

Histograms

Steve Wells

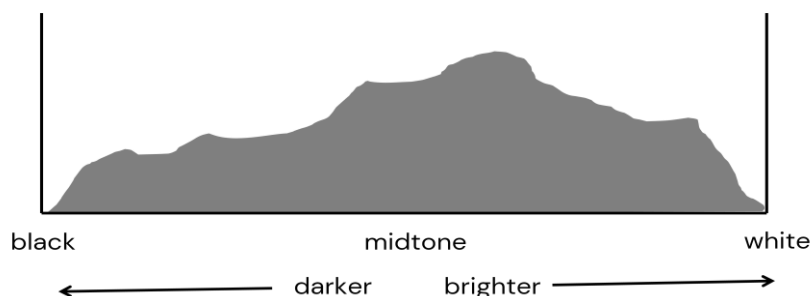


Histograms Everywhere

This montage contains histograms from Nikon and Canon Cameras, from Photoshop (three different examples) and from Lightroom. There is barely a piece of photographic equipment with a display which does not display a histogram.

What is a Histogram?

Imagine an image converted to tones of grey. A histogram representing this image is a graph which shows, horizontally, a greyscale and, vertically, an indication of how much of each tone of grey is in the image.



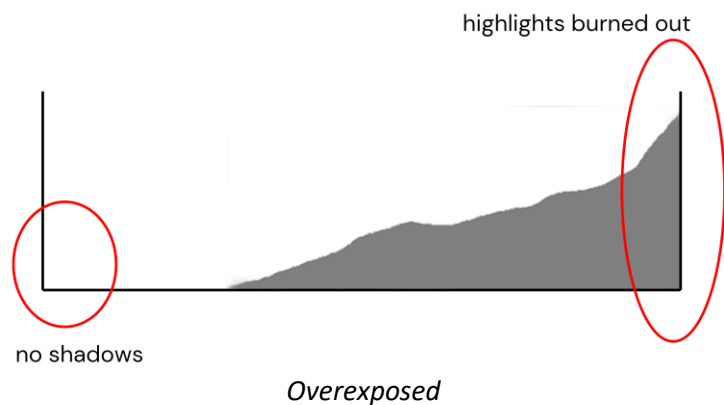
A Histogram shows the proportion of different greys in an image

The greyscale runs from black at the left to white at the right. So, the height of the graph at the left indicates the amount of shadow (black or dark grey) while the height of the graph at the right hand end shows the highlights.

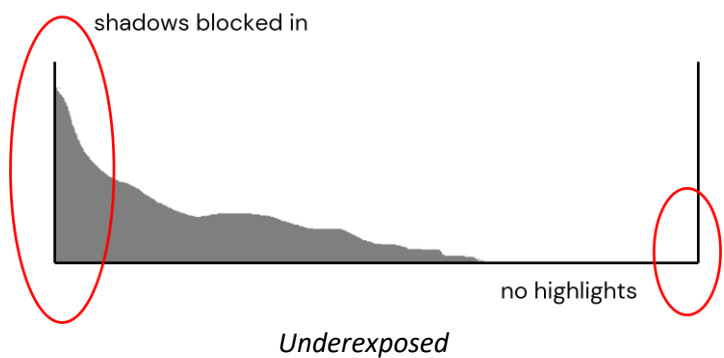
Overexposure and Underexposure

A histogram which is squashed over to the right end of the histogram shows over exposure. Since the extreme right of the histogram shows the amount of pure white, this is showing that part of the image is burned out.

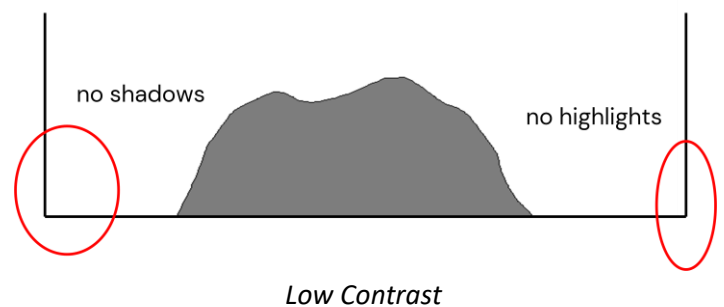
A badly overexposed image may also show no shadows



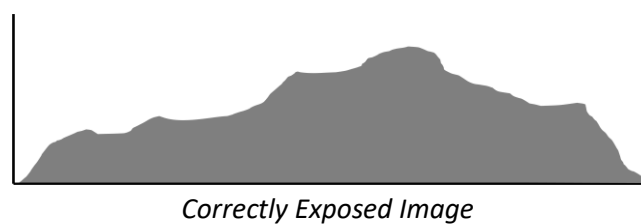
Similarly, a histogram which is pushed over to the left indicates underexposure. The extreme left of the histogram represents black and shows that there are some shadows which have been completely blacked out with all detail lost.



