

# Camera Exposure

Getting it Right!

# Exposure

Three photographs taken from the same spot with different exposure settings.



Under Exposed



Correctly Exposed



Over Exposed

# Three Elements in Exposure.

There are three elements that need to be understood to achieve correct exposure.

The three elements are:

1. the camera sensor's (or film) sensitivity to light.
2. the amount of time that the shutter is open.
3. the size of the opening in the lens when a picture is taken.

# Three Elements in Exposure.

## 1. The camera sensor's sensitivity to light.

How sensitive the image sensor is to the **amount of light** present.

The more sensitive the image sensor is makes it possible to take pictures in low-light situations.



# Three Elements in Exposure.

Most camera's allow you to change the sensitivity on the sensor. Usually it's changed in the camera's menu system.



Sensor sensitivity is measured in a unit called the ISO.

(International Organisation for Standardisation)

The higher the ISO number the more sensitive the sensor is to light.

# Three Elements in Exposure.

## 2. The camera's shutter speed.

The camera's shutter controls the **length of time** that the sensor is exposed to to the image.



# Three Elements in Exposure.

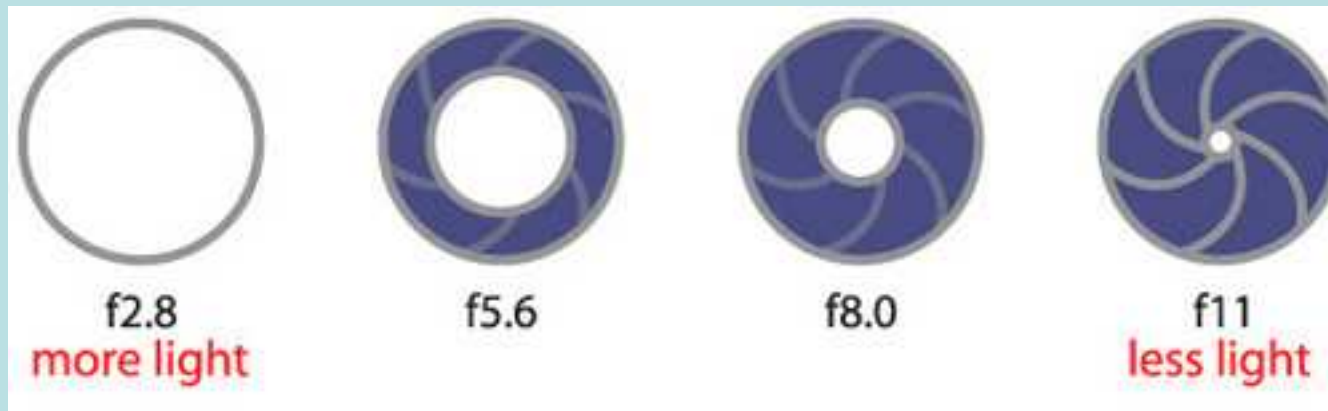
## 3. The camera's lens opening or aperture.

The aperture controls the **amount of light** that the sensor sees.



# Three Elements in Exposure.

Your camera lens has a mechanical variable aperture to control the amount of light landing on the sensor:



Just like the iris in your eye.

You will hear photographers muttering things like:

“I had to reduce the aperture by a couple of stops to get it right”.

# Three Elements in Exposure.

Shutter speed is the time that the shutter is opened to expose the sensor to the image. It's generally measured in fractions of a second.

For example, you are photographing a sports event. Generally you would need a very short shutter speed to freeze the action.



This picture was taken with a shutter speed of  $1/1000^{\text{th}}$  of a second

# Three Elements in Exposure.

A shutter is open to long then you may find that the action is blurred.



This was photographed with a shutter speed of about  $1/60^{\text{th}}$  of a second.

# Three Elements in Exposure.

There's no such thing as a free lunch. There's always a trade off.

You may think that you could set the camera sensitivity (**ISO**) to it's maximum and leave it there, set the aperture to wide open and leave it there. Control the exposure by adjusting the shutter speed.

That's not a good idea.

Setting the camera sensor sensitivity to maximum will result in noisy pictures.



Poor Carol, she doesn't really look like that.

# Three Elements in Exposure.

Setting the lens aperture wide open will make it difficult to focus due to the limited **depth of field** and may cause slightly out of focus pictures and other effects due to limitations in the lenses quality.

Depth of field is the amount of distance between the nearest and farthest objects that appear in acceptably sharp focus in a photograph. At large apertures there is less depth of field than at small.

In some cases you may want a small depth of field; for example photographing portraits where you use a large aperture to ensure the background is out of focus.



# Three Elements in Exposure.

Many point and shoot camera's don't allow direct control of shutter speed or aperture:

Portrait Mode: Large aperture, low to high ISO (sensor sensitivity) depending on light level, short to medium shutter time to freeze movement.

Landscape Mode: Small to medium aperture, low ISO, short shutter time.

Night Mode: Large aperture, high ISO, medium to long shutter time.

Sports Mode. Very short shutter time, medium to high ISO, medium to large aperture.

# Three Elements in Exposure.

The three elements to understand are:

1. The camera sensor's (or film) sensitivity to light defined by the unit ISO. You will hear this referred to as “camera speed”.
2. The amount of time that the shutter is open usually quoted in seconds or fractions of a second. This “exposure time” is usually referred to as “shutter speed”.
3. The size of the opening in the lens when a picture is taken. This is the lens aperture and is referred to in “f stops” or just “stops”.

