Thinking Digitally

The first step in digital photography is to create the best possible picture in the field. The second step is to optimize that capture and use software to present the final image in the best possible way. Digital photography requires embracing some new concepts and choosing the best tools to get the job done. The better your photographic techniques and the more efficient your workflow, the less time you'll spend on the computer doing mundane tasks and fixing mistakes. That will leave more time for photography itself as well as creative interpretations of the images using Photoshop.

This chapter covers some of the concepts you need to consider in the field and other choices you may face.

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Chapter Contents

Photographic Techniques

It really doesn't matter whether you are using film or digital to capture your images—the basics remain the same. Digital photography and Photoshop are not excuses to be sloppy. You still have to do everything possible to take the best pictures you can in the field. That way, the time you spend at your computer will be devoted to optimizing images, being creative, and perhaps other business, rather than trying to compensate for mistakes you made while taking the pictures.

With digital capture you still need to use most of your photographic tools to help create the best images possible, including tripods, mirror lockup, and cable releases when appropriate. Although we claim to sharpen images in a raw converter or Photoshop using the Unsharp Mask or Smart Sharpen filter (techniques described in Chapter 10, "Output"), this sharpening is not designed to fix an out-of-focus picture. Rather, its intent is to compensate for the slight softening that occurs in the digital process.

Focus carefully and accurately so that you capture the sharpest picture you can. Use a tripod whenever it's reasonable. In fact, using a tripod is essential when you want to combine images to expand exposure latitude, and it's highly recommended when you intend to create a panorama by stitching together several individual photographs. If you don't use a tripod when taking several pictures at various exposure settings in order to create an exposure latitude composite, then when you try to combine them into a single image (discussed in Chapter 8, "Composites"), the images won't combine properly; in fact, they may not merge at all. If you try to shoot a panorama without a tripod, you're likely to encounter all sorts of complications when you try to stitch them together, a topic also covered in Chapter 8.

You need to use a polarizer or split neutral-density filter when appropriate, even though it's essentially possible to digitally create a custom neutral-density filter by combining exposures or by using adjustment layers and layer masks, all of which are covered later in this book. If the scene lends itself to using a split neutral-density filter, as in Figure 1.1, it will save you time and effort later, so use it!

Similarly, you need to choose your camera settings such as Aperture Priority, Shutter Priority, or Manual to create the type of image you have in mind. Planning to use Photoshop is not an excuse to suddenly rely on the fully automatic shooting modes. Many nature photographers shoot in Aperture Priority or Manual because controlling the depth of field is their primary concern. If you envision a picture with a shallow depth of field, photograph it that way using a wide aperture to begin with rather than relying on one of the blur filters within Photoshop. Use a filter later to accentuate the effect if desired. Occasionally, nature photographers may choose to use Shutter Priority for a specific need such as to create a blur of birds in flight (like the ones shown in Figure 1.2) or to create a pleasing softness to moving water. Although you can create motion blurs in Photoshop, planning your image ahead of time (for example, using a slow shutter speed combined with panning) enables you to capture images with motion effects that would require a lot more time to make digitally. In some cases, you can capture motion effects that would be nearly impossible to re-create in Photoshop, because objects closer to you blur more than objects that are farther away.

Figure 1.1
Use good photographic techniques, including tripods, cable releases, and even split neutral-density filters, when appropriate, to capture the best images possible and then optimize them in Photoshop for impact. (Photo by Ellen Anon.)

Figure 1.2
It is doubtful you could re-create this blur effect in Photoshop. (Photo by Ellen Anon.)

Compose carefully. Of course you can crop the image later, but that means you will be cropping away pixels, leaving fewer pixels. With fewer pixels your final image will have less detail and may not be able to be printed as large as you had hoped. Take the time to create a pleasing composition so you can use all the pixels your camera is capable of capturing.

Careful metering is as important as ever, even though you now have histograms to give you immediate feedback as to whether the exposure is correct. Meter as you always have, but make it a habit to check the histogram, at least for the first image in a series, to see whether you need to tweak your exposure.

Note: A full discussion of photographic techniques is beyond the scope of this book, but we recommend *Mastering Digital Photography and Imaging* by Peter K. Burian (Sybex, 2004).

Throughout this book, we've asked some of the top nature photographers in the world to share some of their insights and favorite tips for using Photoshop effectively. Here, in the first of these "pro" sidebars, Charles Glatzer, M. Photog., briefly shares some thoughts about shooting digitally. Glatzer, a professional photographer and teacher for more than 20 years, hosts "Shoot the Light" instructional photographic workshops throughout the United States and abroad. His images are recognized internationally for their lighting, composition, and attention to detail.

Getting It Right in the Camera

by Charles Glatzer

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Consistency is key to my livelihood. When capturing images in the field, I eliminate as many variables as possible.

To consistently transpose the images we see in our mind to the capture medium, it is necessary to previsualize the result. Previsualization is possible when one has gained technical proficiency. Knowing the photographic fundamentals and being able to see and understand light, its quality and quantity, its physical properties, etc., and how they relate to your subject and capture medium will allow you to take control of your imagery.

And, although Photoshop affords me the ability to apply levels, curves, contrast, and saturation adjustments while tweaking exposure and color balance to an image, I prefer to get it right in the camera. In doing so, my workflow is now faster and more productive, allowing me to transpose the image I captured on my CF card to the printed page more efficiently.

Translation: I can spend more time in the field.

Choosing RAW versus JPEG

It's funny how this has become such an emotionally charged topic for some, almost akin to the classic "which is better?" debates, such as Nikon versus Canon or Apple versus Microsoft. The truth is both formats have advantages and disadvantages, which we'll discuss. However, the evolution in software to convert raw images has made it just as easy, and in some cases more efficient, to use raw files rather than JPEGs.

Before considering the benefits of each format, we'll define what each one is. RAW is actually a pseudoformat used to refer to a lot of camera manufacturer proprietary formats: Canon CR2 and CRW, Nikon NEF, Olympus ORF, Fuji RAF, and more. It's a category of files rather than a specific file format like JPEG and TIFF. raw files are similar to film negatives. They're files containing all the information about the amount of light that was captured by each sensor. Parameters such as color space, white balance, sharpening, saturation, contrast, and so on, are recorded as metadata or tags, but they're not applied to the image in-camera. You can still readily modify all these parameters at the time of conversion.

JPEG is a file format that uses lossy compression each time you resave your file in order to decrease the file size. This means as the pixels are compressed, data is thrown away, even the initial time when the camera first writes the image. Each time thereafter that you resave your image, it is recompressed, and more data is lost. Although you may not notice any problem with the initial image, if you resave an image often, you are likely to see some degradation in image quality. Figure 1.3 presents sections of the same image at 100 percent magnification. The first image was a raw file saved as a TIFF file; the second image was resaved numerous times as a JPEG to illustrate the potential image degradation that can occur.

Figure 1.3 A section of an image originally captured as a raw file and the same section after being resaved multiple times as a JPEG. (Photo by Ellen Anon.)

TIFF is a generic file format people often use to save their raw files after conversion or to save images that were initially shot as JPEGs. TIFF files can be compressed, but they use lossless compression, so you can resave your files with no loss of image quality. TIFF files are larger than JPEG files, meaning that they require more space on a hard drive.

Another difference among these formats has to do with something called *bit depth*. Many nature photographers start to feel over their heads when computerese slips into the discussion, but bit depth isn't very complicated. In simple terms, a *bit* is the smallest unit of information that can be recorded digitally—either a 1 or a 0—and it refers to black or white (even in a color image). In an 8-bit image, each color channel (red, green, and blue) contains 2^8, or 256, possible tonal values. Since each channel has 256 possible tonal values, each pixel has 16.7 million (256×256×256) possible color values, as shown in Table 1.1.

Table 1.1 Colors and Bit Depths

Bit Depth	Typical Format	Possible Colors per Component	Possible Colors per Pixel
8 bits	JPEG	256	16.7 million
12 bits	raw	4,096	68.7 billion
16 bits	PSD, TIFF	65,536	281 trillion

Now, 16 million may seem like more than enough, but in reality, at times the transitions between tones in an 8-bit image are not smooth, which is called *posterization* or *banding*. Twelve-bit images, which is what most cameras can capture in raw, have 4,096 tonal values for each color channel, which means a choice of 68.7 billion (4096×4096×4096) possible colors. Tonal gradations are much smoother with so many possible values for each pixel.

JPEG images are limited to 8 bits, so some JPEG images may demonstrate posterization. Although not a problem for many images, some images, particularly those requiring smooth gradual transitions of color and tone, such as sunset pictures, may show evidence of banding. Clearly, more detail can be accurately conveyed the higher the bit depth. Eight-bit color files used to be common, but 16-bit images are now the standard for most photographers. Even 32-bit files are starting to emerge and can be created using Photoshop's Merge to HDR, which we'll cover in Chapter 8. (HDR stands for *high dynamic range*.)

It can seem confusing initially that in Photoshop you have options to use 8-bit or 16-bit images (even 32-bit if you've created an HDR image). If you have a JPEG image, it is clearly an 8-bit image. When you convert a raw file, which is usually a 12-bit file, you can convert it as either an 8-bit file or a 16-bit file. Converting into an 8-bit file results in a smaller file in which you have discarded 3,840 possible tonal values per color channel. That's a lot to throw away!