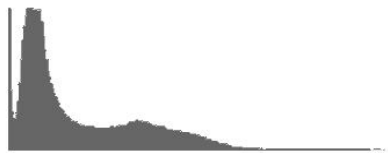
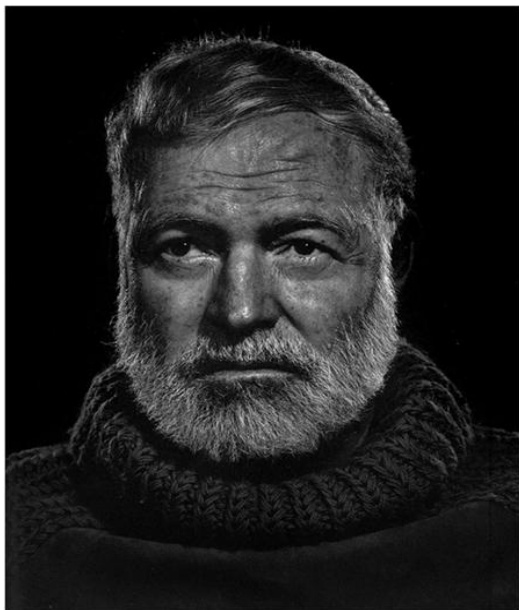
A histogram showing no highlights or shadows suggests a low contrast image which might benefit from adjustment in software later.



All this suggests that an ideal histogram should be as wide as possible without actually containing any whites or blacks.



However, this is not necessarily the case. It depends what the photographer wants...



Ernest Hemingway by Yousuf Karsh

At first glance, the histogram of this image by Yousuf Karsh suggests that it is underexposed. Now, how about this image by Claus Jensen.



Mariann by Claus Jensen

Here the histogram suggests that the image is over exposed.

In both cases the images is what the photographer intended. So, it's your choice. The histogram is there to help but it can't make decisions for you.

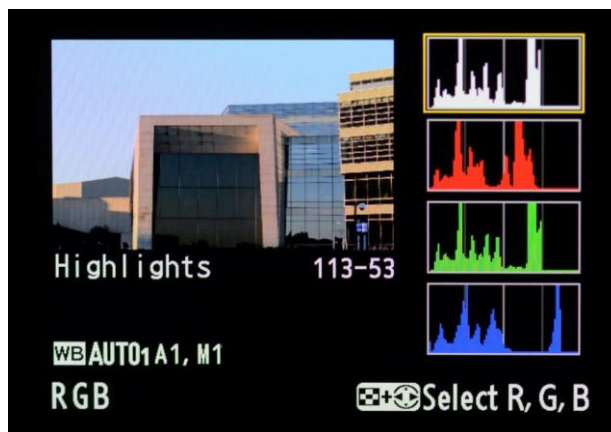
In Camera – the Live Histogram

The histogram in camera available when taking the picture may be a guide to exposure, but it is not all that it seems.

- early Nikon cameras showed the green channel and ignored red and blue;
- modern Olympus cameras show an average of the three channels.

Showing only one channel may simplify the design of the camera but it doesn't help you, the photographer. The early Nikon approach showing a histogram of the green channel for a predominately red image would be, at best, misleading. Taking an average may seem better, but it still means that a subject with a single strong colour can have one channel overexposed while the the average may still look OK.

You may think that presenting the three colour channels as separate histograms might be better. This is often available after the picture has been taken. If it was presented earlier there may be so much information for the photographer to assimilate that the photographer's attention would be distracted from taking the picture!



Full colour histogram provided after the exposure by a Nikon camera

Exposing to the Right

If there are genuinely no highlights, there will be a gap to the right of the histogram graph.



Highlights not present

You can increase the quality of the image by increasing the exposure: but not so much that the highlights are burned out. This increases the amount of light falling on the sensor. The effect is to increase the shadow detail and decrease the overall noise.



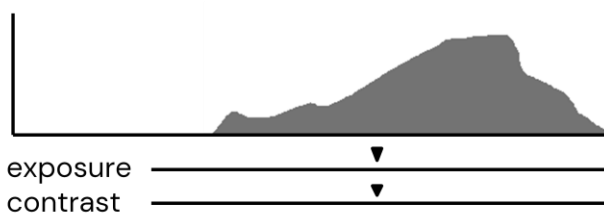
More light on the sensor

On the other hand, the image straight out of the camera will now be too bright. You will need to tone it down in post-processing.

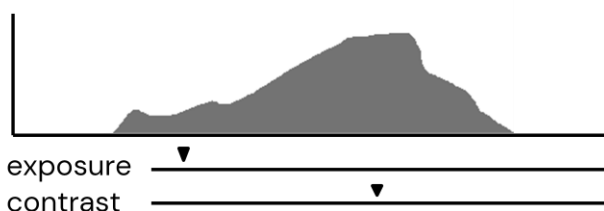
Post-Processing

This is a general guide to starting post processing using the histogram. The idea is to take a lacklustre image and resolve exposure and contrast images.

