

BBC

Wildlife

with Mark Carwardine

PHOTOGRAPHY MASTERCLASS

#8 Why aperture priority is best: understanding aperture, shutter speed & ISO

How does exposure work?

Exposure is a measure of the amount of light in a photograph. Photos can be underexposed (unacceptably dark - too little light hits the image sensor to make a good photo), overexposed (unacceptably bright - too much light hits the image sensor to make a good photo) or properly exposed (when you've captured just the right amount of light). Bear in mind, though, that 'properly exposed' is subjective and variable - it depends on what you are photographing and the effect you are trying to achieve.



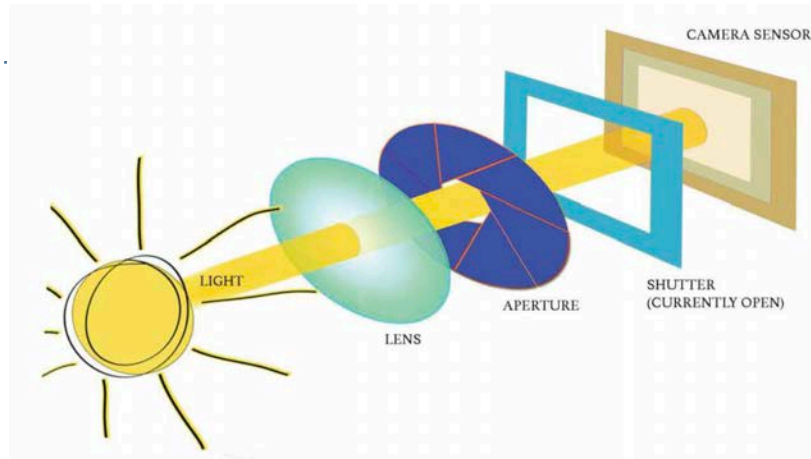
Overexposed



Underexposed



Properly exposed



Controlling exposure is a fundamental part of photography. The exposure is affected by three things:

1. Aperture (the hole through which the light passes).
2. Shutter speed (the length of time the light passes through the hole).
3. ISO (the sensitivity of the camera sensor to light).

Together, these three make up what's called the 'exposure triangle'. Every time you change one setting, it affects the other two in a constant triangle.

Aperture

The aperture is the hole in the centre of the lens that allows light to pass through. It works in much the same way as the pupils in our eyes (which dilate in darker conditions and contract in brighter conditions). As with our pupils, you can make the hole smaller or larger - and that, of course, has an immediate impact on the exposure (it also affects something else - the depth of field - the amount in front of and behind the subject that is in focus).

The most confusing part of understanding aperture is how the size of the hole is measured. It's measured using what are called 'f-stops' or 'f-numbers'. The main ones are f/1.4, f/2, f/2.8, f/4, f/5.6, f/8, f/11, f/16, f/22 and f/32 (sometimes, they are written simply as f8 or F8, but it all means exactly the same thing). It's confusing - at first glance, anyway - because the smaller the f-stop, the larger the aperture (and the larger the f-stop, the smaller the aperture). You can see this in the diagram on the next page.

For inspirational e-books, workshops, free fact sheets, tours and more on wildlife photography, please go to www.markcarwardine.com

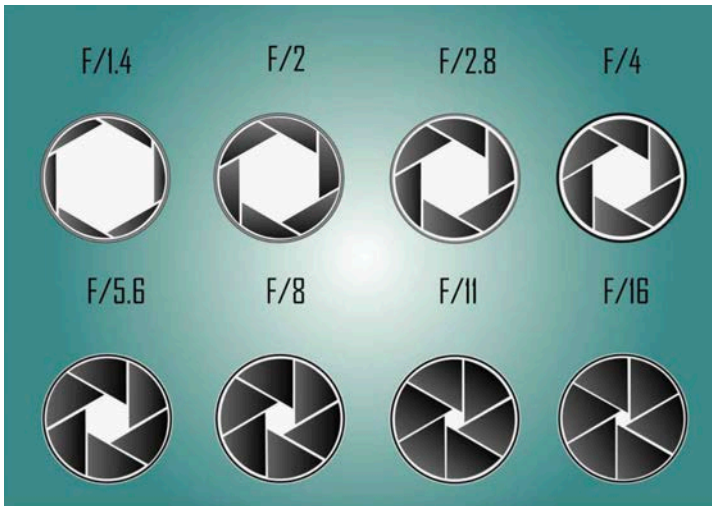


Wildlife

with Mark Carwardine

PHOTOGRAPHY MASTERCLASS

#8 Why aperture priority is best: understanding aperture, shutter speed & ISO



Different sizes of aperture: understanding aperture is fundamental to photography.

You don't really need to know why this is the case. You just have to remember that a smaller f-stop equals a bigger aperture, and this makes the picture brighter (because it lets more light through); conversely, a larger f-stop equals a smaller aperture, and this makes the picture darker (because it lets less light through).

If someone tells you to pick a large or wide aperture, or to 'open up' they're recommending an f-stop such as f/2.8 or f/4; if they suggest a small aperture, or to 'stop down', they're recommending an f-stop such as f/11 or f/16.

Shutter Speed

Think of your camera's shutter as a door that can be opened or closed. When you take a picture, it is open for as

long as you've set it to open, allowing light to pass through to the sensor and expose the image. When it is closed – when you are not taking a photograph – it stays shut and no light reaches the sensor.

The 'shutter speed' is the length of time the door remains open. The longer it is open (ie the longer the shutter speed) the more light passes through the hole in the lens (the aperture) and the brighter the image.