When you convert a raw file that is initially 12 bits into 16-bit space, you retain all your original data. You can use the additional tonal values as you make adjustments to the image. In other words, as you tweak the color and tonal values within the image, the adjustments can take advantage of the additional tonal options. Way back in Photoshop 7, there was minimal support for 16-bit images, but Photoshop CS, CS2, and CS3 all offer considerable support, making it logical to convert into 16-bit space.

What's So Great About RAW?

A lot of things! As just described, you have many more possible tonal values, which offer the possibility of more accurate detail in your photos and smoother tonal transitions. But raw has other advantages as well. For example, you can "expose to the right" (as we'll described shortly) and then correct the exposure in the raw converter to optimize the signal-to-noise ratio and have the most accurate tonal information with the least problems from noise.

More important, all the information captured by the sensor is available, and during the conversion process, you get to determine how it appears. A tremendous amount of flexibility and control is available to you as to how to present the information you captured on the sensor, as you can see in Figure 1.4. The raw capture (top) was converted with settings that revealed significantly more color than was captured in the JPEG version (bottom) of the same image. No pixels have been damaged, and yet the image is significantly more dramatic.

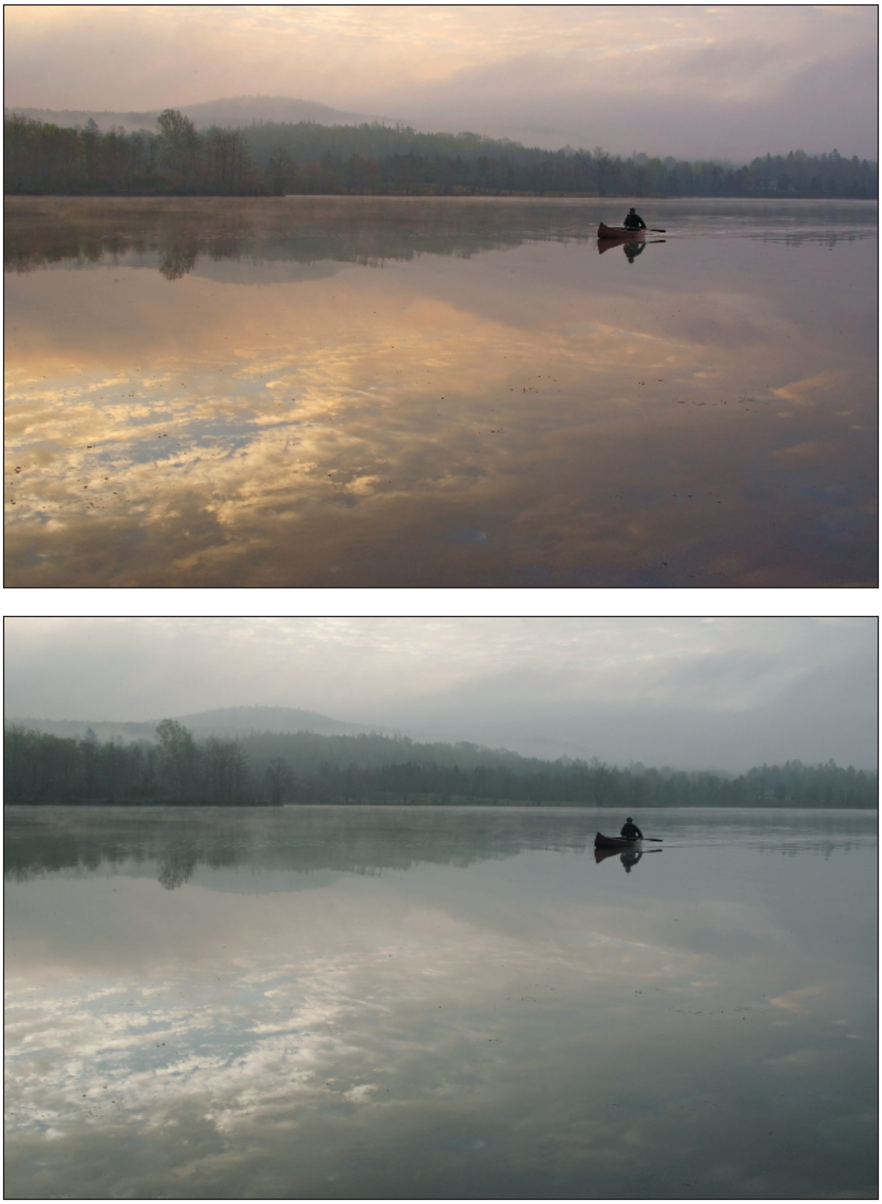

Figure 1.4 The raw capture (top) was converted with settings that revealed significantly more color than was captured in the JPEG version (bottom) of the same image. No pixels have been damaged, and yet the image is significantly more dramatic. (Photo by Ellen Anon.)

You can modify the exposure of raw files after the fact, making the image lighter or darker, sometimes significantly lighter or darker. In most cases, you can tweak the exposure in the raw converter such that there is rarely a need to bracket exposures by a third of a stop in the camera anymore, except when you are in danger of clipping your highlights. *Clipping highlights* means you have overexposed your image and captured no detail in the highlights. Although you can instruct the converter to distribute the information the sensor captured in ways that will maximize the contrast, decrease it, or change the white balance, and so on, what you can't do is to re-create information that isn't there. So if you have highlights with no information or shadows with no information, you may be able to lighten or darken them, but you won't be able to re-create detail within them.

That may make it seem that you would be wise to underexpose rather than overexpose, but the fact is that more noise may become visible in the image when it is lightened, as shown in Figure 1.5. For the best results, try to limit lightening in a raw converter to one stop or less. We'll talk more about this issue later in this chapter when we discuss exposing to the right.

In addition to being able to make final decisions about parameters such as exposure, contrast, white balance, color saturation, and more in the raw converter, you can even select the color space there. Usually you will want Adobe RGB (1998), which is a wide color space that correlates well to the colors most ink-jet printers can print. When capturing as JPEG files, most cameras use the sRGB color space, which has fewer colors available. sRGB is particularly suited for web use and projection use. We'll talk more about color spaces in Chapter 5, "First Steps."

Note: If your camera allows you to select a color space, Adobe RGB (1998) is a good choice for nature photographers.

RAW also offers you the ability to easily fix some problems that occur in some images, such as noise reduction for images taken using higher ISOs, chromatic aberration that occurs with some lenses resulting in fringing, and vignetting. We'll explain how to identify these potential problems and how to easily minimize or eliminate these issues using Adobe Camera raw in Chapter 3.

It used to be that the downside of all this flexibility and capability was that in order to use raw images you had to convert them. Although you still have to convert a raw file before final output, new software such as Aperture and Lightroom make it as easy to work with raw files as with JPEGs. We'll talk more about those programs later in this chapter. Photoshop CS2 offered a feature called *smart objects*, which allowed you to place a raw image in your PS file and adjust it at will. The technology was new enough then and had some limitations, so we didn't adopt it as part of our regular workflow at that time. In CS3, Smart Object technology has been improved to make it practical to incorporate raw files right into our PS documents. We'll cover this more extensively in Chapter 5.

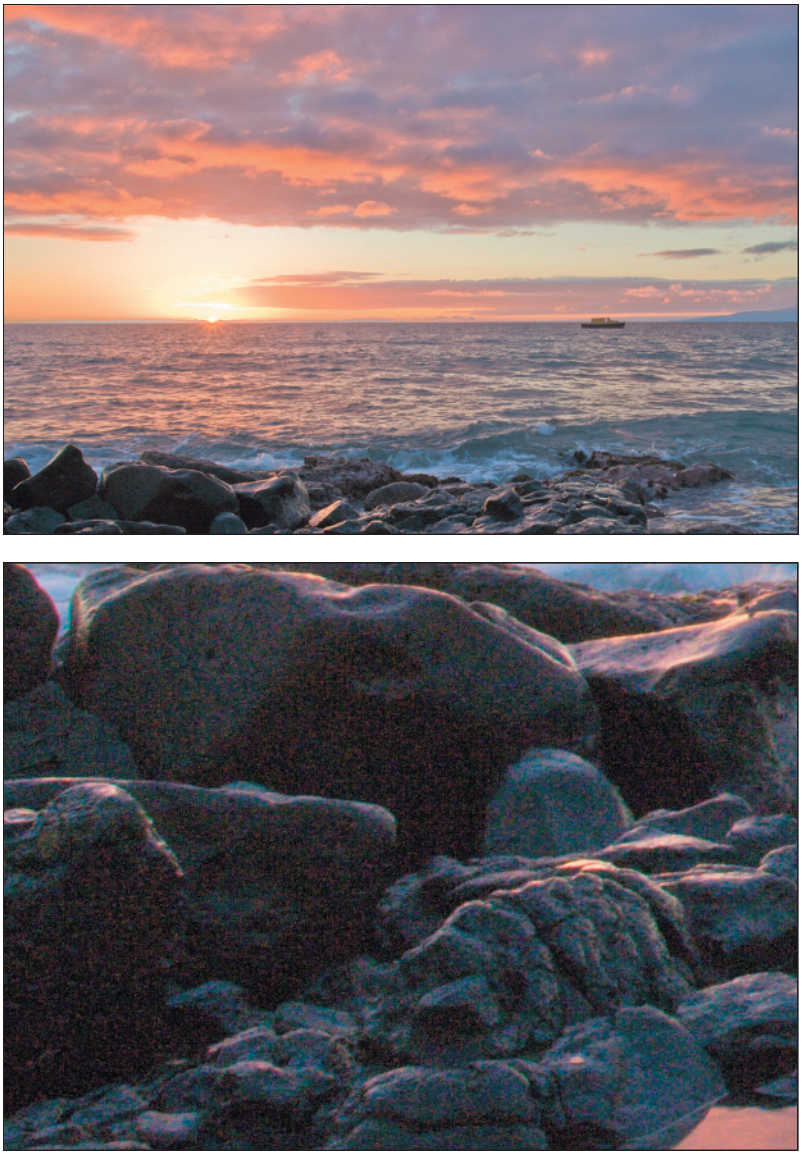

Figure 1.5 Lightening the rocks revealed considerable color noise—the magenta, green, and blue blobs on areas of the rocks that should be shades of gray. (Photo by Ellen Anon.)

