Digital Photography Myths

Introduction

This article will explore some beliefs and techniques of digital photography which many people blindly follow without even questioning. One particular myth is known as Expose To The Right also known as ETTR. This may surprise many of you in the same way as I was surprised at a recent photographic conference when I discovered how many people still follow this myth. Technology changes very rapidly and this is also very true when it comes to digital cameras. Many things that were valid at the very beginning of digital photography are no longer relevant or valid. I will attempt to prove these are myths in as simple a manner as possible without too much technical detail.

This article will begin by explaining some of the technology we take for granted and use without too much thought. Some of these explanations may be surprising and specially when they are used to prove wrong techniques that have been used for 15 years.

Links to relevant web pages will be provided so that you can explore some of these topics in more depth. It is important to remember that not everything you read on the web is true, so do your research with an open and enquiring mind.

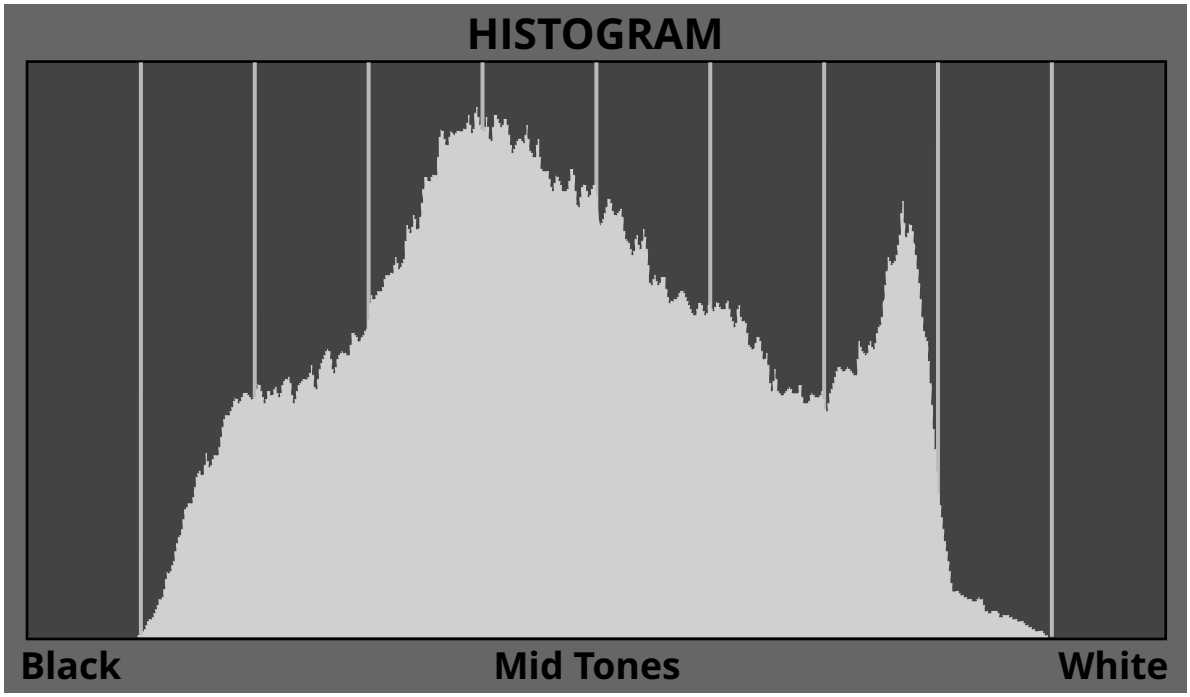
Some topics and myths presented in this article may upset you but ultimately I hope to help you understand your camera better and to help taking that perfect photograph a little easier.

The Histogram Defined

The histogram will be familiar to most digital photographers and is a very useful tool in analysing your photos and deciding on your optimal exposure. The histogram gives a graphical representation of the spread of tonal values in your photo where the tonal values range from black on the left to white on the right. The height of the histogram represents the relative number of pixels for each tonal value present in the image.

At a more detailed level, the Histogram is a linear representation of the number of pixels of each tonal value plotted along the horizontal axis of the graph. The horizontal axis can be scaled to fit the device you are viewing on, a computer or the camera itself. The thing to remember is that histogram is LINEAR having values 0 through N equally spaced along the X-axis with the smallest value (black) at the left and the lightest value (white) at the right and the mid tones in the centre (N/2).

