Photoshop Mastery

Little things make a big difference when working in Photoshop

BY BEN WILLMORE

Are You a "Bit" Confused?

Should you work in 8 or 16-bit mode? Is a 36-bit scanner better than a 24-bit one? Why does my 40-bit scanner only deliver 16 bits to Photoshop? So what is a bit anyway and why should I care? And, why can't people just use plain English when talking about all this gobbledygook?

When you're talking about bits, you're usually talking about how much memory your computer uses to deal with an image. You might have an 80-Gigabyte (GB) hard drive, which contains a folder that has 40 Megabytes (MB) of smaller 20-Kilobyte (KB) files, right? Well, if that makes any sense to you, then that means you're used to dealing with computer terms to describe how much space something takes up on your hard drive, and bits are no different.

A bit is the smallest part of computer memory that can be changed. The number of bits Photoshop uses determines how many colors your images can contain. A bit is as simple as a light switch—it's either on or off.

If you only have one light switch, then you have only two ways to light the room: full on or full off. But what if you have more than one light bulb in the room with each one wired to its own switch? Then each time you add a light switch, you double how many choices you have to light a room. If that's the case, then how many choices would you have if you walked into a room that has 4 light switches? Well, the first switch gives you two choices (on or off); the second one would double that to four choices; the third would double that to eight; and the fourth would double that again to 16 choices (2x2x2x2=16). Bits work the same way. A 1-bit image can contain no more than two colors, a 2-bit image can contain up to four colors, a 3-bit image won't contain more than eight colors, and so on as follows:

4 bits=16 colors	11 bits=2,048 colors
5 bits=32 colors	12 bits=4,096 colors
6 bits=64 colors	13 bits=8,192 colors
7 bits=128 colors	14 bits=16,384 colors
8 bits=256 colors	15 bits=32,768 colors
9 bits=512 colors	16 bits=65,536 colors
10 bits=1,024 colors	

Imagine that wall with four light switches again. The more switches you have, the more space they'll take up on your wall, but each time you add a switch, you double how many choices you have to light your room. With one switch, you only have two choices (full on or full off), but add seven more switches to the wall and now you suddenly have 256 on/off switch combos to light the same room, and you've taken up eight times as much space on the wall for the switches. The same goes for bits in Photoshop.

A bit is simply a chunk of memory. So, a 2-bit image will take up twice as much memory (which is measured in bits) as a 1-bit image, just as a 16-bit image will take up twice as much memory as an 8-bit image (just like 16 light switches takes up twice as much space as 8 switches). But let's see how that affects what we can have in those images. Well, if you look at the table we created, you'd find that an 8-bit grayscale image would max out at 256 shades of gray, whereas a 16-bit image could have up to a whopping 65,536 shades of gray even though it only takes up twice as much memory.

Now here comes color: An RGB image is made from Red, Green, and Blue light (also known as channels). Each one of those colors can either be 8 or 16 bits. At 8 bits per color, an RGB image would have 8 bits of Red, 8 Green, and 8 Blue for a total of 24 bits. This also means that each one of those colors would have 256 shades and when you do the math, you'd end up with 16,777,216 colors. An 8-bit-per-channel scanner will deliver an 8-bit grayscale image (256 shades of gray), or 24 bits of color (16.7 million colors). The more bits your scanner can deliver, the more shades of gray or color you'll get out of it; for example:

9-bit gray=27-bit (1 billion colors)
10-bit gray=30-bit (8.5 billion colors)
11-bit gray=33-bit (68 billion colors)

If all you were going to do is scan an image and print it, then 256 shades of gray, or 16.7 million colors would be plenty. But, if you plan on adjusting the brightness, contrast, or color in your image, then it would be best to get as many colors as possible, otherwise your image might end up looking posterized (where smooth transitions between colors become stairstepped).

Most modern scanners will be able to capture more than 8 bits per channel (24 bits of color), but not all scanners can deliver all that information to Photoshop. You can find out what your scanner is doing by scanning an image and then taking a peek under the Image>Mode menu. If "16 Bits/Channel" is checked, then your scanner is giving more than 8 bits of information to Photoshop. If that's the case, then you'll find that most of Photoshop's adjustment choices will be available, but most of its creative tools will be grayed out. That's because those tools would be much too slow on such a big image. So, once you're done adjusting your image, choose Image>Mode>8 Bits/Channel, which will make all of Photoshop features available.

If your scanner doesn't deliver 16 bits to Photoshop, that means it's capable of capturing more than 8 bits, but it's only delivering 8 bits of info to Photoshop. If that's the case, then it would be best to make all your adjustments in the scanning software before the image is brought into Photoshop. That way you can adjust your image without ending up with a posterized result. ■

Ben Willmore is founder of Digital Mastery, a Colorado-based training and consulting company that presents the national seminar tour of "Photoshop Mastery." He's also the Author of Photoshop 6 Studio Techniques. *Ben provides hundreds of free Photoshop tips and tutorials at his Web site, www.digitalmastery.com.*