Many people are happy using the converter in Photoshop called Adobe Camera raw, noting the ease of workflow with Adobe's Bridge program. (We'll look more closely at using Bridge—which replaced the File Browser used in versions of Photoshop prior to CS2—in Chapter 2 and at AdobeCamera raw in Chapter 3.) Some users prefer a separate raw converter program, whether developed by third-party software makers (for example, Capture One, Bibble, or BreezeBrowser) or supplied by camera manufacturers. As mentioned, other people are using Aperture or Lightroom, which incorporate the converter into the image-editing program.

The one remaining notable downside of shooting in RAW is you will need a lot more storage space, both in your camera and on your computer, when you capture in raw than if you use JPEG.

Advantages and Disadvantages of Taking JPEGs

Taking JPEGs does offer some conveniences. For example, capturing in even high-resolution JPEG means you need less storage space; a 1GB compact flash card will make you feel like you can shoot forever. Also convenient is that JPEG images are ready for you to edit or resize and show others in slide shows, emails, or whatever you desire (although programs such as Aperture offer these same conveniences for raw files).

But JPEGs have two *huge* downsides. One is that whatever your camera settings are, including color space, contrast, sharpening, white balance, exposure, and saturation, they are applied to your image at the moment of capture. Any changes must be done within Photoshop itself to this 8-bit image and will result in some destruction of pixels and therefore image degradation. In reality, this may often be so slight that it's not noticeable, but it's there. And, sometimes the differences may be huge. For example, if you accidentally use the wrong white balance, a JPEG image may seem nearly useless at first and at best may require extensive corrections in Photoshop. But the extent of the exposure corrections you'll be able to make will be less because you'll have only an 8-bit image to work with, and extensive Photoshop corrections may result in posterization or noise. Furthermore, as discussed earlier, a JPEG file is compressed lossy, which means that even when you first open it on your computer, it has already thrown away some information the sensor captured when you took the picture. Sometimes this is not noticeable, but at other times it can result in banding and other strange artifacts.

Which is right for you, JPEG or RAW? For most serious amateur and professional photographers, RAW is the way to go. If you make large prints and want the best images you can get, RAW is without a doubt the way to go. If time and convenience are your priorities and if you primarily post your images on the Web, email them to friends, and make only an occasional tiny print, then JPEG may be for you. If you plan on selling your images or entering contests, check with your intended clients or the contest rules, because some will require you to provide the original raw file as well as the converted image.

Try It! Shoot a series of images in raw and in JPEG. Expose them to the best of your ability in JPEG and then use the same settings for the raw version. Then shoot one set with an incorrect white balance setting. Capture a variety of scenes, including some with shadow areas, some with significant highlight areas, and some more average-toned scenes. See whether you can detect a difference in the optimized versions. You may have to wait until you finish a few more chapters so you can optimize both versions of the pictures to their maximum potential for your final decision.

Understanding Histograms

Without a doubt one of the most important advantages of shooting digitally is the ability to check the histogram to ensure you are exposing your images correctly. In the old days—that is, just a few years ago, before digital was so common in the field—wherever there was a group of photographers shooting similar subject matter, you'd inevitably hear someone ask, "What are you shooting at?" People felt comfortable with their compositions but always worried about setting the exposure correctly, knowing that as little as 1/3 stop difference could mean the difference between an awesome image and a throwaway.

With digital cameras you can review your shots on the small LCD screen on the back of the camera. Although this may be somewhat helpful for double-checking your composition and to a certain extent to check for sharpness, the real value lies in displaying the histogram. Get in the habit of checking the histogram in the LCD on the camera back (like the one shown in Figure 1.6). In addition, if your camera has a flashing highlight overexposure alert feature, be sure to enable it. The alert will cause the area of the picture that appears to have clipped highlights to blink or have marching ants. That way you'll know immediately what areas may not have highlight detail, and you can decide whether you need to modify your exposures.

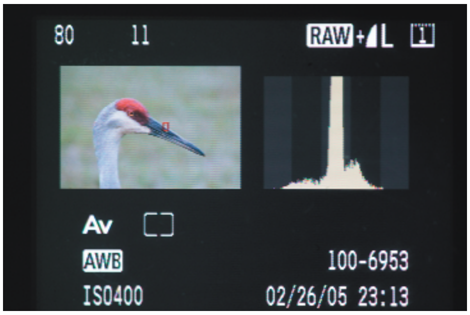

Figure 1.6
The major value of the LCD screen on your camera back is the chance to review the histogram and double-check your exposure.

What is a histogram? A *histogram* is simply a bar graph showing the distribution of the tonalities (lightness/darkness) of the pixels you captured in the image. Each pixel not only describes a color value but also a brightness value. The tonal range extends from pure black on the far left to pure white on the far right, with the different tonalities in between. This means that dark tones are toward the left, middle tones are in the middle, and light tones are toward the right. The higher the peak corresponding to any particular value, the more pixels there are of that particular tonality within the image.

Types of Histograms

All histograms are not the same. Many cameras display an RGB histogram that is a combination of the pixel values in each of the three channels. This is different from a luminosity or brightness histogram that other cameras use. The data in a luminosity histogram is a weighted combination of the values in each channel. Still other histograms show each channel individually. Each type of histogram has advantages and disadvantages.

Luminosity histograms are easier to use to determine if you have areas within your image that are pure white or pure black, lacking detail. The only time a pixel will register against the far-right or far-left side of a luminosity histogram is when all three channels have a value of 0 or all three have a value of 255. With a luminosity histogram, there is no question that if you have a spike of data on either edge, you have pure black and/or pure white areas in your image, as shown in Figure 1.7.

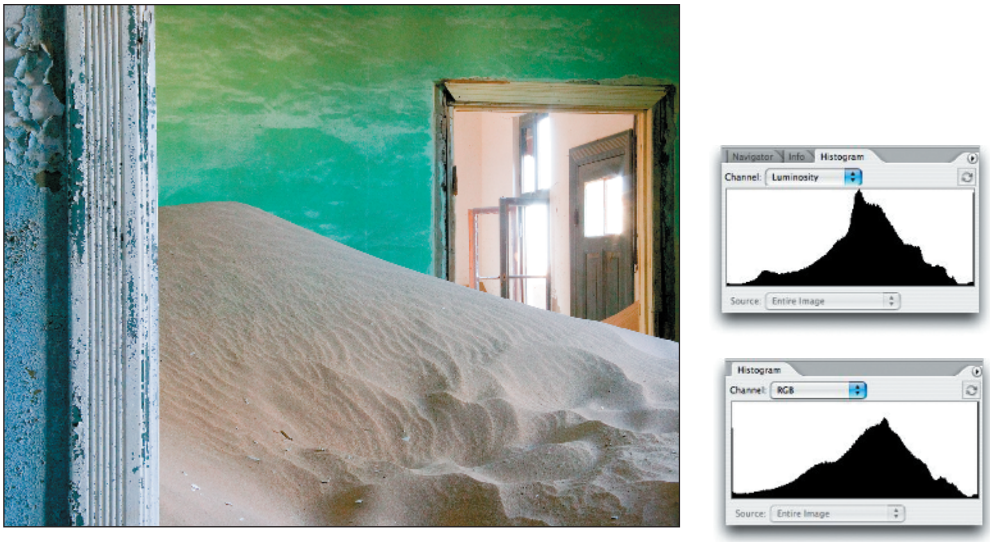

Figure 1.7 When a luminosity histogram has a spike on one or both edges, you can be certain that the image has areas that are pure white or pure black, like the windows in this image. (Photo by Ellen Anon)

RGB histograms sometimes look very similar to their luminosity counterparts, while at other times they differ substantially. An RGB histogram presents all the data from each channel, so if just one channel has a value of 0 or 255, you will see data peaking against the edges of the histogram. It will appear that you could have highlights or shadows without detail when in fact that may not be the case, as shown in Figure 1.8.