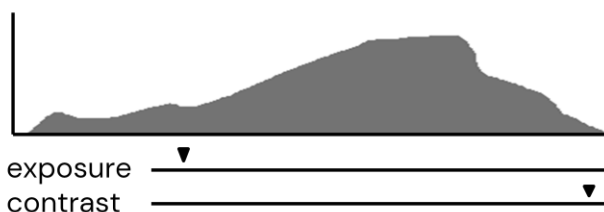
First, if the histogram is shifted to one side use the exposure slider to move it to the centre.



Then, a low contrast image will have a narrow histogram: no highlights or shadows.



So, use the contrast slider to spread the histogram over the full range from black to white.

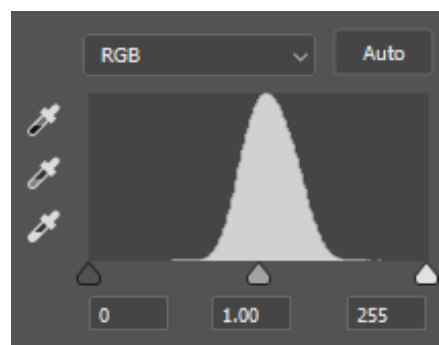


Exposure and Contrast

If you are using Photoshop a levels adjustment layer will achieve this. Open up a levels adjustment layer and, guess what... you get another histogram!

Under the histogram are three markers. The two outer markers, called the “black point” and the “white point”, show where pure black and pure white appear on the horizontal scale of the histogram.

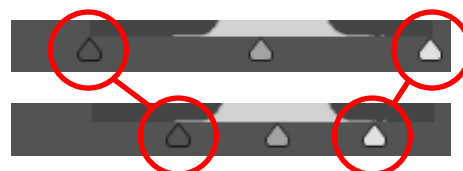
In this example, the black and white points are well outside the curve of the histogram.



Levels Adjustment

When we used the exposure and contrast sliders, we were adjusting the shape to fit the scale. In this case we are going to work the other way round: change the scale to fit the shape.

Select the black and white markers in turn and slide them to the edge of the histogram shape to show where you want to place pure black and pure white.



Move the Black and White Markers

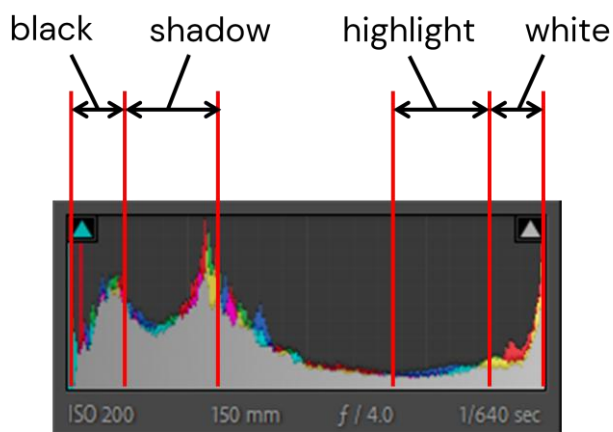
If you look at the overall histogram after moving the Black and White Points, you will see that it has widened to fill the whole of the horizontal scale. However, you can't get something for nothing. You may see gaps (vertical black lines) in the histogram indicating that some tones are now missing.

If you have lost detail in the highlights or shadows (or both) you will need to recover the lost detail during your RAW processing (you were using RAW files weren't you?)

The examples here use Lightroom but other RAW processors should be able to achieve the same result.

In this example, the shirt has been overexposed and converted to plain white with no detail. The histogram shows that the image is blocked to the right of the scale. It is actually blocked in the shadows as well but I am not worried about that!

Lightroom provides four sliders to control the levels: white, highlights, shadows and black. These four names refer to different regions of the Histogram

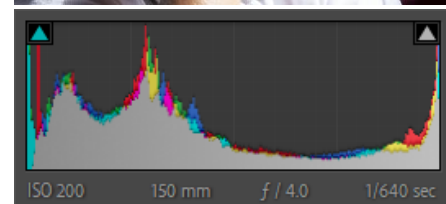


Regions of the Lightroom Histogram

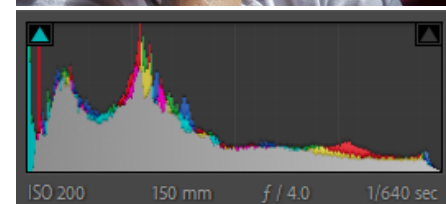
By moving the slider you move the corresponding part of the histogram. In fact, it's a bit like pressing on a piece of soft rubber. As you press in one place, the other parts of the histogram also move a little to allow for the change. As you move the sliders you can see the histogram changing to reflect what you are doing.

As you darken the highlights or white, or lighten the blacks or shadows, Lightroom will pull in more detail from the RAW file to fill in what would have been plain white or black.

In the example, I darkened the whites a little and the highlights a lot to get rid of the histogram peak at the white end of the scale.



Before Editing



After Editing