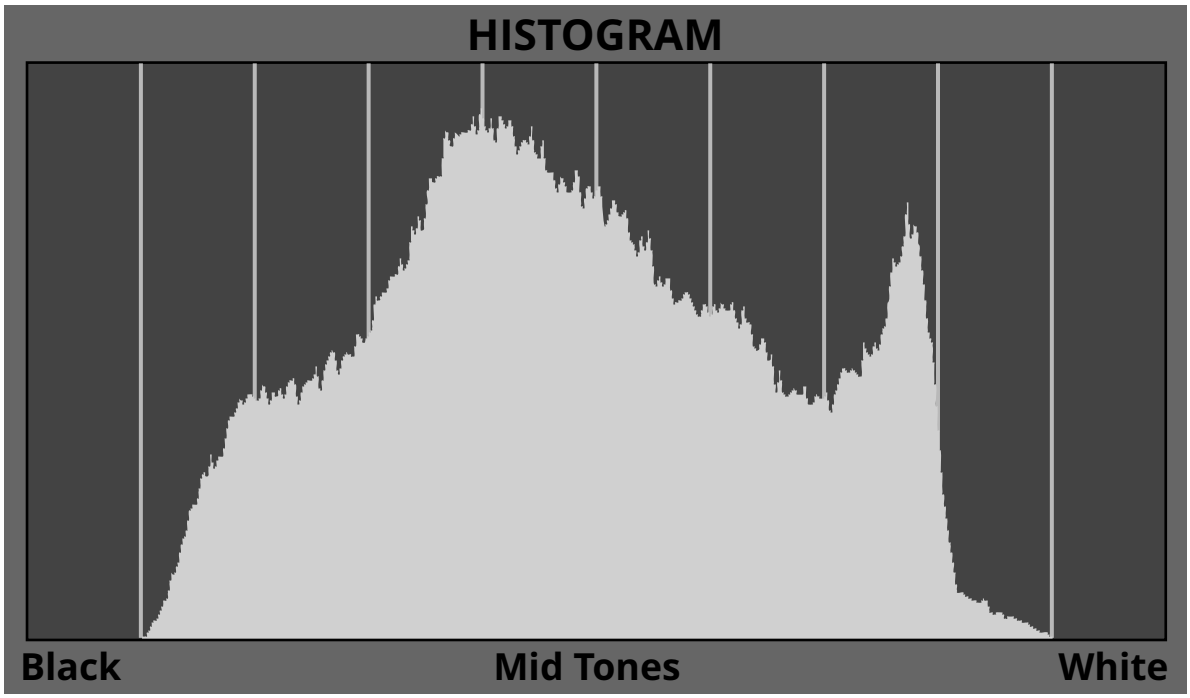
Neither axis is labelled as the values are unimportant. What is important is how the histogram is placed and spread across the X-axis.



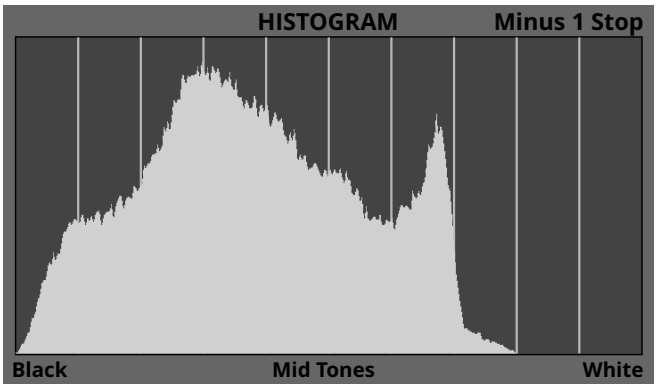
Exposure and the Histogram

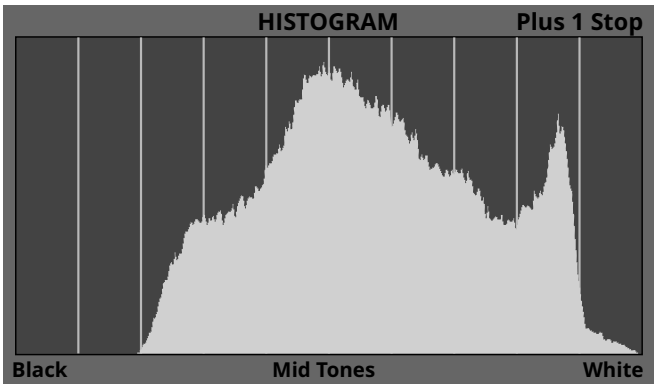
The definition of "stop" can be described as follows: *Each stop of exposure is the doubling or halving the amount of light let into the camera (hitting the sensor or film) when taking a photograph*.

