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PROFESSIONAL DIGITAL IMAGING

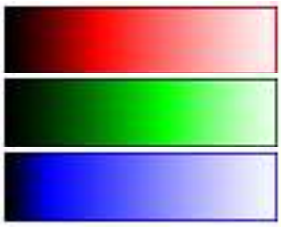
DIGITAL IMAGING BASICS

This document is an overview of digital imaging and serves as the basis for one of my Digital Camps for learning digital photography. On its own, it is an overview only, and the Camp greatly expands on this information.

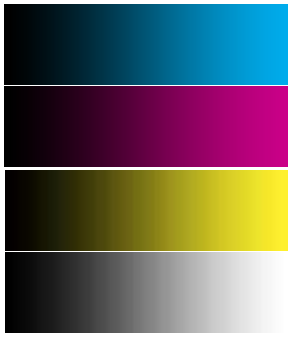
Pixels – Digital Building Blocks

Digital Photography is a "binary system" based on two possible states of an electronic signal, on or off. Off is 0 (zero) black, and on is 1 (one) white. This is the basic building block for the digital imaging system. This is a "one bit" image. Obviously limiting, there is no color or shade of gray possible in this image.

If we combine 8 bits of information and use the result to define the state of the single pixel, we can expand the possible states of the image from two (black or white) to 256, creating a stepped scale from black to white, or a "grayscale" image. A grayscale image is a single channel image with 8 bits of information



If we expand this system to 3 channels, each containing 8 bits of information, and let one channel define red values, one green values, and one blue values, we create a 24 bit color image (3 channels times 8 bits per channel). In programs like Photoshop this is referred to as an 8 bit per channel RGB image. Monitors and TV sets also create color using RGB. Each of the channels actually remains a gray scale image that controls the value of each color in the composite image. Our interpretation of the color channels is therefore only to help visualize the concept.

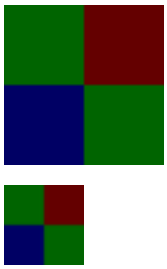


CMYK images use 4 channels instead of 3, Cyan, Magenta, Yellow, and Black, and they represent the colors of inks used to create images in a printing press. Inkjet color printers basically print in CMYK using inks or dyes. However, images sent to the printer by Photoshop should remain in RGB as the printer's software handles the conversion.

Most cameras capture images using a 12 or 14 bit system, which provides original capture information of 4,096 values per color channel. The additional information is used to improve the interpretation of color values by the processor in the camera before providing you with an 8 bit image, usually a jpg. Note that this additional

information can also be used to process “raw” capture files to a higher quality image. See the section on file formats for more information on this.

Resolution



Resolution easily confuses most people as a pixel must be seen in the context of the device that captures it, displays it, or prints it. Since this can change the size of the pixel, we need to be sure we speak the same language when describing resolution. Understanding that pixels are not an absolute, but a relative measurement will help you understand resolution better.

Camera Capture Resolution

Cameras are usually described in terms of “Megapixels” or the millions of pixels that they capture. A theoretical camera that captures an array of 2000 x 3000 pixels would be a 6 Megapixel camera as the total number of “sensors” equal 6 million. A compact or “point and shoot” digital camera with a 6 Mp sensor and a more expensive DSLR with the same number of sensors will capture the same number of pixels, but the quality of the capture will be different. The captured noise, color fidelity, and dynamic range are functions of the individual pixel size, the manufactured tolerances of the sensor, the sophistication of the software in the camera and other factors. Therefore, your decisions on what camera to buy need to be based on a number of factors with the pixel count only being one consideration. While the pixels in the capture chip have a size, they are only providing original color information to the file. The size and density of pixels on a camera chip can influence the quality of the image. For our purposes, the actual “size” of the pixel in an image only becomes a factor when the image is displayed on a monitor, or printed.

Monitor Display Resolution

Monitor display resolution is not a fixed number. The idea that monitor resolution is 72 ppi (pixels per inch) is a convenient target for conversation rather than a reality. In fact, most monitors are not 72 ppi. Original Apple monitors displayed 72 ppi and established the terminology, but PC monitors were 96 ppi. Currently, when you set the monitor resolution in your computer, you modify that standard based on the size of your monitor and your preferences for viewing images or text. The on-screen result of setting a 19 inch monitor to 1024 x 768 results in about a 72 ppi display regardless of the platform (Mac or PC). A 21 inch monitor set to 1280 x 960

results in a display resolution of about 81 ppi. Except as a point of interest the actual screen resolution is not something we typically need to deal with. It simply indicates how large the image will display based on the available pixels in the image file. It also means that compared to printed output, we are always looking at an image at a lower resolution than will be used for the final image. In other words, we are looking at an image with larger pixels than will be used to make a print. For a more in depth look at monitor resolution see my article **MONITOR RESOLUTION** at my website Learning Center page - http://www.brysonleidich.com/support/Resources.html.

Output Resolution - Monitors

If our output is the monitor, such as an image for the web or an email, we only need to be concerned with how it will display on the monitor. If your monitor resolution is actually 72 ppi, a 4 x 6 inch image on screen would only have to be 288 x 432 pixels. On a monitor with a 100 ppi resolution a 4 x 6 inch image would have to be 400 x 600 pixels. Compared to an original image captured by our theoretical 6 megapixel camera (2000 x 3000 pixels) this is a very small image. Now you know why your images directly from the camera look huge on your monitor (displayed at 100%, or full size). A typical monitor resolution is 1024 x 768 pixels, so any image larger than that would not be viewable on your monitor unless it is modified in some way.

