

UNDERSTANDING Exposure

Every exposure creates an image from an instant of recorded light. The image can be on a screen, on film, on a sensor or on a sheet of sensitive material, usually but not always paper. It could be glass... metal or a fabric.

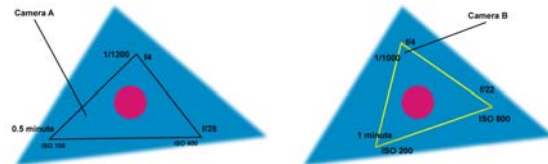
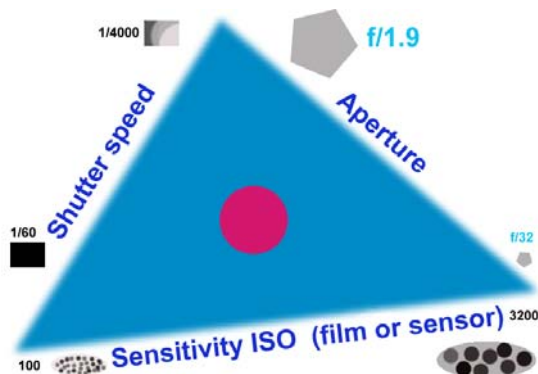
First think about sensitivity

So to capture an image you must expose your sensor to light. The amount of light received determines the strength of the image. But too much light creates overexposure and the image is white without discernable detail and too little light produces under exposure and the image is black, again without any useful detail.

For digital cameras and photographic film sensitivity is usually indicated by the ISO number say 100 – 800. The range can be much higher or lower, depending on the camera.

Aperture

The volume of light entering your camera depend on the diameter of the opening - the



Aperture - some where between f1.9 and f 64 again depending on the camera design and lens, but remember f1.9 is wide open, letting a large volume of light in, and f64 lets a miniscule amount of light through!!

Shutter speed

The shutter allows light to enter the camera. A high shutter speed of 1/4000 lets very little light in, but may be necessary to record a F1 car passing by. 1/6 of a second is slow in photographers' terms but allows a lot of light to pass through. This allows you to record fine detail...but leaves you open to camera shake and may create too much blur in your image.

Every digital camera has its own set of choices of sensitivity, aperture and shutter speed and usually a host of preset (auto) combinations to suit different light conditions such as sunlight, shade, cloud etc.,

If the **sensitivity** of the film or sensor remains constant the strength (darkness) of the impression or image depends on the amount of incoming light. Low sensitivity, say ISO **100**, means a slow response and little noise.

This gives few errors in recording... so you can get all the details and subtle colour variations in a landscape maybe! High sensitivity, say **ISO 800**, gives a rapid

response usually with more errors in recording and more noise but enables you to catch a speeding motorcyclist or a flick-flack in the gym!. The broad principles are the same for all cameras but there are a number of important differences between SLR and compact digital cameras.

Most SLRs give you control over all aspects of the image. Compact cameras restrict your choices to try and ensure sharp well focused pictures most of the time... and they are small, light and easy to use on an auto setting... one which will often decide on the ISO setting, which may not always be what you want.

Control the light

Cameras control the amount of incoming light (exposure) in two ways with a shutter and an aperture, while the sensor (or chip/ LCD) records the total amount of light received:

1. The Shutter:

In a camera, the shutter blocks all light from exposing the recording medium (film or the sensor) UNTIL you press the button. Then it quickly opens and closes, allowing the light to affect the sensor. You can control the length of time the shutter remains open by setting the **SHUTTER SPEED**. A half second exposure is a long time in photography terms and it is ONE STOP darker than a one second exposure.

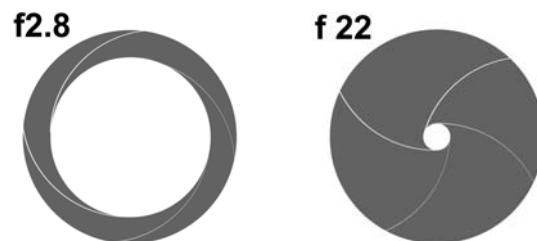
The standard time is around 1/50th of second. An exposure time of 1/1000 of a second is a much shorter time, i.e. it has less time to leave data or record details on the sensor or light sensitive film. A 1/125 exposure is TWO STOPS brighter than a 1/500 exposure. A 1/1000 exposure is THREE STOPS darker than a 1/125 exposure.

The longer exposures (like 1 second) allow much MORE light to reach the film

or sensor than a 1/1000 of a second exposure. So even though the zeros make the numbers may look bigger, they are fractions; don't be deceived!