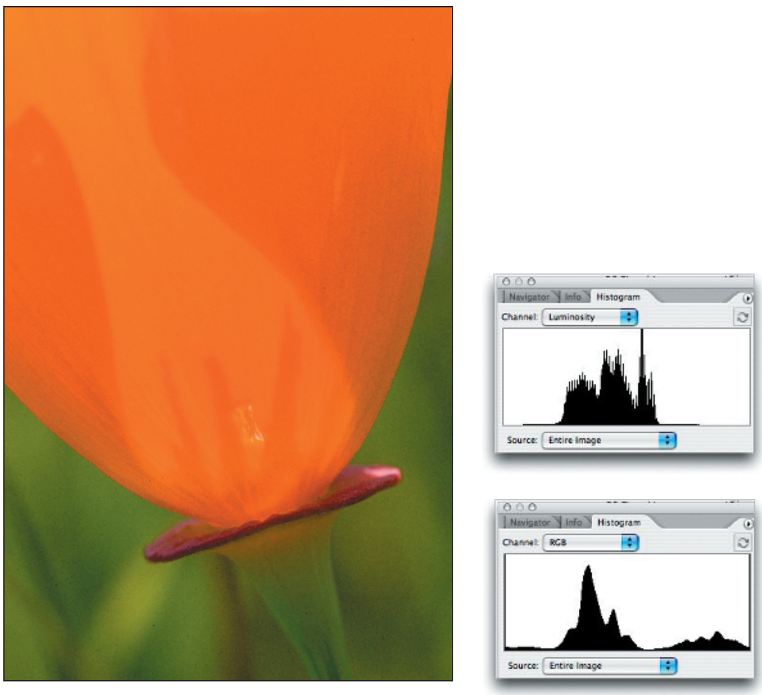

Figure 1.8 If your image contains very saturated colors, the RGB histogram may indicate potential blown-out and/or blocked-up areas, whereas a luminosity histogram will clearly indicate that these areas are not close to being pure white or pure black. (Photo by Ellen Anon.)

RGB histograms may have spikes on the edges when there are no white or black areas because some colors legitimately have one or more channels with values of 0 or 255. For example, pure red is represented by RGB values of 255, 0, 0; pure green would be 0, 255, 0; and pure blue would be 0, 0, 255. Similarly, cyan is 0, 255, 255; magenta is 255, 0, 255; and yellow is 255, 255, 0. But those are not the only colors that use the extreme values of 0 and 255.

Any color that has a value of 0 or 255 in a single channel will contribute to a spike on the edge of an RGB histogram. For example, the purple in Figure 1.9 has a color value of 132,0,189. In an RGB histogram any pixel that shade of purple will contribute to a spike in the shadows, making it appear as if there are blocked-up shadows when there may not be. That same shade of purple will be represented by data at the point corresponding to a tonal value of 60 in a luminosity histogram…far away from either end of the histogram.

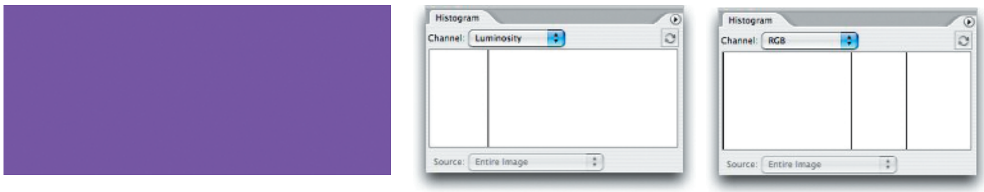

Figure 1.9 Checking the histogram for a color such as this shade of purple that has RGB values of 132,0,189 clearly indicates how an RGB histogram differs from a luminosity histogram.

Checking the histogram for a color such as this shade of purple that has RGB values of 132,0,189 clearly indicates how an RGB histogram differs from a luminosity histogram.

That may make it seem like it would always be easier to use a luminosity histogram. The issue is that if you have a subject with very saturated colors, such as a poppy or a bright red cardinal, in reality the colors vary slightly to allow you to perceive detail in the flower petals or the bird's feathers. So, you need to have the tonal values varying. If a lot of the pixels are values that contain 0 or 255, the chances are that you don't have as much detail in those colors as you may need. A luminosity histogram would give you no indication of any potential trouble, whereas an RGB histogram would be clearly indicating overexposure and/or underexposure. By adding or subtracting light from an exposure, you may be able to capture those areas of the flower or bird with more detail.

Which type histogram should you use? That depends. Many cameras offer only one or the other type of histogram, while some of the newer models offer a choice. What's most important is to be aware of what type of histogram your camera uses so you will understand precisely what the data is saying.

Interpreting Histograms

Some people mistakenly think that an ideal histogram would be a bell-shaped distribution of pixels. *In fact, there's not a single ideal histogram for all images*. Rather, the ideal histogram for an image is one that captures all the data within that particular image. Let's look at a series of pictures and their histograms.

Figure 1.10 shows a good histogram for an average scene with a full range of tonalities. Note that the pixels extend across the entire histogram, but there are no spikes at either end. Spikes at the ends would mean you have pixels that are overexposed and/or underexposed and therefore areas with no detail. Since all the pixels fall within the bounds of the histogram, this picture will have detail throughout.

Figure1.10 This is an ideal histogram for a scene with a full range of tonalities. (Photo by Ellen Anon.)

Figure 1.11 shows an underexposed picture. All the pixels are in the left portion of the histogram, indicating no light tones. Since you know that the pelican is in fact white, a proper exposure would have the pixel distribution moved to the right. If you are shooting a subject with a large light area and see a histogram that looks like Figure 1.11, you need to add light to your exposure.

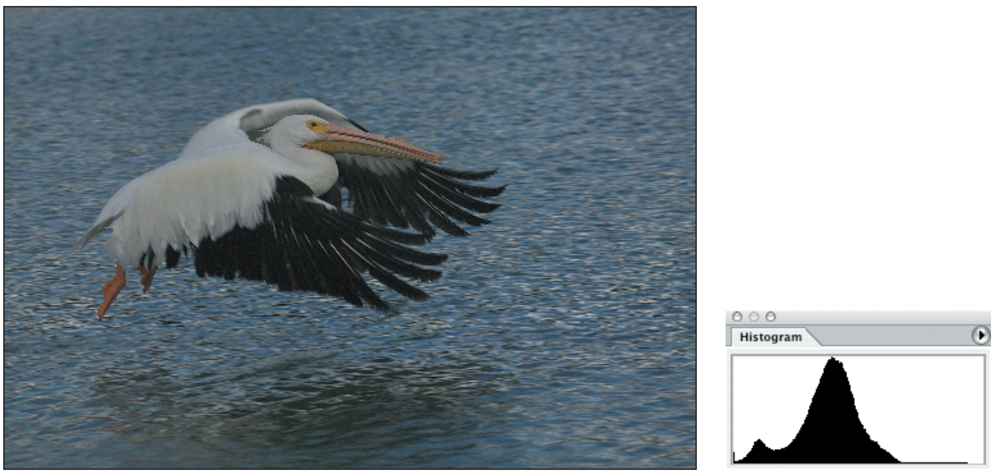

Figure1.11 This picture is underexposed. Note that all the data in the histogram is skewed toward the left and there are no light tonalities. (Photo by Ellen Anon.)

Compare the image and histogram in Figure 1.11 with those of Figure 1.12. The latter is a well-exposed picture with an ideal histogram of an overall dark scene with a few bright areas. If the exposure had been any brighter, the whites would have been *blown out* and lost their feather detail. *Blown-out highlights* means that no detail has been captured in the brightest areas of the picture. It’s another way of referring to clipping. Although the darker portions of the picture may need to be lightened in the raw converter or in Photoshop, this is the ideal in-camera capture because it captures all the detail information in both the highlights and the shadows. Don’t get confused between an ideal in-camera histogram for the capture and the final histogram of the optimized image, which may be noticeably different. The goal in-camera is to capture all, or at least as much, information as possible. Once you have the information, you can modify it as you tweak the image, but information you don’t capture in the first place is not going to be there no matter what!

Figure1.12 Overall dark scenes with small bright areas will have histograms that look like this. This is not underexposed, even though the data is skewed toward the left, as in Figure 1.11. (Photo by Ellen Anon.)

Figure 1.13 shows an overexposed image. Note the spike on the right side of the histogram indicating blown-out highlights. Unfortunately, no amount of Photoshop magic can restore data that was not captured. Checking your camera’s histogram regularly, and using the highlight alert feature in your camera, can avoid the frustration of taking an entire series of pictures like this.

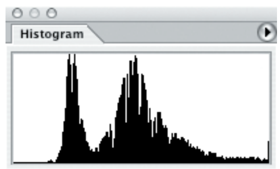

Figure1.13 The whites in this image are blown out, as indicated by the spike on the right side of the histogram. (Photo by Ellen Anon.)

Now compare the histogram and picture in Figure 1.13 with those in Figure 1.14. This picture of white birds on a nearly white sky is not overexposed, although most of the pixel data is skewed toward the right. This is the type of histogram you want in this type of situation—light background and light subject with minimal dark areas.