The histogram helps visualise your exposure by plotting the tonal values of all pixels in your photo onto a graph. Most modern cameras have a dynamic range (tonal range) of approximately 10 stops. So if you divide the histogram into sections each representing 1 stop then you will have 10 sections in your histogram.



Now each time you decrease exposure by one stop you will move the histogram towards the left by one section and conversely, each time you increase exposure by one stop you shift the histogram by one section to the right.





This article will assume that your camera has a dynamic range of 10 stops and that your histogram matches that dynamic range and is thus divided into 10 sections, each representing one stop of exposure.

Myth 1: You lose half your tonal values for each stop of underexposure

In an article written in 2003 by Michael Reichmann of The Luminous Landscape website, Michael argues that for each stop of underexposure you lose half the tonal values available. This is simply WRONG! Remember that the histogram has a LINEAR x-axis so you will only be losing 1/10 of the tonal values.

But what if your scene does not span the whole 10 stops of dynamic range and only uses the middle eight. When you now underexpose by one stop you are simply shifting the exposure to the first eight sections, BUT your image still spans eight stops of dynamic range and you have not lost anything!

The thing to remember here is that stops of exposure is NOT linear and the histogram is linear so you cannot say you are losing half your tonal values for each stop you underexpose.

For a more detailed discussion you can read Mike Baird's article.

Sensors and In-Camera Display

Understanding sensors and in-camera display is important in understanding how the histogram is generated. Sensors consist of a large number of photosites that measure the amount of light hitting them. Each photosite has a RED, GREEN or BLUE filter in front of it in order to create a colour image. It is

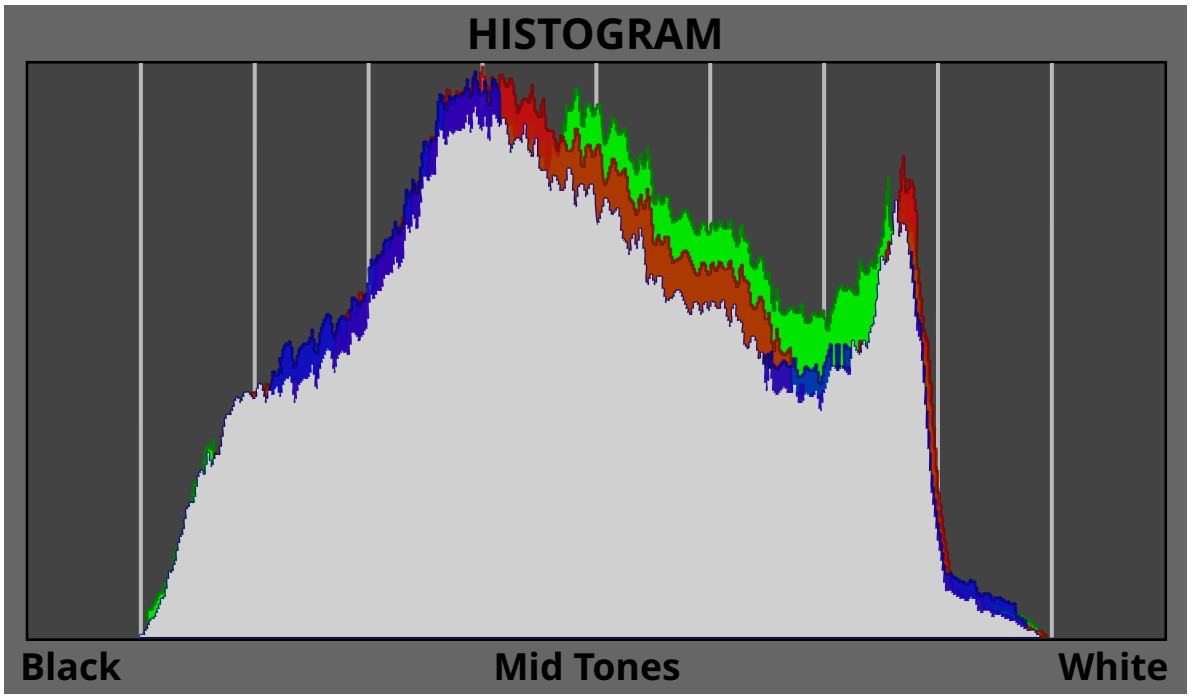
important to understand that each photosite can only measure the amount of one of the three colours it receives. To create a full colour image you need to combine groups of photosites in such a way that each pixel in the resulting image has a value for all three colours. This process is called de-mosaicing.

