure Compensation I

When the light meter in your camera evaluates an exposure, it makes certain assumptions about how much light is being reflected. In fact, it assumes that you are looking at a grey object that is reflecting 18% of the incident light.

Why? Well, after a group of researchers at Kodak did many experiments, they estimated that this was a pretty good approximation to most scenes.

In reality, a white body may reflect 36% of the light and a black body may reflect only 9% of the light.

So what? Why should this matter?

Well, ever taken a picture that came out under/over exposed and the light meter told you it was correct?

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So what? Why should this matter?

Well, from time to time you may take a picture that comes out too bright or too dark (i.e. it is under or over exposed) when the light meter told you it was correct...

Exposure Compensation II

One Clear example should explain:

I am trying to photograph a snow scene, and the exposure keeps coming out blue, I know the snow is white, so what is happening?

What is happening is that the snow is reflecting 36% of the light (for example) instead of the assumed 18%. So my camera thinks it is brighter than it actually is. Therefore my camera responds by shortening the exposure time, letting less light in (or decreasing the aperture...).

Result = Under Exposed
White Snow looks blue

Exposure Compensation III

Rule: In general, bright object will require you to over expose the value your camera suggests, while dark object will you to tell your camera to underexpose them.

How much to overexpose/underexpose will depend on the scene, but for example, a snow scene may require over exposing by 1 or 1.5 stops

Note that you are not actually over/under exposing the image, only telling the camera to do so, to compensate for its short comings.

Note also that this applies to all cameras, whether manual film cameras or digital medium format cameras

Its easy. If its bright/dark, set the +/- button to +/- 1/2... +1.0 etc. Then shoot!

Note: Some cameras change light in 1/3 increment stops

Note also that dark objects work the opposite direction (ie minus 1/2 stop).

Finally. How much to compensate takes a small bit of practice (see histogram)

Finally

- We will look at how to check this exposure using histograms, but for now, setting an exposure will mean:
- Set ISO (say 100)
- Set Aperture (Say f2.8 for fast action shot requiring fastest available shutter speeds)
- If its bright/dark, adjust the +/-
- That's it