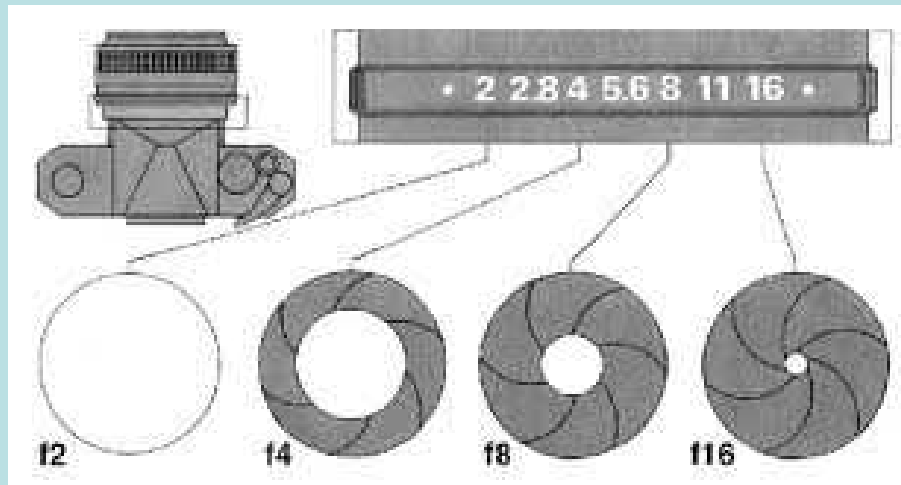
The three elements of exposure are interdependent, that is changing one may require changing another.

# Three Elements in Exposure.

What are these “f/ stops”?

f/ stop number: 1 1.4 2 2.8 4 5.6 8 11 16 22 32 45

These numbers are standard aperture opening “f/ stops”. Each f/ stop number change above will double or halve the amount of light reaching the sensor.



# Three Elements in Exposure.

What are these “f/ stops”?

f/ stop number: 

|   |     |   |     |   |     |   |    |    |    |    |    |
|---|-----|---|-----|---|-----|---|----|----|----|----|----|
| 1 | 1.4 | 2 | 2.8 | 4 | 5.6 | 8 | 11 | 16 | 22 | 32 | 45 |
|---|-----|---|-----|---|-----|---|----|----|----|----|----|

Now you may assume (justifiably so) that as the numbers increase it would allow more light to the camera sensor.

**Not So!**

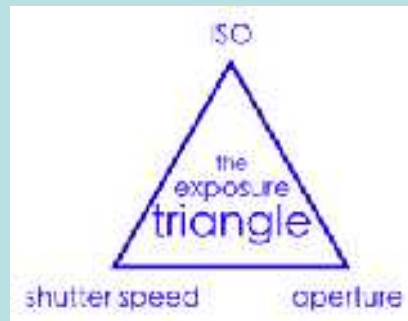
Just to admit a bit more confusion to the system it works in reverse.

If you change the f/ stop to a lower number (stop up) the light to the sensor increases.

If you change the f/ stop number to a higher number (stop down) the amount of light to the sensor decreases.

# Three Elements in Exposure.

The three elements are interdependent, that is changing one may require changing another.



For example, if, assuming the scene brightness stays constant, you shorten the shutter speed you will have either to increase the amount of light to the sensor by making the lens aperture larger or increase the sensitivity of the sensor. If you don't the picture will be underexposed.

Conversely, if you increase the size of the aperture to let more light on to the sensor you must shorten the shutter speed or reduce the sensitivity of the sensor. If you don't the picture will be overexposed.

# Three Elements in Exposure.

The three elements are interdependent, that is changing one may require changing another.

For simplicity lets keep the scene brightness and the camera sensitivity constant.

It's a nice sunny day and you have already photographed the sports team in a static pose. The camera shutter was set to  $1/100^{\text{th}}$  of a second and the f/ stop was f/16. You check the picture on the little screen the exposure was perfect.

**It's important to remember that each time you halve the shutter speed you must increase the aperture opening by one f/ stop and visa versa.**

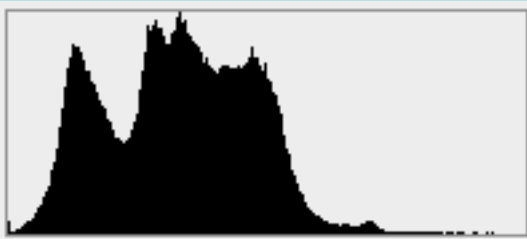
Now the team gets into action and you want some high speed action shots. You change the shutter speed to  $1/1600$  of a second. That's five f/ stops that you have to open the lens aperture to to allow for the shorter shutter time. So counting back that's f/: 11 - 8 – 5.6 - 4 - 2.8. So your f/ stop will be f/2.8.

# The Histogram.

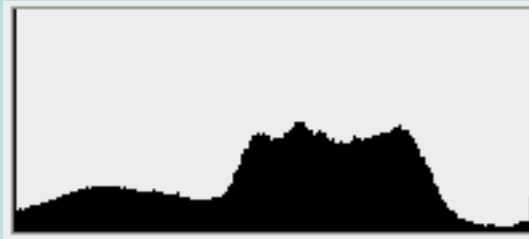
One feature that many digital camera's have to help you get correct exposure is the histogram.



# The Histogram.



Under Exposed



Correctly Exposed



Over Exposed