If you take RAW images then the file created by the camera has all the data from each photosite and NO de-mosaicing has taken place which is then done in software on your computer. Each RAW file will also have a JPG image embedded in it which is normally smaller than the full RAW image. **This embedded JPG is used by the camera to display the photo on the screen and to calculate the histogram**.

Myth 2: The histogram is the truth

The histogram was developed to graphically represent the tonal distribution of an image. In its simplest form, a histogram sums the tonal value for every pixel in an image and plots them on a graph with the horizontal axis representing the tonal value from 0 to N, where 0 is black and N is the brightest the camera can capture (pure white). The vertical axis simply represents the number of pixels for each tonal value present in the image.

There are normally options to display histograms for each of the Red, Green and Blue values as well as a combination of all three. It is important to understand that you can blow out your highlights or lowlights in one or two of these colours without blowing the other(s). If you are really worried about blowing highlights or lowlights then you also need to look at the Red, Green and Blue components of the histograms.



The most important thing to understand is that **the in-camera histogram is**

generated from the JPG and NOT the RAW data, even if you take RAW only. What this means is that the histogram does NOT represent the RAW data and that you will have more latitude to work on your RAW files on your computer. Another important point is that even if your camera histogram shows blown highlights or lowlights they may not be blown in the RAW data and hence may be recoverable later in software.

If you fully rely on your histogram for exposure then you need to be aware of its limitations and work in knowledge of what it represents. Additionally, the histogram shown when editing RAW files on a computer DOES use the RAW data to generate the histogram.

Shooting RAW

Shooting RAW provides you with the RAW data as it comes off the sensor after applying ISO. This gives you huge scope for processing in software later.

Shooting JPEG provides you with an image that has been converted in-camera from the RAW data into a JPEG file. De-mosaicing and all settings for white balance, picture style, sharpening, de-noising etc. have been applied to the RAW data to produce the JPEG image. Editing this file later is more difficult because you are starting from an already edited image. To make matters worse, JPEG is a 'lossy' file format which means the file has been compressed to save space at the expense of quality in terms of throwing away data. The eye may not see this depending on the quality settings. Most importantly, each edit of a JPEG file after being saved compounds the quality degradation. For this reason you should only use JPEG as the final image format and do all your edits either on the RAW file or on a lossless format like TIFF.

Editing RAW files allows you to correct white balance, exposure, contrast and a host of other options **after** the shot was taken. You perform these edits on the data as it was shot without any modification by the camera, with the exception of ISO which is a hardware function.

Myth 3: ISO affects exposure

ISO is used to amplify the charge level read from each photosite on the sensor. At your camera's base ISO you can say there is no amplification. As you increase the ISO setting you increase the amplification. Greater amplification results in greater distortion of the charge which manifests itself as 'noise' in the image.

It is very important to understand that **any change in ISO does not change the amount of light received by the sensor**. Only the aperture and shutter

can affect the amount of light received by the sensor.

For more information see Demo Mateo's article.

Increases in ISO forces the camera to underexpose

From our short discussion of ISO we now understand that changing ISO does NOT change the amount of light reaching the sensor (exposure) but it does change the brightness of the photo. We do know that shutter, aperture and ISO affect the brightness of the photo. So if you change one setting, and you want to maintain the same brightness, you need to change one or both of the other settings.