2. The Aperture:

When light passes through a camera's lens, it must pass through an opening called an "Aperture" to reach the sensor or recording medium. In the early pinhole cameras it was a single hole to let in the light. Modern cameras have an adjustable aperture similar in function to the iris in your eye which expands and contracts to control the amount of light entering the camera. When the aperture is wide open more light enters; when it's smaller, less light comes in. The aperture setting, also known as an f-stop, controls the volume of light passing through the lens.



Wide open f2.8, almost shut f64

Like the pupil in a human eye, the aperture on a camera closes up to restrict light, and opens up to let more light through. Aperture settings such as f5.6 indicate MORE LIGHT... so a stronger image. High f numbers, say f22, allow much less light through... so a weaker image.

BUT....BUT Depth of Field??

Okay, so now you know about the shutter and the aperture. Exposure is the result of different combinations of shutter and aperture (f-stop) settings. These combinations can drastically affect the finished picture. The physical laws of optics mean that at small apertures (F22 and above, the depth of field



ISO100 1/90 F5.6

First attempt; focused on the rose. Because the rose was in shadow and the background in direct sunlight was bright the auto setting gave priority to the background and the rose was too dark. But the aperture was relatively wide so the shallow depth of field included the rose petals which are sharp and blurred the background to concentrate attention on the rose.



ISO100 1/125 F4.5

The depth of field is shallow to emphasise the rose. I zoomed in and set a wider aperture (f4.5 is wider than f5.6). This let in more light so that the rose was brighter. Because the depth of field was smaller (the aperture was wider) the background was more blurry, focusing more attention on the rose as well. Though the background was overexposed!.

Exposed for the rose

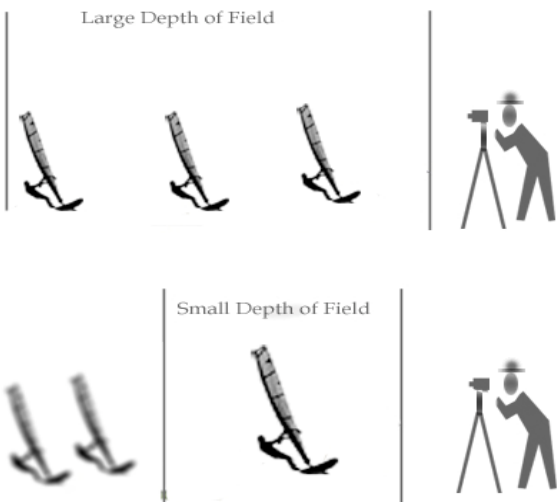


ISO100 1/750 F4.5

Though the rose is sharp, and the depth of field is still shallow, the shutter opening time, a brief time of 1/750 of second was not long enough to record the image fully so the effect is too dark and does not give enough information for us to see the details. The rose is lost in the darkness.

Under exposed

is great i.e. the sharpness is good over the whole image area, maybe from a few inches to infinity. See the diagram below left on page 3. The set of three pictures on page 3 (top) are similar but the aperture and shutter combinations make each one unique. Why is the background moderately blurred in the left picture, and much more blurred in the two on the left? Because if the exposure is made with a wide aperture (like f4/5), then objects farther away from the subject are thrown even more out of focus.



ISO100 1/6 F22 - good depth of field but the skip is over exposed and the rose under exposed and some



Generally speaking, if you want great depth of field you need a lot of bright light; hence flash is usually provided as a standard fitting for use in low light situations, like parties and indoor portraits.

BUT... BUT..... SENSITIVITY

The picture below was taken at f22 to give good depth of field (but because the narrow aperture required a long exposure...1/6 of a second it still up ended up a bit blurry by the skip... this is **camera shake**. (Of course, I could have used a tripod!!) If you want both a large depth of field and long shutter opening times, a tripod is a must.

Film and sensor makers give you a choice of film speeds and sensitivities to overcome this problem.

ISO 100-400 reacts slowly but is good for recording detail and colour. The high ISO numbers, say 800 to 3200 and more, react quickly to help avoid long shutter opening times, the risk of camera shake and carrying heavy tripods... but often at the cost of noise and grainy, gritty images. Some photographers, especially news photographers and news editors like these effects!! (Often the choice is a grainy image or NO IMAGE!). Landscape photographers and specialist portrait photographers tend to use low ISO numbers and sports & news photographers and those interested in children, parties and animals tend to use higher ISO settings.

BUT... Sometimes in very poor lighting conditions you have to use maximum sensitivity After all a grainy or an under exposed image is better than no image, and often image editors such as Photoshop will help you recover something usable.



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