

UNDERSTANDING HISTOGRAMS

Robert Baumgartner
(www.baumgartnerphoto.com)

A histogram is a graph that depicts the various tones in an image. When a picture is taken, the image data captured as tonal values is depicted on the histogram and usually appears somewhat like hills, mountains, valleys and or plains. The dark tones are to the left with pure black being at the left edge and the light colors are to the right with pure white being at the right edge. The midtones are in the middle of the histogram. The height of the data at any point on the histogram indicates the number of pixels with the same tonal value. In addition to using the camera's histogram, histograms are also used in various software processing programs such as Photoshop to assist in processing the image. The availability of histograms in digital photography is one of its greatest attributes versus shooting film. A working knowledge of histograms and diligent use of them results in almost foolproof exposures.

USING HISTOGRAMS WHEN TAKING PICTURES

On most cameras a histogram can be displayed on the cameras LCD monitor after a picture is taken. It can be displayed by activating an information control menu. The first thing to check on the histogram is whether all the image data falls within the left AND right edges of the histogram. This is determined by looking to see that the data represented by any raised coloring on the graph has disappeared and flat lined before reaching either edge of the graph.

If any data butts directly against either of the edges, it is indicative that some data depicting aspects of the subject was not captured by the camera. If the data was lost at the left edge (black) than those tonal values were underexposed thereby leaving out any details of the lost data. (see Figure 1 attached). To adjust the exposure to capture this otherwise lost data, light, by the way of (+) increased exposure compensation would need to be added. This is added by way of a control wheel or switch on the camera. As exposure compensation is added, upon reshooting the subject or taking any other pictures under the identical lighting conditions, all of the data is shifted to the right or lighter side of the histogram and data which had been left off of the histogram now shifts onto the histogram indicating that it is data that has been captured. The amount of exposure compensation applied determines how far right the data shifts on the histogram.

Conversely, if data butts directly against the right edge (white), it is indicative that some tonal values were not captured by the camera and would be outside of the right edge of the histogram. (see Figure 2 attached). This is caused by overexposure, a.k.a "blowing out the whites". To adjust the exposure to retake this picture or take any other pictures under the same lighting conditions and capture the otherwise lost data, light must be (-) decreased by subtracting exposure compensation. As exposure compensation is decreased, the data is shifted to the left or darker side of the histogram and data which had been off of the histogram to its right now shifts to the left onto the histogram

indicating that it is data that has been captured. The amount of exposure compensation subtracted determines how far left the data shifts on the histogram.

Most experts advocate having a histogram that has its lightest tones just inside of the right edge (for a normal exposure). (see Figure 4 attached). Exceptions exist to this rule with the most obvious being images with silhouettes for which the histogram should have the silhouetted blacks underexposed with data pegged against the left (black) edge.

If a histogram shows that an image possess both overexposed and underexposed data then it means that the tonal range of the subject is beyond the capabilities of the camera's image sensor to capture. In order to capture an image such as this, adjustments have to be made to narrow the tonal range such as using fill flash, applying a neutral density filter, or shooting multiple images with different exposures and merging them in the image processing software on the computer.

USING HISTOGRAMS IN IMAGE PROCESSING SOFTWARE

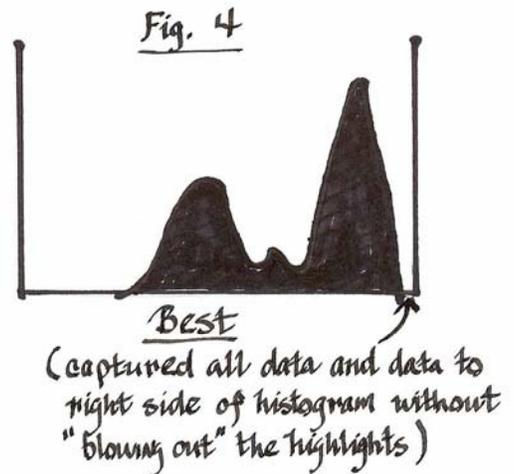
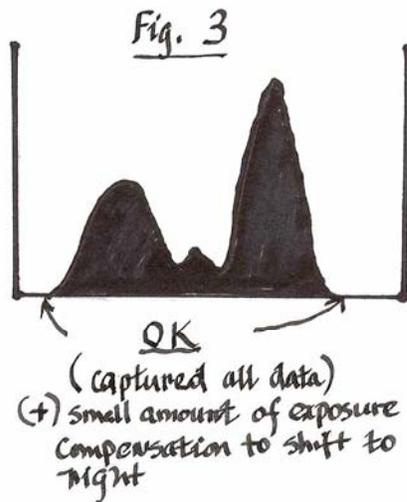
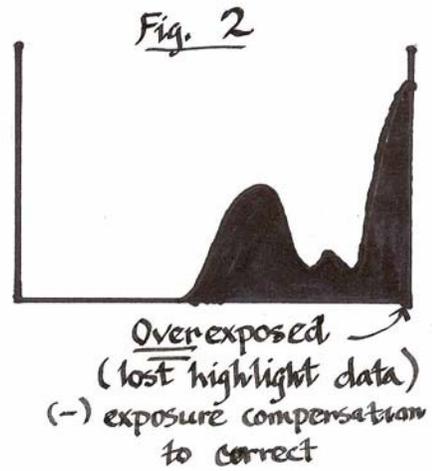
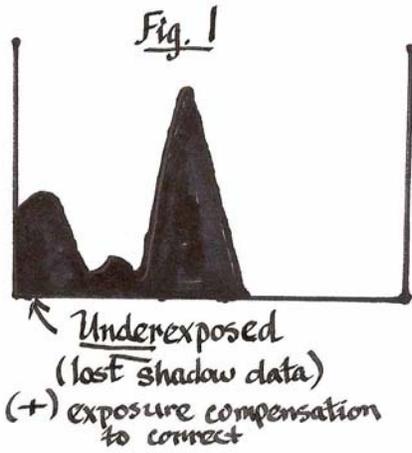
Histograms also appear and can be utilized during various steps in optimizing images when processing the images in the computer. The first opportunity to use a histogram to optimize an image in the computer is when converting a RAW file to a TIFF, PSD or other working format. Conversion software often allows you to view a histogram of the RAW image then (+) add or (-) subtract exposure compensation during the conversion action to optimize the exposure in the converted format.

Another use is in setting a good reference point for printing the images. A consistent problem with prints is "poor blacks" – blacks that are dark gray but not black. Lack of rich blacks often leaves an image looking flat with dull colors. A primary focus of the legendary darkroom work of Ansel Adams was to have a solid black in his photos (pure white is also important). Even in color photos, black is a reference for the eye so that the viewer can better understand the rest of the tones. Most photos should have some elements that are solid black and solid white (exceptions would include such things as fog shots).

Photoshop users can easily establish solid black in their photo by reviewing the LEVELS histogram and pulling the black (left) slider to the right to almost touch the closest data point. The left boundary of the histogram is solid black so by placing it next to the closest data point it renders that data point solid black.

Conversely, a solid white can be established by pulling the right edge of the LEVELS histogram to the left to nearly touch the closest data point. The right boundary of the histogram is solid white so by placing it next to the closest data point renders that data point solid white.

The midtones can then be lightened or darkened by moving the middle slider. Photoshop CURVES can be used to fine tune the midtones.



Attachment: 'Understanding Histograms'
Robert Baumgartner