Figure 1.15 shows a histogram of a high-contrast scene. It has a spike on the left side of the histogram, although the data extends through the tonalities all the way toward the right of the histogram. There is no way to capture this shot at this time of day without losing either some highlight detail or some shadow detail. Ordinarily it's better to preserve the highlights and sacrifice some shadow detail, as was done in this image. An alternative appropriate for some situations, which we will discuss later, is to shoot multiple exposures and combine them in one image.

Figure1.14 A light subject with a light background will have a histogram that is skewed toward the right. (Photo by Ellen Anon.)

Figure1.15 This scene has too much contrast to capture in a single shot. The spike on the far left of the histogram shows that there is some loss of information in the shadows, but the highlights have been preserved. (Note that the small spike on the right is just before the end of the histogram.) (Photo by Ellen Anon.)

Finally, let's look at the histogram of a silhouette in Figure 1.16. As you may expect, the far-left side of the histogram shows a spike, but in this case it doesn't mean the image is underexposed. On the contrary, we want silhouettes to be pure black! Sometimes when you shoot a silhouette, the spike won't be all the way toward the left. The reason for this is you will need to expose the image so that you capture the most detail possible in the rest of the image. This will mean exposing to the right (which we'll discuss later in this chapter) even if the silhouette is then too bright. It's a simple matter to darken the silhouette in the raw converter or in Photoshop. By exposing to the right and then darkening part of the image, the darkest tones will have less noise.

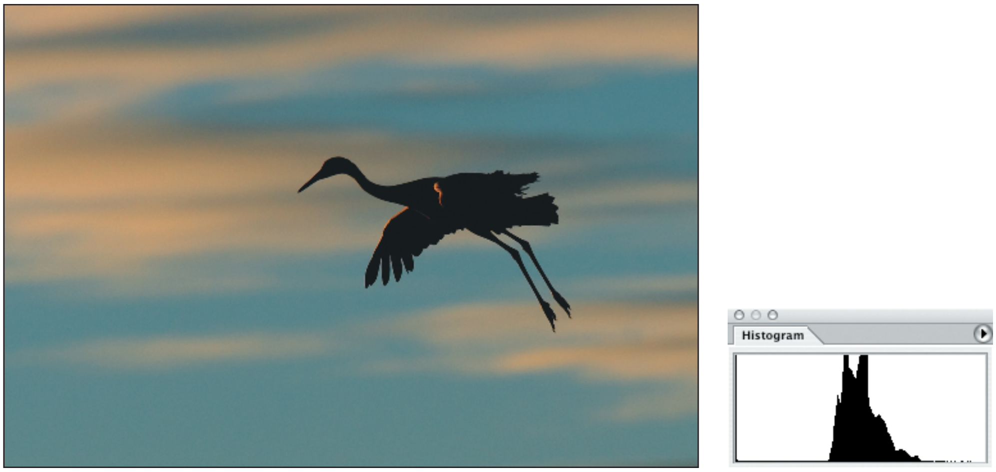

Figure1.16 Silhouettes will often have histograms that have a spike on the left side indicating areas of pure black. (Photo by Ellen Anon.)

The bottom line is that there is no single ideal histogram for every situation. You have to think about the tonalities in your image and where they should fall on the histogram to know what is ideal for any particular situation. It's important to make sure you don't have spikes at the extreme ends of the graph, since that could mean shadow or highlight areas without detail. However, when the lighting has so much contrast that you can't avoid spikes on one or both ends of the histogram, you must consider the tonalities of your subject and preserve as much detail as possible in the subject. If necessary, you can forgo some detail in the background. Normally the order of priorities is to preserve detail in the subject; don't clip the highlights, even in the background; and maintain shadow detail including in the background. If your subject has a very dark area and the background has bright areas—such as bright clouds—you may opt to maintain the detail in the dark areas of your subject, at the expense of the detail in the clouds.

Of course, if you are shooting a silhouette, a spike at the left side of the histogram indicating blacks for the silhouettes is acceptable, while any specular highlights may be fine as pure white. But for most images, in order to capture detail in both the shadows and the highlights, you want the tonalities to fall within the boundaries of the histogram.

Note: Some photographers new to digital and Photoshop think they don't have to worry about exposure anymore because they can "fix it later" in Photoshop. The harsh reality is if you blow out the highlights or totally block up the shadows, the only "fix" will be to clone in pixels from other areas. Photoshop gives you lots of ways to tweak the exposure, which we'll explain in Chapter 6, "Exposure Adjustments," but if the data isn't there because of overexposure or underexposure, Photoshop isn't going to create it for you.

Exposure

If you check the histogram and see that you have a spike at the far right and room on the left side, you need to modify your exposure to have less light. If you are shooting in Aperture Priority, you may choose to put in some minus exposure compensation, or if you are using manual mode, either use a smaller aperture or increase your shutter speed. Because you're shooting digitally, you have a third option—to switch to a slower ISO. Although you still need to set the correct exposure compensation, you can use the same depth of field/aperture setting as you originally wanted (perhaps in an effort to keep the background out of focus) and the same shutter speed (perhaps in an attempt to blur your subject).

Similarly, if the histogram is indicating a spike at the black end and has room on the right side, you'll want to add light via plus exposure compensation, slower shutter speeds, wider apertures, and/or possibly a faster ISO to allow you to use the desired apertures and shutter speeds. Faster ISOs—those with the larger numbers—mean that less light is required to hit the sensor to achieve the proper exposure. The problem with this is that the faster the ISO, the more noise the picture may have. Some cameras have less noise while using higher ISOs than do other cameras. Test your own camera to determine the highest ISO you can use without noise becoming an issue. When using a higher ISO, be extra careful not to underexpose your image. In general, use the slowest (smallest number) ISO that you can.

Note: Usually, the lower the ISO, the less noise you will encounter. Noise is in many ways the digital equivalent of film grain, except that it tends to be more evident in darker shadow areas. It appears as variations in color and tonality in areas that should be smooth.

Technically, the ideal histogram for a raw image should not only contain all the pixels with no spikes at the ends, but also it should be exposed as far to the right as possible with no blown-out highlights. This is to obtain the best signal-to-noise ratio possible. (It is important to keep in mind that this applies to raw images but not to those captured as JPEGs because the main benefits occur in the process of the conversion. If you are shooting in JPEG, make the most accurate exposure you can, and make sure you're not clipping data on either end.)

Michael Reichmann does an excellent job of explaining this, so we asked him to share that explanation with you. The following section, "Expose Right," was written and contributed by him. For more information on Reichmann and his work, please visit his website, www.luminous-landscape.com.

"Expose Right" by Michael Reichmann

In the beginning there was the light meter. Photographers used them and saw that they were good. Then there was through-the-lens metering, and the people rejoiced. Automatic exposure followed, and photographers thought that the millennium had arrived. Eventually the millennium actually did arrive, and with it digital cameras with histogram displays; and the world changed again.

What hasn't changed over the years is the need for accurate exposure, which all of this technology is ultimately in aid of. But what constitutes proper exposure is quite different between film and digital. In this section, you'll see why and how to take best advantage of it.

Don't Blow It

Digital is very much like color slide film in that you want to avoid overexposure. Although it's often possible to recover some information from the shadows of an underexposed digital image, especially if a low ISO is being used, once overexposed beyond 255, there is no information to be retrieved. The individual photo sites or pixels have simply recorded 100 percent of the information that they can absorb, and this is a featureless white.

© Michael Reichmann

Note: We authors interrupt Michael here to say the exposure scale of a histogram goes from black at 0 to white at 255 in 8-bit capture; the same principle applies for 12-bit capture, where the maximum value is 4,095. For convenience sake, the convention is to describe histograms as extending from 0 to 255 whether for 8-bit, 12-bit, or 16-bit images.

This would lead most people to think that the best thing to do would therefore be to bias their exposure toward the left of the histogram—toward underexposure. This would avoid the risk of blown-out highlights, and since it's often possible to retrieve detail from underexposed shadow areas, what have you got to lose?

A lot actually, as you'll see.

Signals and Noise

Film has *grain*. These are particles of silver or organic dyes that, when exposed to light, turn dark to varying degrees. Fast films have more grain because they have more of these light-sensitive particles with which to absorb light.

Digital uses very tiny photo sites—sensor elements made of silicon that are sensitive to light. Essentially, if no light hits a sensor element, no voltage is generated, and a value of 0 or black is recorded. If the sensor element is flooded with light (overexposed), it records a maximum value of 255 (in an 8-bit image) and a corresponding voltage level is produced. Light levels in between are recorded as some value between 0 and 255.

Although silicon doesn't suffer directly from what we describe as grain, it does have a comparable issue. This is described as *noise*. Noise in this context is any form of non-image-forming energy (light is just one form of energy). Various things can cause noise to be recorded by the sensor. These include heat, cosmic rays, and several other exotic sources. All silicon chips have an inherent noise level. As a percentage of the total signal being recorded, it is usually quite small and unnoticeable. But it's always there, and depending on the exposure being recorded, it can become visible and annoying. This is somewhat akin to the noise that one sees on a TV screen when there's no channel broadcasting or antenna attached.