Shutter speed is one of the most important settings on your camera and can make or break a photograph. Quite simply, it either prevents or accentuates blur. Most of the time you want to capture sharp images, of course (as in the leaping bottlenose dolphin, below); when the shutter is only open for a tiny fraction of a second, you can freeze a moment in time. But sometimes blur (made by using a slow shutter speed) can be used to create a sense of movement (as in the ring-tailed lemurs, and king penguins).

It's even more than that. A fast shutter speed helps to avoid camera shake (a form of blur that ruins images, caused by moving the camera when you take a picture); this is critically important because camera shake is impossible to correct in image-editing software such as Lightroom or Photoshop. At the other end of the scale, if you're using a tripod, a slow shutter speed enables you to shoot in surprisingly dark conditions.

Shutter speed is also linked with aperture (as we'll soon discover): a slower shutter speed means a smaller aperture and, consequently, a greater depth of field (as in this image, right).



For inspirational e-books, workshops, free fact sheets, tours and more on wildlife photography, please go to www.markcarwardine.com

BBC

Wildlife

with Mark Carwardine

PHOTOGRAPHY MASTERCLASS

#8 Why aperture priority is best:
understanding aperture, shutter speed & ISO

ISO

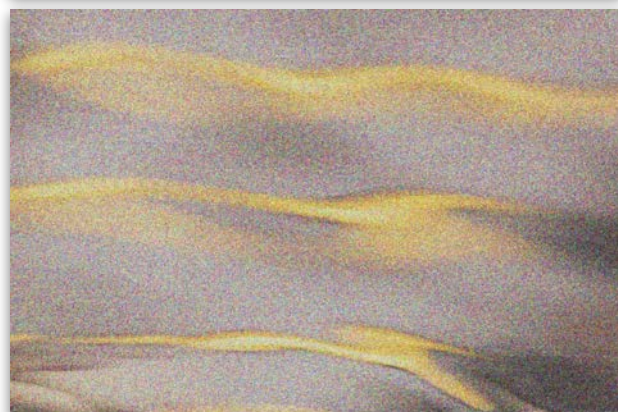
ISO is the third component in the exposure triangle, along with aperture and shutter speed. Unlike the other two, it doesn't brighten or darken your photos by physically capturing more or less light. Instead, the ISO setting tells the sensor how much to amplify the light signal as it is captured.

The easiest way to understand ISO is as the sensitivity of your camera's sensor to light. (Technically, this isn't quite correct – sensors have a single sensitivity, regardless of ISO; it would be more accurate to describe it as how much the signal is turned up or down – but you don't need to worry about such details.)

In simple terms, think of ISO as a setting that will darken or lighten your photos. Turning it up to a higher number makes the picture brighter and turning it down makes it darker. Setting a high ISO has two advantages: it enables you to use a faster shutter speed (or a smaller aperture) because less light is needed for a correct exposure, and it enables you to capture images in darker environments. But it comes at a price, as we'll discover in a moment.

You can change the ISO in real time, from picture to picture, and react to changing lighting conditions or creative impulses on the fly.

This picture of a jaguar was taken at 6,400 ISO.



Now for the caveat. It's all very well being able to increase ISO willy-nilly, but it comes at a significant price. As high ISOs magnify the light signal, they also magnify background interference and other unwanted signals – and the result is 'noise'. This is rather like grain in high-speed films (though, many would argue, far less easy on the eye) and is caused by pixels that are not representing the colour or the exposure of the subject correctly.

At low ISOs, noise is essentially invisible. But the higher the ISO the more obvious it becomes. There is an inevitable tipping point, where it begins to compromise an image until it completely dominates and renders it almost useless. I've exaggerated the effect, to show you what it looks like, in these two pictures of a tufted duck, above.

It's worth noting that noise doesn't affect every picture in the same way. It isn't particularly visible in light areas or areas with complicated textures, and is much more visible in smooth, darker areas.



For inspirational e-books, workshops, free fact sheets, tours and more on wildlife photography, please go to www.markcarwardine.com

BBC

Wildlife

PHOTOGRAPHY MASTERCLASS

with Mark Carwardine

#8 Why aperture priority is best:
understanding aperture, shutter speed & ISO

The best way to avoid noise is to keep it to a minimum when you are shooting. There are two ways of doing this:

1. Avoid unnecessarily high ISOs (obviously!).
2. Expose your photographs as bright as possible (as close to the right side of the histogram as you can without overexposing) so that you have to do minimal brightening at the processing stage. If you don't, when you brighten your photos in the computer you're effectively turning up the volume which increases the intensity of noise along with everything else.

ISO is always a trade-off. You learn to judge how far to push it. As a general rule, you should only raise your ISO when you are unable to brighten or darken the photo using shutter speed or aperture instead. I start low (ISO 200 or 400) and push it higher only if I really have to (if the light gets really dull and overcast, for example).

Having said that, my philosophy is that I'd rather have a sharp image and a little noise than a blurry image (because I couldn't achieve a fast-enough shutter speed) and no noise. I adjust my ISO all day long, according to the subject and the amount of light. And I'm not afraid to push it to a really high number, if that is the only way to get a picture.

Just remember that there is a reason why your camera allows such a wide range of ISO settings: different situations call for different ISOs. Use them to your advantage. I would be more aware of ISO when shooting the picture of the eider, below, for example, because it would show up on the water; but I'd be less worried about the Arctic fox, because it wouldn't be so obvious in the light snow or the complicated textures of the rocks. And try not to get too paranoid about noise – don't keep zooming in so much that you are 'pixel peeping' because you'll see imperfections that don't actually matter in real life.



For inspirational e-books, workshops, free fact sheets, tours and more on wildlife photography, please go to www.markcarwardine.com