# Working With Your Digital Camera's Histogram
By: Scott Bourne

While teaching a recent photography workshop, an older fellow in the back of the room raised his hand. He said, "I just bought me a new toy and she's a beauty! But I can't figure out how to make the hysterectomy work?" Fortunately, my student wasn't describing a woman. He was talking about how to pull up the histogram on his new Nikon digital camera. His confusion is not unusual. When I use my digital cameras around film people, one of the first things they see and ask about is the histogram. They want to know what it is, and how should they use it.
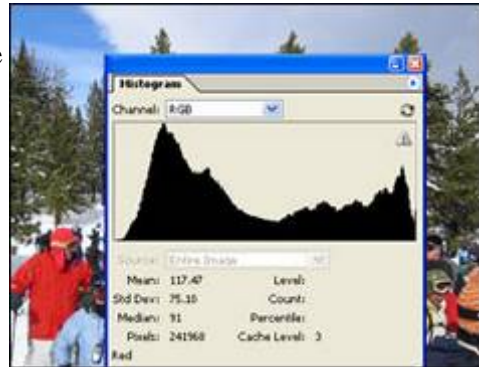
In this article, I will detail the basics of working with histograms.

Introduction

At its simplest, a histogram is a graphical representation (such as a bar graph) of digital data (brightness values) in a given image. According to Adobe, a histogram:

"[I]llustrates how pixels in an image are distributed by graphing the number of pixels at each color intensity level. This can show you whether the image contains enough detail in the shadows (shown in the left part of the histogram), midtones (shown in the middle), and highlights (shown on the right side of the graph) to make a good correction."

You can see an example of a histogram here at http://www.photofocus.com/histogram.jpg.

I like to think of a histogram as a very sophisticated lightmeter. It can help the digital photographer understand if an image is over or underexposed, and it can evaluate the quality of the light. Using a histogram you can determine things like whether or not the image is flatly lit or of high contrast. (Try doing that with your father's old Soligar meter!)

Histograms illustrate how 256 possible levels of brightness are distributed in a digital image. The histogram's horizontal axis represents the range of brightness from zero (0) (the shadows) on the left side of the graph to 255 (the highlights) on the right. Think of it as a football field with 256 yard markers (0 to 255) upon which the team can stack pixels of the same brightness. Since these are the only values that can be captured by the camera, the horizontal line also represents the camera's maximum potential dynamic range. In other words, the horizontal line (from left to right) represents increasing brightness in your image. The vertical axis represents the number of pixels that have one of the 256 brightness values. The higher the line goes (coming up from the horizontal axis,) the more pixels there are at that level of brightness. In other words, the vertical line represents an increasing amount of digital information from bottom to top.

If all you learn from this section of the article is that the histogram helps you to understand the tonal range of your image, you are ready to move on.

Using the Histogram
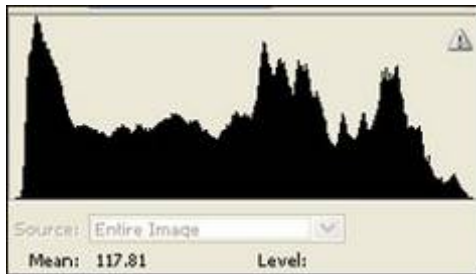
Histograms come into play in two places: in capture and in image processing. If you use a digital camera, it probably has a menu or command function that allows you to see a histogram for each image that has been captured in the camera's memory. For example, on a Canon 10D, you get the histogram by hittingthe INFO button.

By evaluating the histogram in the field, you can determine whether you captured enough information to get a good image out of Photoshop. For instance, if you look at the histogram and see that its graph has moved to the far right, it is likely that you have blown out the highlights and need to increase your shutter speed or close down your aperture to let in less light. With practice, you can learn to trust the histogram better than trusting the image displayed on your camera's LCD screen.

You can also get a histogram on the capture side of your digital workflow if you scan. Most scanning software allows the display of image data including the histogram.

One very technical point to remember is that there is a slight difference in the way your digital camera and Photoshop will represent the histogram. These differences are accentuated if you capture in 16-bit rather than 8-bit mode and then transfer the image to Photoshop using a linear mode. This is all techno-speak that leads us to the following point. After you have a digital image, and you have moved it into Photoshop, your Photoshop histogram then represents the true digital image.

Evaluating Histograms

Just as a pilot must learn to trust his instruments, photographers can learn to trust the exposure information contained in histograms. If you know what you want to photograph, how you want it to look and what the histogram should look like when you have accomplished your goal, you will walk away with a winner every time.

I use histograms to determine if there is enough detail in the highlights, midtones and shadows of my image. As long as there is enough data to work with, Photoshop can correct the image to look great on the screen or as a pirnt.

To get proper correction in Photoshop, you want to understand your image's "black point" and "white point." The black point is the darkest portion of your image and the white point is the brightest highlight of your image. (This is not the blackest black or whitest white your camera can record, but the blackest black and the whitest white in a particular photograph.) The information between the black point and the white point is known as the dynamic (or tonal) range of your photograph.

The Levels dialog box in Photoshop provides five places where you can adjust the distribution of brightness in your image. These are represented by small triangles. There are three on the

input side of the dialog box and two on the output side of the dialog box.

Most photographers use the three triangles located in the input side of the dialog box (located just below the histogram.) Here's how they work. Dragging the left (all black) triangle to the right darkens the image shadows. Dragging the right (clear) triangle to the left lightens the image shadows. Dragging the middle triangle (gray) to the left or right lightens or darkens the image midtones.

There are two additional triangles in the output side of thedialog box. They have nearly the opposite effect of the triangles located above. Dragging the left (all black) triangle to the right lightens the image shadows. Dragging the right (clear) triangle to the left darkens the image highlights.

Correcting the Image Using the Histogram

Establishing a white and black point by dragging the image triangles is where a great portion of your color and contrast range correction will take place in Photoshop.

You can set the highlights and shadows in an image by moving the input sliders on both ends of the Levels histogram. This correction adjusts the affected pixels in each channel, increasing the tonal range of the image. The corresponding pixels in the other channels are adjusted proportionately to avoid altering the color balance.

You can also use the middle Input slider to change the intensity values of the middle range of gray tones without dramatically altering the highlights and shadows. While there are other slightly more precise ways to accomplish this in Photoshop, this method works well for 95% of images.

Conclusion

Whether or not you intend to go digital, you will eventually have to deal with some of the digital world's conventions. Histograms are a basic component of digital imaging. Understanding their value and how they work will benefit even those photographers who intend to send their images to the lab.