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TAKING CONTROL OF YOUR CAMERA

To most photographer beginners, the magic that happens within the camera to transform a view into a photograph is a mystery beyond fathoming. However, remaining ignorant of the basics will restrict your photographic endeavours. If you don't know why your photo did not 'come out ', or even why it did, then you're relying on luck and the assumptions of a few engineers who set your camera's software!

The most important decision you can make to improve your photography, is to take control of your camera and force it to operate how you want it, to get the result you envision. (I suggest you take out your camera and fiddle with it as you practice with the controls we'll discuss. For the sake of these exercises, set your camera to Manual so you can individually adjust each of the settings.) Let's take a step back to the basics of photography. If you've just unwrapped your new summer camera then this will set you on the right track. If you're a more experienced user you may need a nudge to take your camera off Auto. There are a number of settings you can control but let's look first at the Big Three. Aperture, Shutter Speed and ISO.

Your camera records, via the sensor chip, the light that's transmitted through your lens. The lens is, essentially, a simple optical device which focuses the light beams onto the sensor. Without a lens, your sensor would still record the light falling on it but it would be a featureless blur. Unless you're photographing the sun, everything you shoot will be emitting reflected light. The amount of light received by the sensor will vary tremendously, depending on the amount of light reflected by your subject. A subject photographed on a sunny or cloudy day, a dark or a light subject, will all reflect varying amounts of light. But your sensor chip can only take a given level of light, so lenses have a circular diaphragm, called an aperture, which can be opened or closed to control the amount of light reaching the sensor.

The aperture is a set of moveable metal sheets designed to produce a roughly circular 'hole' through which light has to pass to reach the sensor. This 60mm Nikon lens shows, from the rear element, an open aperture set at f2.8, a partly closed f8 and and the minimum aperture of f32. The aperture is always set inside the lens body at a point where the light beams cross within the optical array of the lens. It is a more sophisticated version of dropping the visor in your car if the light is too bright.

Aperture settings are identified by numbers. Initially they may seem a little confusing as the numbers refer, not to the diameter of the aperture in mm, but to the relationship between the diameter and the length of the lens. So an aperture of 8 means that the aperture will fit 8 times into the length of the lens. These are called 'f-stops' as in 'focal stops'. A lens with a focal length of 100mm set to f8 has an aperture set to a circle or iris measuring 12.5mm – 100mm ÷ 8 = 12.5mm. But if we have a 200mm lens with the same aperture of 12.5mm, the f-stop now becomes f16. So the f-stop designation or f-number will have a different physical diameter depending on the focal length of the lens.

This bit of technical trivia is not important to remember. However, we do need to understand that the aperture is measured in f-stops and those numbers help us to understand and control the amount of light being passed through the lens. Is your photo too dark? Open the aperture. Is it too light? Close the aperture. We'll discuss later how much we should change the aperture. As you open the aperture, the f-number will become a smaller number because it will divide fewer times into the focal length; when you close the aperture the number will become higher as it will divide more times into the focal length. All you need to remember is that to close you want a larger number, to open, a smaller number. But now let's look at the next feature that we can adjust to control our image making: shutter speed.

Between the lens, with it's variable aperture, and the sensor chip, is a shutter. Like a protective storm shutter on a window, the camera's shutter prevents all light from hitting the sensor, then its opened when we press the shutter button, exposing the sensor for a prescribed period of time. Think of a wardrobe or cupboard with two sliding doors – to open the cupboard you slide one door across to expose the contents behind, then when you've removed your shirt you slide the other door back to shut the wardrobe.

Digital cameras have two leaves or shutter blinds. When you press the shutter the first curtain which is covering the sensor moves across exposing the sensor to light. When the time you have set has elapsed, the second curtain, hiding 'off stage', rushes across and covers the sensor. At slow shutter speeds the entire sensor may be uncovered (i.e. a half or one second exposure or longer) while a fast shutter speed may have the second curtain doing it's job almost immediately, so that they move across together with only a thin slit exposing the sensor.

The speed of the shutter, how long it is open, is expressed in seconds or fractions of a second. For example, a common shutter speed often used by the camera under normal lighting conditions may be 1/60th of a second or 1/125th of a second, or 1/250th. So if your camera fires off with a shutter speed of 1/125th of a second, that's exactly how long the sensor is exposed to light.