You will notice that I refer to the brightness of the image and not the exposure. The reason for this is that only Shutter Speed and Aperture affect exposure.

Assuming we want to maintain the same brightness and we increase the ISO by one stop then we need to reduce either the shutter or aperture by one stop to compensate for the increase in ISO. What we effectively have done is halve the amount of light reaching the sensor, in other words we have forced the camera to underexpose by one stop! The more you increase the ISO the more your camera under-exposes given the same lighting conditions.

Myth 4: Expose To The Right for best results

Understanding that increasing ISO forces the camera to underexpose is fundamental to deciding how you should expose your photo. If you are shooting in very bright conditions then it is quite likely that you need to be careful of blown highlights and hence ETTR is not really an issue. If, on the other hand you are shooting in low light then you need to increase exposure to get more detail in the shadow areas.

In both situations you should strive to keep your ISO as low as possible, preferably at your camera's base ISO (normally 100). If the conditions require higher ISO to get definition in the shadows and your aperture and shutter speed are at the required values for Depth Of Field (DOF) or motion stop capability, then increase your ISO to get the exposure required. Do NOT increase the ISO beyond what is required to get the exposure you require because doing this you will be forcing the camera to effectively underexpose!

If you do expose to the right you will be increasing noise in your image due to a higher ISO. Correcting any overexposure in software will then effectively be reducing the ISO with regards to noise reduction i.e. reversing your original higher ISO. See this Chromasoft Blog for examples and more detailed explanation of how this does NOT provide any benefit.

What this shows is that ETTR is the wrong thing to do to get the best from your image. There is however one situation when ETTR is useful and that is when you remain at your base ISO. If you then reduce exposure in software you will effectively be creating an ISO lower than your camera's base ISO and get a less noisy photo.

My shooting tips

I have been taking wildlife photos for a few decades now and have used both film SLRs and digital SLRs. I always strive to keep things as simple as possible and use the technology available to help achieve this. Photographing wildlife is difficult enough without having to worry about the technicalities of taking the photo because invariably you will miss the shot due to being occupied with camera settings. If you do like doing most things manually then you need to become very practised and proficient in order to capture the moment - it is not impossible but simply not my preference.

Below I have listed the important things I do to help me concentrate on the composition and focus to get the shot I am looking for. I hope they help or at least make you aware of other options available to you.

1. Keep it simple. Worrying about ETTR is a waste of time and specially for wildlife photography. It is more important to get the shot you want than miss it because you are trying to do ETTR. Cameras are so good these days that ETTR is obsolete.

2. Let the camera choose the exposure for you. Use whichever mode you prefer to get the effect you want and let the camera worry about exposure.

3. Choose a metering mode to match the condition and/or effect you are after. If your subject is relatively small then choose Centre-weighted, Partial or Spot metering. If you are taking landscapes then you may wish to use Evaluative or Centre-weighted metering.

4. Use Single Point of focus for better results where required.

5. Use autofocus because your camera can focus quicker than you. The only time I manually focus is when I am taking panoramas or the subject is behind objects like grass or branches. I do however frequently change the focus area and type depending on the scene.

6. Do you know about Program Shift? In P mode you can adjust the combination of shutter speed and aperture while maintaining the same exposure. This gives you both Shutter and Aperture priority along with

Program mode all in one place with the simple rolling of the front dial after initiating metering. For this reason I almost always shoot on P mode unless I have a specific reason not to.

Conclusions

I may have ruffled some feathers with some of the information and conclusions presented here. It is not my intention to upset anyone but I am simply pointing out that you need to be critical of everything you read and, most importantly, keep up with technology as it changes rapidly and techniques used in the past may no longer be relevant. Do your research, or even better, experiment for yourself to satisfy your curiosity and hone you techniques as technology advances.

References

There is a huge amount of material on the web and a lot is wrong or outdated. Below are a few references I used in compiling this article which I found both very informative and educational.

- Why “Expose to the Right” is just plain wrong. 27 September 2009, Chromasoft
- Histogram Myth explicated: “you’ll lose half your tonal values for each one full stop of under-exposure. 19 February 2012, Michael L. Baird
- Expose To The Right (ETTR) Is Obsolete. 7 November 2015, Demo Mateo
- The ETTR Myth. 19 November 2007, Rags Gardner