Note: We authors interrupt to add that usually the energy that causes noise is low enough in its intensity that it falls to the left (dark) side of the histogram.

This is where what we call the sensor's *signal-to-noise* (s/n) ratio comes in. If there's a lot of signal (data to the right side of the histogram), then the s/n ratio is high, the signal predominates, and the noise isn't visible. But if the signal is low (to the left of the histogram), then the s/n ratio is low, and one sees the noise because it represents a relatively high percentage of the total signal present.

So, the solution is clear. Take a photograph, check the instant review histogram, and make sure that the exposure is as far to the right of the histogram as possible without touching the right edge.

But wait. This has a problem. If you do this and you're shooting JPEGs, you'll see some fairly nasty-looking exposures—ones that appear very bright, inappropriately so. Of course, you can try to fix the shot in an image-editing program such as Photoshop. But because JPEGs are prebaked images (reduced to 8-bit mode and with predetermined exposure and color balance characteristics embedded in the file while in the camera), such adjustments can't really be performed while still retaining decent image quality. So, with JPEGs at least, the idea of biasing your exposures to the right of the histogram appears to be good in theory but not terribly practical.

Raw Mode

The answer is to shoot in raw mode. In raw mode the file contains the data that the sensor recorded. In addition, *tags* describe the camera's settings, such as white balance, sharpening, contrast saturation, and the like. But these tags are just that. The raw file itself is not changed in any way. It is also in 12-bit or 14-bit mode and in a 16-bit space (more on this in a moment). Finally, a raw file isn't compressed the way a JPEG file is. If it is compressed, which a few manufacturers do, it's done so losslessly.

Dynamic Range and Bit Mode

The concept of *bit mode* is important to properly understanding digital image quality.

Assume for the purposes of illustration that a digital SLR has a dynamic range of five stops. (It's usually closer to six stops, but let's not quibble.) When working in raw mode, most cameras record a 12-bit image. (Yes, we say it's in 16 bits, but the reality is that the camera is recording only 12 bits of information in a 16-bit space. This is better than 8 but not as good as a real 16 bits would be.)

A 12-bit image is capable of recording $2^{12} = 4{,}096$ discrete tonal values in each component. One would think that therefore each f/stop of the five-stop range would be able to record some 4,096 divided by 5 = 850 of these steps. But, alas, this is not the case. The way it really works is that the first (brightest) stop worth of data contains 2,048 of these steps—fully half of those available.

Why? Because CCD and CMOS chips are linear devices. And, of course, each f/stop records half the light of the previous one and therefore half the remaining data space available. Table 1.2 tells the tale.

Table 1.2 Where Light Levels are Stored on Chips

F/Stop	Number of Levels
Within the first f/stop, which contains the brightest tones	2,048 levels available
Within the second f/stop, which contains bright tones	1,024 levels available
Within the third f/stop, which contains the midtones	512 levels available
Within the fourth f/stop, which contains dark tones	256 levels available
Within the fifth f/stop, which contains the darkest tones	128 levels available

This realization carries with it a number of important lessons, the most important of them being that if you do not use the right fifth of the histogram for recording some of your image, you are in fact wasting fully half of the available encoding levels of your camera.

But, we all know (or at least should by now) that the worst sin in digital imaging is to blow out the highlights—just as it was when shooting slide film. Once they're blown (past the right edge of the histogram), it's bye-bye data.

The Lesson

The simple lesson to be learned from this is to bias your exposures so that the histogram is snuggled up to the right of the histogram (as illustrated in Figure 1.17) but not to the point that the highlights are blown. This can usually be seen by the flashing alert on most camera LCD screens. Just back off so that the flashing stops.

Figure 1.17
A normal exposure shows a centered histogram (left). This histogram is shifted to the right for maximum signal/noise ratio (right).

Now when you look at the raw file in your favorite raw-processing software, such as Camera raw, the image will likely appear to be too light. That's OK. Just use the available sliders to change the brightness level and contrast so that the data is spread out appropriately and the image looks "right." This accomplishes a number of goals. First, it maximizes the s/n ratio. Second, it minimizes the posterization and noise that potentially occurs in the darker regions of the image.

Please be aware, though, that for proper results you need to make these corrections while working in 16-bit (12-bit) mode in a raw converter. Unlike what some people think, in RAW mode, the camera is not doing any nonlinear processing. All nonlinear processing takes place in the raw converter. This is why if you're going to try this trick, you must shoot in RAW and then manually readjust the image in the raw converter before exporting the file into Photoshop. By doing this you'll be maximizing the data bandwidth of your entire system.

Also be aware that by doing this, you are in fact effectively lowering the ISO used to capture the image, requiring slower shutter speeds and/or larger apertures. If you are holding the camera by hand or shooting moving objects, the trade-off may not be worth the reduced noise level.

But, if ultimate image quality is your goal and you have the ability to control all the variables, *exposing to the right* is a technique that will serve you well.

White Balance in Nature Photography

With film cameras, you used specific types of film according to the lighting conditions, and you used filters to further control the color casts. With digital, you have a somewhat equivalent, but more flexible, choice, which is white balance. As you know, the color (or temperature) of light varies throughout each day. It's a "warmer" color in the morning, and the world takes on a reddish/yellow glow. Your eyes adapt to that and compensate because you know that white is still white. (Think about when you put colored glasses on and a few minutes later the colors look "normal" again.) Later, when the bright sun is overhead, the color appears "cooler" or bluer. Your eyes continuously adapt so that you see neutral colors as neutral, and most people are rarely aware of color casts.

Your cameras are more literal—they record the colors exactly as they see them. With digital cameras you can use the white balance setting to render the neutral tones (any shade from white to black where the red, green, and blue values are all the same) as neutral, rather than rendering them with a color cast. For example, you need a different white balance in the cool bluish light of an overcast day than in the warm reddish light of a sunset. All digital cameras offer an automatic white balance setting in which the camera makes a best guess as to the correct lighting temperature. Surprisingly, most do quite a good job, as shown in Figure 1.18.

Figure 1.18
Auto white balance was used to capture this photo in the warm light of early morning. (Photo by Ellen Anon.)

However, some photographers think the best way to be certain of getting the correct white balance is to set it themselves. Most of these photographers are content to use one of the presets supplied with the camera such as Flash, Sunny, Cloudy, Shade, Fluorescent, and so on. With many cameras, using these settings ensures that the image you capture will appear as neutrally colored as possible, although other cameras tend to have a warm bias. If you don't use Auto White Balance, you must be vigilant about changing lighting conditions and changing your white balance accordingly. As you can see in Figure 1.19, if you use the wrong white balance setting, your picture may have a strong color cast. If you shot the image in RAW, you can easily correct this during the conversion process; but if you shot it in JPEG, a mistake like this could ruin the image.

Figure 1.19
The white balance here was accidentally set to Tungsten. A mistake like this can be deadly if the image is shot in JPEG.

But if you've ever gotten up before dawn to go out and photograph in the beautiful, warm, early morning light, you know that we nature photographers aren't always seeking to make neutrally colored images! Often, we want a color cast in our images, particularly a warm cast, as shown in Figure 1.20. This is one of the reasons we prefer to shoot in raw mode; we don't have to make a final decision about the white balance until we're converting the image, whereas with JPEG mode, the white balance is "baked" into the image. Our decision may be based more on the mood we want to portray than on what the actual lighting conditions were at the time.

Figure 1.20 This picture, taken at dawn, actually has a warmer color cast than what existed at the time, but the result is pleasing. Altering the white balance lets you effectively convey a mood. (Photo by Ellen Anon.)

If you are shooting in JPEG, you may want to try using the auto white balance feature, along with setting the white balance specifically. You may not only want to set the white balance for an accurate rendition of the scene, but you may also want to experiment a little. For example, if you use the Cloudy or Shade settings in fairly sunny conditions, it's similar to adding an 81A or 81B filter to your camera lens; these settings will add a warm cast to your picture. Product photographers must be concerned with absolute color accuracy in their photography. Nature photographers have the luxury of being able to be creative with the white balance and create, augment, or remove color casts as it suits their vision. You can use the white balance settings rather than filters to do this both with JPEG and with RAW.

When you capture your images as raw files, because the white balance you selected in the camera is not actually applied until you convert the image, you have the luxury of time to adjust the white balance as you want. Most raw converters provide a continuous temperature slider to set the white balance that best fits the mood of the image. You can tweak it in small increments to precisely obtain the effect you want. Because of this, many photographers elect to leave their cameras on auto white balance and then use the sliders in the converters to impart or remove color casts. Others still select what they believe is the best white balance setting while in the field so they can recall what the lighting was and how the image actually appeared. They prefer to have their images be as close to accurate, realistic color as possible. Who's right? Both are! It's a matter of your personal goals and preferences with your photography.

Note: If you are using auto white balance, using a warming or cooling filter may have no effect, because most cameras will compensate for the filter and try to make everything neutral!

Photographing Elements to Composite Later

How many times have you looked up and commented on the great clouds or beautiful sunset but not taken the picture because foreground elements were missing? Or the opposite—you found a great subject, perhaps a bird posing wonderfully or a gorgeous scene, but the sky or background was completely blah? Or you could tell there was just too much contrast to be able to capture the picture? When you are in the field with your camera, it's important to remember that Photoshop enables you to combine images in a seemingly infinite variety of ways. You have to adjust your thinking to include seeing the potential for an image.