The combination of the aperture and shutter speed allows us to control the total exposure. A camera sensor is designed to work best at a given light level. To meet that level, the camera needs to adjust aperture and/or shutter speed. Think of a large tank of water; on the side is a hole plugged by a cork. To empty the tank, we remove the cork. The hole is our aperture. It takes a long time for the tank to empty as the hole is quite small. To empty the tank quicker, we can increase the size of the hole. The bigger the hole (aperture) the shorter the time (shutter speed) to empty the tank.

F-stops (A) are an indication of the mathematical relationship between the diameter of the aperture and the focal length of the lens. The focal length of the lens is the distance between the optical center of the front element (B) (when focused at infinity) and the point of focus, in our case that would be the sensor chip (C). With this lens the focal length (D) is 105mm, as shown stamped on the lens barrel. The same aperture diameter in mm will have a different f-number on a different focal length lens.

With our camera we set the aperture and the shutter speed to get a correct exposure. How much is enough? The camera has a built-in light meter to measure the light entering the camera. This is usually in the form of a linear scale where the centre has a zero setting and either side will be markings, usually in 1/3 f-stop increments. As you adjust the aperture the exposure indicator will run up and down the scale. The same happens when we change the shutter speed. With the indicator at zero, the camera is proposing that we now have a correct exposure.

This is where it all falls apart. If we're photographing a scene that has a variety of tones from dark to light, then the camera will make a fairly accurate exposure. But if the scene is predominantly dark, or mostly white, the camera is tricked into increasing or decreasing the exposure to create an exposure that will provide an average toned photo. A typical example is a bride in a white dress on a white sandy beach. The camera, faced with all that brightness, drags the exposure down so that the image is an average grey. Our happy bride is now a dull grey as is the beach. Or, if we have a diver in a black wetsuit sitting on a dark shipwreck, the camera measures the amount of reflected light and cranks up the exposure to create a mid-grey tone. Our black suited diver is now grey-suited, and their comparatively pale face has blown out to white.

The standard f-stops are shown on this Nikon 100mm macro lens (A). f2.8, f4, f5.6, f8, f11, f16, f22 & f32. These are standard f-stops with the numbers representing apertures that let in half the light for each step as you go up the scale. Digital cameras will have either extra 1/2, or more often 1/3, stops as well.

By starting with the exposure indicated by the camera, we can then adjust up or down to get the exposure we actually want and need, not the exposure the camera thinks we need. But what happens when we start to run out of light, maybe a cloudy day or late in the afternoon? Our aperture can only open so far, and the shutter speed needs to be kept above 1/60 to prevent camera shake. There's one more control that will come to the rescue.

Not so long ago, when cameras used film, the sensitivity of the film to light was rated on a scale set by the International Standards Organisation or ISO. A film with an ISO of 100 was considered 'normal'. Over that was considered 'fast' and below that film was considered 'slow'. While camera sensors are not chemically >

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The shutter, the barn doors of the whole operation, allows light to hit the sensor for a pre-set period of time. A long shutter speed, such as 1/4 sec, will expose the entire sensor while a faster shutter speed will have the sensor exposed by a narrow strip, as shown here, as the second shutter curtain rushes to complete the time set by your camera's shutter speed controls. You can see why using a flash with a high shutter speed will not work as only a small strip will be exposed by the very brief flash duration. Old flash bulbs had a much longer burn time so a slightly higher shutter speed could be used as the strip passed over the film. Today modern dedicated flash units will fire multiple times in a perfectly synchronised bunch of flashes that will follow the strip across the sensor to give precise light coverage to the entire frame.

based, they still use the same system of rating the speed of the sensor or the amount of light needed to hit the sensor to form a correct exposure. The signal is then amplified or reduced to emulate a change in film speed or ISO. If our sensor is set to ISO 100 and light levels drop, we can, if we run out of options with aperture and shutter speed, change the ISO setting to a higher level, such as 200, 400 or 800. Each step will provide an extra f-stop or rise in shutter speed.

So how do we put all this into practice? For many situations, Auto exposure will provide pretty good results. It will measure the amount of light reflecting off your subject and select the appropriate settings to get a correct exposure. When it all collapses, you can switch to Manual, put in the settings proposed by the Auto setting, then adjust the aperture and/or shutter speed to get the result you want. For example, if you're photographing a fish hovering next to a lump of reef, the camera averages out all the light, mid and dark tones and comes up with an exposure of f8 @ 1/60. You push the button and your shot looks fine. The fish then swims across the reef a touch and hovers in front of a deep hole. It forms a black, impenetrable area surrounding your subject. The camera measures all the tones, including the zero light reflecting from the background and comes up with a totally different exposure, one that opens the aperture a couple of f-stops. Now, the light falling on the fish is exactly the same, so the exposure should be the same. But the black background has thrown our Auto setting out of kilter. The averaging process now shows a washed-out fish. If our camera had been set on Manual then the second photo without adjustments would still be correct. The black hole would stay black and the fish would stay correctly exposed. And when the fish swims on to hover over a white sand patch, the exposure would still be correct, though the camera would be indicating that we need to close the aperture or use a faster shutter speed.

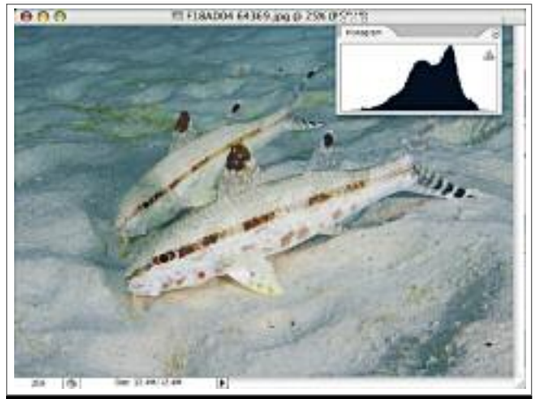
On Auto your camera will bunch all the pixels so they average a mid tone, shown by the even distribution of pixels either side of the halfway point of the histogram. While shooting I've pulled the histogram across a touch by using manual controls, otherwise the image would be even darker. You can see I have room on the right before any clipping occurs so I could have opened up another 1/3 or 2/3 without clipping. A few of the shadow area pixels are being just clipped on the left of the histogram so I'll drag the exposure slider across a touch so that all pixels are in the graph, not clipped at either end. A perfect exposure would have meant no tweaking needed in the RAW file conversion window.

Camera manufacturers well know this issue but still push users to set their camera to Auto. Then when an overly dark or light situation occurs, they instruct you to go through a process of applying exposure compensation – actually the identical process of using Manual exposure.

Camera LCD screens have improved a lot but still should not be relied on to give an absolute indication of how accurate your exposure may be.

Another fantastic tool is the Histogram. Your camera may give you the option of viewing the Histogram, which is a graphical representation of the pixels in your newly acquired file, in a combined graph or one showing each separate colour channel. Go for the combined, the other is just confusing eye candy, like chrome muffler tips on an ancient Mazda.

LINKS>
Focal length: **http://en.wikipedia.org/wiki/Focal_length**
Apertures: **http://en.wikipedia.org/wiki/Aperture**
www.ephotozine.tv/video/lens-aperture-explained-609
Variety of Aperture vidoes:
www.youtube.com/results?search_query=aperture+tutorial&aq=5
ISO: **www.digital-cameras-help.com/basic-photography-tips.html**



A very tricky subject. Bright reflective fish on bright reflective sand but with mid tones and darker tones on the brown and black stripes. In my photo editing software you can see the histogram over to the right of the mid point but without any clipping of highlights or shadows. A dark subject on a dark background is more prone to wildly blown highlights, unrecoverable by any means. At least we can salvage this with a minor tweak. I could probably improve this shot more by sandwiching a second RAW conversion on top with darker highlights then blending them, but that's another story.

If your graph shows all the pixels lying between the two boundaries of the histogram, the left side and the right, then your exposure is in the ball park. If it is 'clipped' running off either end, you need to adjust the exposure. If it is running off to the right, reduce the size of the aperture – if you're using f8, use f11, the next full f-stop up the scale. (You can, depending on your camera's settings, adjust in 1/3 or 1/2 f-stops as well.) With a little practice, you'll let the Histogram slide up or down to allow for the extra light or dark backgrounds. For example, a light coloured flounder on a white sandy background will be correctly exposed when the Histogram shows the pixels very close to, but not passing, the right hand side of the Histogram. Your camera set to Auto will show a Histogram placing the bulk of the pixels in the middle of the graph, turning them into a mid grey tone. Remember that you want your exposure between the ends of the graph without any clipping at either end. The opposite applies to a dark subject on a dark background. You need to adjust your aperture so that the Histogram tends towards the left side, but without clipping.

To sum up, practising your manual controls will help you become familiar with the aperture and shutter speed adjustments needed for those extreme exposure situations. It will also give you the confidence to take control of your camera, pre-visualise what you want in a finished photo and choose an exposure to make it happen. The same principles apply to flash photography or mixed/balanced lighting of flash and ambient light. ■