Skies, Clouds, and Moons

A number of situations lend themselves to photographing parts of a picture that you will later combine in Photoshop. You can create libraries of these image elements to use at some later time. Perhaps the most obvious elements to store are skies and clouds. Whenever you see a dramatic sky, photograph it! Place the images in a special folder labeled skies. You'll need more than one replacement sky, because one of the keys to creating believable composites is to match the direction and quality of the lighting. Sunsets are great to photograph, as are clouds—the blue sky with puffy white cloud types as well as impending storm clouds. When you start paying attention to clouds, you'll soon see that different types clouds tend to occur more in certain seasons. By having a collection of skies, when you find a great subject (perhaps that leopard in the tree while in Africa) or a beautiful scenic, you'll be able to remove the distracting white sky and make it appear that luck was with you in the field.

Figure 1.21 shows a picture that could have occurred but didn't. Capturing all these landing cranes in one shot was wonderful, but unfortunately the sky behind them was boring. A few minutes earlier, the sky in the very same spot had been dramatic, but there were no birds. This image is a combination of the birds with the sky that had been there a few minutes earlier.

Don't limit yourself to just skies and clouds, though. You can add all sorts of elements to pictures to add impact or create a sense of your own style. Ellen likes to keep a folder of moons to use as accent elements in pictures. She shoots full moons, crescent moons, moons against black skies, and moons in daylight skies. You'd be amazed at the variety of color casts in the moons. Then when she thinks a picture needs a little extra pop, she puts one in. (We'll explain how to do that in Chapter 8.) Sometimes she makes them a realistic size, and sometimes she enlarges them. Another person we know adds docks and has a collection of docks to add to scenic water pictures! You're the artist, and the choice is yours. Use your imagination, and keep your eyes open for other elements to collect to add to your images.

Figure 1.21 Sometimes nature doesn't cooperate and gives you a great subject but a boring sky, or vice versa. In Photoshop you can combine them to have the best of both worlds. (Photo by Ellen Anon.)

When photographing something that you're likely to want to later extract from the picture and use elsewhere, try to design your photograph to make it easier to remove the desired object. For example, it will often be easier to remove an item from a blurred background rather than a cluttered one, so consider using a wide aperture. You may need to take a step or two left or right or perhaps get down a little lower to help separate intricate background objects from your subject. A little care in the field can make your work in Photoshop much easier!

Be sure to store these photo elements in a consistent place that's easy for you to find. You don't want to have to look through all your pictures in order to find them. Of course, adding keywords to them can also make it easier to locate them when you need them.

Expanding Camera Capabilities

Sometimes you see a scene and know that you can't capture it in a single shot because of the technical limitations of your equipment. Photoshop provides ways to combine shots to create images not possible with a single exposure.

Your eyes can see a much greater range of tonalities than can your camera, where the dynamic range is limited to five to six stops of lights for digital captures and slide film. This means although your eyes may be able to see detail in both the highlights and the shadows in a scene, today's cameras may not be able to do so within a single exposure. The solution is to take a series of exposures, making sure you capture detail in all parts of the pictures. This could mean two or more exposures varying at least one stop each.

Some Helpful Definitions

Dynamic range

The range between the brightest and darkest points of an image.

High dynamic range (HDR) images

An HDR image contains a far wider dynamic range than can be displayed on a screen or printed on a printer. HDR images are often created from multiple exposures of one image and are stored in special file formats. They are of interest to photographers because you can convert them back to 8-bit or 16-bit images and compress the dynamic range, allowing you to get images with detail in both shadow and highlight areas of an image, more like what your eye saw when looking at the scene rather than what your camera captured.

If you're dealing with a static subject and shooting from a stable platform, you can take a series of exposures to later combine using Merge to HDR to create a 32-bit file. This file is called a high dynamic range (HDR) file, and we'll discuss it more in Chapter 8. In addition, there are several other ways to combine 16-bit exposures within Photoshop to extend the latitude. So even if your subject matter is not completely static, take at least two or three exposures: one or more that capture all the detail in the shadows and one or more that capture all the highlight detail. Make certain to keep your camera in precisely the same spot and not change the focus or aperture between the exposures; vary only the shutter speed. Chapter 8 will explain several techniques to put these pictures together to create a picture with as much or more detail than your eyes are accustomed to seeing.

Photographing Parts of the Scene Individually

Another limitation of your camera sometimes arises when you need more depth of field and shutter speed than what the amount of light will allow. This happened to Ellen in Bosque del Apache, New Mexico, when she saw the beautiful mountains and sunset in the distance with the cranes flying fairly close to her. Although she could see it, there was no way to capture the entire scene with adequate depth of field to have the cranes in focus as well as the mountains and have enough shutter speed to freeze the motion of the birds. Her solution was to photograph the birds in one frame and the background separately. Then she combined the two in Photoshop, as shown in Figure 1.22. In reality, the moon was behind her while taking those shots, but in the end, she decided to add it to the picture because she wasn't trying to create a documentary image but, rather, one that captured how it felt to be there. Photoshop made that possible.

Figure 1.22 There was no way to capture the birds and the mountains in a single shot because of the low light levels. Instead, individual shots were combined in Photoshop. (Photo by Ellen Anon.)

Ethical Considerations

Is the image manipulated? It sounds like such a straightforward question. But answering honestly may be more difficult than it appears, especially when responding to people not well versed in digital photography.

If you shoot in RAW, you essentially have a negative that needs to be processed during conversion. The settings you apply determine the appearance of the image, but these really aren't manipulating the image any more than chemicals do in a darkroom. Similar adjustments done in Photoshop, as opposed to in the raw converter, are considered by some to be manipulations. Many accept that it is necessary to clone out dust and to perform some sharpening since there is some slight softening of digital images by their very nature. A few people are bothered by basic exposure and color modifications, but most accept this as part of the processing, as long as the overall intent of the capture remains the same. Modifying the colors or tonalities within only a section of the image is more troublesome for some, and such changes are not allowed by several prestigious contests such as the Shell Wildlife Photographer of the Year or *Nature's Best* magazine. If you enter your image in a contest, be sure to follow their rules for what changes are and are not permitted.

Although cloning out dust is usually acceptable, there is debate about how much of an object one can clone out before the image is considered manipulated. Sometimes it's more environmentally responsible to clone out an object rather than remove it in reality. Sometimes it's impossible to remove it in reality. Unfortunately, for some this crosses the line into a manipulated image. Maybe it's an area that needs to be thought through more carefully.

Many gray areas exist. For example, it's common practice when photographing hummingbirds at feeders to put up a man-made background so that the birds are photographed against a pleasing, nondistracting background rather than clutter. This is acceptable. But if you took the image photographed with the cluttered background and, in Photoshop, replaced the background with a simpler one, many would insist the image is manipulated.

Ellen's feeling is that when she composites elements within an image, the image is manipulated, and she is careful to indicate this whenever reasonable. When asked, she responds honestly and labels images accurately. The bottom line for her is that photography is an art form, and her goal is to create images that express what she feels. For those of you who are more inclined toward scientific documentary types of nature photographs, the lines may be different. You have to decide what's right for you!

Removing Objects in the Field or Later in Photoshop

There's an old adage that reminds us to "Take only pictures and leave only footprints, and barely those if possible." But as nature photographers we know that sometimes there are distracting elements that are interfering with our picture. It may be an ill-placed stick, a wayward branch, or maybe a rock that's too light and bright. It seems harmless enough to move it and create a cleaner photo. Many times doing so may be fine. But have you considered that perhaps that rock or branch was serving a purpose to one of the many critters in our world? Perhaps the branch provided some protection against the wind or shielded visibility from a predator; maybe the rock provided a safe resting spot while looking for food. We know and see the world though our human perspective, and what seems inconsequential to us may actually have a significant impact on a variety of wildlife.

Does that mean you should never move anything in the environment? That would be an extreme and unrealistic position, but the reality is you may want to consider whether it would be smarter to remove the offending item later in Photoshop. Although it may create more work for you, you will be creating less stress on the nature around you. You are going to have to use common sense in making this choice. (We'll cover how to remove objects in Photoshop in Chapter 5.)

Software Choices: Aperture and Lightroom

A few years ago the software choices for digital photography were fairly limited. Photoshop has dominated the market for quite a while, and its sister products such as Photoshop Elements provided a reduced selection of tools offering some of the basic adjustments. Many photographers, amateur as well as professionals, have based their workflows entirely on using Photoshop for years. In fact, Photoshop offers a good workflow (which is what we're teaching you throughout this book), but it's not perfect. Photoshop was developed not only for photographers but also for graphic artists. The result is that it has numerous features that photographers don't need. And there are some features that photographers need but that Photoshop doesn't do quite as well as we wish. For example, Photoshop is not an image management device. Although you can add keywords in Photoshop, the process can be arduous, and Photoshop doesn't help you keep track of where you've stored the images. (Eventually, if you shoot enough, you can't keep all your images on your computer's internal hard drive—you must export them to external hard drives or gold DVDs, and so on.) Further, because Bridge is a separate program from Photoshop, you actually encounter three different user interfaces—Bridge, Camera Raw, and Photoshop. This can be confusing for some and is a little time-consuming as you go back and forth among them.

Apple introduced Aperture in late 2005, followed shortly by Adobe's announcement of a beta version of software called Lightroom. These new programs are designed from the ground up to meet the needs of photographers. In addition, they make working with raw files virtually indistinguishable from working with JPEGs or TIFFs. No separate converter software or interface is needed. Currently, they are intended to be used in conjunction with a program such as Photoshop, rather than as a replacement for Photoshop.

Aperture is designed to make your workflow easy and efficient from the moment you download images from your camera through locating your best images and showcasing them to others. When you connect your camera or card reader, an import window appears and nearly instantaneously so do low-res previews of your images. You choose where to store these images and how to name them. In addition, you can quickly add any metadata you choose, such as basic contact information and keywords. Aperture will import the images you select into a project. From there you can easily edit the images, using a magnifying loupe to check for sharpness and details—even within the thumbnails—to quickly identify the best images. You can compare similar images side by side.

With a single keystroke, a window appears containing most of the adjustments you're likely to need to make. You can save commonly made adjustments as presets, or you can adjust the sliders to tweak all aspects of the exposure and colors. These adjustments are stored as instructions while the master file remains untouched. The adjustments go beyond those typically available currently in most raw converters and include all the expected features as well as an outstanding Highlight/Shadow tool, individual color controls, Spot and Patch tools, red-eye reduction, cropping and straightening, toning, and more.

One of the major innovations of Aperture is the ability to generate versions of the image that are stored with the master file simply as instructions. That way you can create several variations of an image (see Figure 1.23)—perhaps a different crop, a black-and-white version and a sepia version, and so on—yet the demands for storage space on your hard drive are greatly reduced because the master file is not recopied each time. This makes your computer more efficient, and it makes it easy to find the different variations of your image. In Aperture you can add keywords at any time; search for images, including those you store offline; send emails; or create slide shows with a single click.

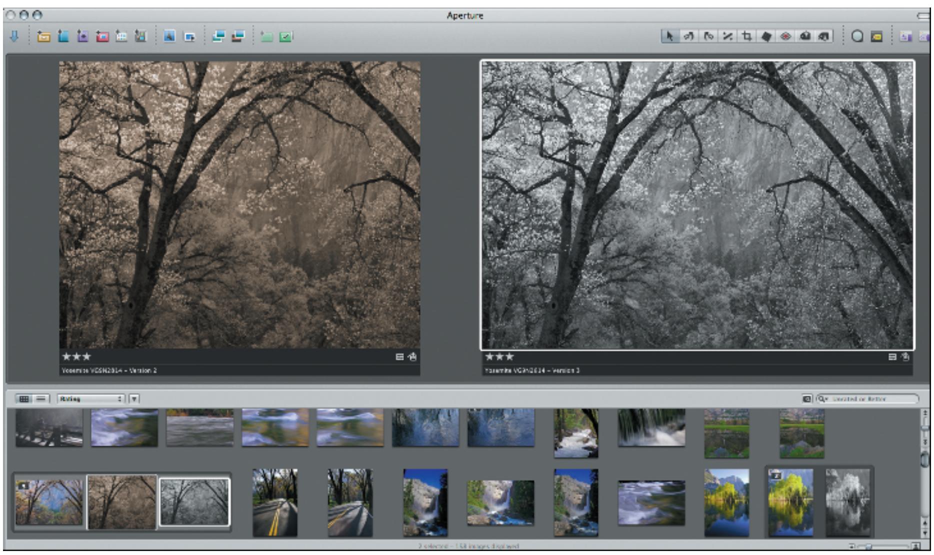

Figure 1.23 Experimenting with different variations of an image in Aperture is easy and requires only minimal additional storage space on your hard drive. (Photo by Ellen Anon.)

If you opt to use Aperture (or Lightroom), you're likely to find that you will not need to use Photoshop for all your images. You'll still need Photoshop when you want to make adjustments to just one particular area of your image, when you have more complicated cloning to do, or when you want to use any of the filters available in Photoshop. When using Aperture, if you want to open an image in Photoshop, it's just a keystroke away. The image will open in Photoshop, and you can make the desired changes. When you're done, you click Save, and Aperture will automatically update the image preview to reflect the changes you made in Photoshop. You can save all your layers when you work in Photoshop, and although the individual layers are not accessible from within Aperture, if you reopen that same file in Photoshop, all the layers will still be there.

Aperture provides equally efficient methods for creating slide shows, sending emails, creating books, creating websites, and making prints. Ellen has adopted Aperture as her primary workflow tool. For more about Aperture, see *Aperture Exposed: The Mac Photographer's Guide to Taming the Workflow* by Ellen Anon and Josh Anon (Sybex, 2006).

Lightroom provides similar functionality; however, it currently is not quite as full-featured as Aperture. It too provides a workflow enabling you to use raw images as easily as JPEGs or TIFFs. It has an intuitive interface that enables you to make many of the global color and tonal modifications that you may want to make and has a good keywording system to make it easy to find your images. Lightroom has the advantage that it will be available for both Microsoft Windows and Apple Mac OS, whereas Aperture is a Mac-only application. For more about Lightroom, see *Lightroom Workflow* by Tim Grey (Sybex, 2007).

If you opt to adopt Aperture or Lightroom as the basis of your workflow, you'll find that you make many or all the global exposure and color changes we discuss in this book in those programs. You'll still find it advantageous to work in Photoshop for some tasks. For example, we still use Photoshop for most of our cloning. We also use Photoshop anytime we want to make a change to part of the image and not have it affect the rest of the image—which means anytime we'd like to use a layer mask. As you'll discover later in this book, we use layer masks a lot! The ability to make a change and have it affect only the targeted area gives you more precise control over the final appearance of your images. We also use Photoshop when we want to use any of its filters as well as for all types of creative ventures including creating composites of all natures. Even if you use Aperture or Lightroom, it's worthwhile knowing what controls are available in Photoshop. That way if you encounter a difficult image, you'll have more tools available to you to work with it.

Storage Considerations

A comprehensive discussion of storage media is beyond the scope of this book. We'll cover only a few aspects here, which are especially pertinent for nature photographers.

Many nature photographers often do at least some of their photography away from home. We know one photographer who actually buys enough compact flash cards so that he can use a new one when needed rather than having to download and/or edit images while on the road. Although the cost of compact flash cards has come down considerably in the past few years, for most photographers this is not a practical solution. Even if you can justify it monetarily, it's impractical because it means you will have all your editing to do when you get home, and that can be overwhelming. In addition, it eliminates one of the major advantages of digital shooting—the ability to review the shots you took during the day and to learn from what went right and what went wrong so you can adjust your shooting the next day accordingly. Being able to view your images, preferably reasonably large, allows you to fine-tune your shooting skills and experiment with new techniques while still on location. That way you can return to a location if necessary or build upon a creative approach you tried.

A variety of independent handheld image storage and viewing devices have come on the market for the past few years. All of them have been promising, and most have had their issues. In addition, the screen sizes on most is too small to be as helpful as needed, although they're large enough to be tantalizing and tempting. At best these devices should be used as a secondary backup in our opinion. Canon recently announced a new storage device, similar to the Epson P that has been available for sometime, that holds some promise. (At the time we're writing this, we have not yet had a chance to test one.)

When we're on a photographic trip, we prefer to take a laptop along and make certain that it has plenty of space on its hard drive. That way we can download our images and view them at a reasonable size. (In addition, having the computer enables us to have email access while on the road.) Also, Ellen takes a small external portable hard drive. These drives are the size of a deck of cards. She backs up all the images she stores on her computer on this hard drive. That way if something happens to the computer, she still has a copy of all the files. If she is on a long trip that will involve a lot of shooting and not much time for editing, she'll bring along a second external portable hard drive for overflow images when her computer's hard drive becomes full. Ordinarily we recommend doing at least a first pass of editing each day to delete the images you are certain you don't want, but sometimes that's not possible. When we return home, we transfer the images to our main computer for further editing and archival storage.

After editing our images, we establish a `Best Of` folder for each shoot containing the images we want to keep. That folder gets backed up onto a RAID system. RAID stands for Redundant Array of Independent Devices. A RAID system consists of two or more hard drives that function together. There are several different types of RAID devices, but we use RAID-5. When you back up to a RAID hard drive, the data is automatically copied to all the drives. If one hard drive develops an error, it uses the information on one of the other drives to correct it. We think this provides the best storage system currently available.

Other photographers prefer to use DVDs or CDs. If you have a lot of images, the volume of DVDs and/or CDs can become unwieldy unless you have a clear-cut system for storing and identifying the discs. In addition, it's imperative to use gold discs, which are archival and are reported to last 100 years or so. Ellen uses the gold discs that are available from Delkin Devices. DVDs and CDs that are not gold may become unreadable in as little as one year! If you have been using regular DVDs or CDs to archive your images, we urge you to copy them to a gold disc.

Note: Whatever storage system you adopt, be consistent so that you protect your images and can easily locate them when you need them!