Most image viewers default to reducing the image size to "fit on the screen". This is done by "interpolating" the image information to a smaller size so you can see the whole image. It can also result in the image looking fuzzy, displaying an interference pattern or otherwise having less than full quality. This is a display issue, and viewing the image at full resolution in an imaging program will reveal the full quality of the capture.

We can also modify the pixel resolution of our images with imaging programs to make the image size more appropriate to the intention of the image. For emails and monitor display, such as web pages, use either absolute pixel numbers or calculate the approximate size needed using any convenient number for monitor resolution (100 ppi is really easy) and you will be close enough.

Output Resolution – Printing

Printing an image on a desktop printer, sending it to a kiosk for printing or providing an image for professional offset printing requires looking at the file in a different way. We need to attach the "output resolution" numbers to the image to

determine how large the image will be. The more you know about the device that will used to make the print, the better you will be able to provide an image of the appropriate size. This will mean the best quality print will be produced from your image file.

The key is to think in terms of the size of the image in pixels. Our theoretical camera capture provided us with 2000 x 3000 pixels. If we need to provide someone with a 300 ppi (remember that means **pixels per inch**) image, we need to divide the number of pixels by 300 to get the numbers of inches the file will provide. 2000 / 300 = 6.666 and 3000 / 300 = 10, so our 6 Mp camera will provide an image 6.666 x 10 inches at 300 ppi. By comparison, a 72 ppi monitor display of that image was 2000 / 72 =27.777 x 3000 / 72 = 41.666 inches. An Epson printer is usually used at 240 ppi, and the kiosk at your local Costco sends files to the printer at 320 ppi.

So, the same number of pixels results in different size images depending on the output resolution, which is the resolution of the device on which the file will be displayed or printed. A smaller file with fewer pixels will produce a smaller image. Our on screen 4x6 only had to be 288 x 432 pixels. If we try to print that file at 300 ppi it will only be .96 by 1.44 inches. The number of pixels doesn't change, just the size of the pixels depending on the output device.

How does a printer like Costco change the size of your file to make different sized prints if the print size is a matter of how many pixels you provide? The answer is software, and the printer at the store can "interpolate" or modify the file to satisfy your order for larger or smaller prints, just as you can with imaging software. The process isn't complicated, but ppi resolution is a starting point for printing, and for understanding how resolution works. It is not an absolute determination of how a file can be used in different circumstances.

Resizing images

Making a large image smaller is a task easily accomplished by software programs and can retain much of the quality of the original within the bounds that it contains fewer pixels, and therefore less image information. Making a small image larger is a different story. With less information to begin with, interpolation of the image to a larger size essentially means guessing at what the missing information might look like, and multiplying pixels to fill in the missing information. This can result in what we call "pixelization" or the blocky appearance of an upsized file. Minor changes can work well with good software such as Photoshop using the smoother option in the resize dialog. There are also specialty software packages designed specifically to improve on the quality of images that are enlarged. The best plan of attack for the photographer is to **capture and maintain the largest, highest quality file** the

camera can produce, and **make smaller, lower quality copies where necessary for certain purposes.**

There are a variety of methods for interpolating information in a file when resizing. Some of these are better suited than others for certain purposes. Check your program for options. We explore the differences in Photoshop options in the camp.

Monitors

The monitor is our gateway to the image, and the interface between what we captured and what we will produce. It is also the place where a substantial amount of problems arise, with density and color in particular. It is necessary to understand that a monitor is not a precision device with a built-in ability to correctly display an image. It is more like an untuned musical instrument that requires some attention to get it to play well with the rest of the orchestra. It is also true that some instruments are better made than others, and it may be impossible to make a poorly made guitar sound good no matter who plays it.

LCD Flat Screen Monitors

The currently available computer monitors are primarily flat screen LCDs. High quality CRT monitors had just about reached the point where it was silly not to get the best thing your pocketbook would allow and feel pretty good about being able to produce professional quality output. High quality LCD monitors for professional use have not yet fallen below the $1000 mark for the most part. Even a good profiling software package cannot drag lesser monitors into acceptable range. Laptop monitor can be rarely used to make critical judgments about the color and density of a file and have it translate reliably to the printer. Sorry, but that is the reality. Just because it looks great on screen doesn't mean it will print well.

If you are not a working professional you will have to live with a little testing and modifying of your files, and a little willingness to get something out of the printer that doesn't quite match your intentions. Your tolerance level or need for precision may very well be flexible enough to have you be satisfied with an occasional surprise. If you are not producing professional level work for output, you may find a moderately priced monitor sufficient for your purposes. The thing to remember is, when you find that your monitor and prints do not match or are inconsistent, the monitor is likely the first place to look, not including yourself, of course. That said there are things you can do to get the most out of whatever you are using, especially if you are fortunate enough to have a reasonably good CRT from the good old days.

Monitor Settings

There are settings you can make for your monitor for image size and resolution. With an average 19 inch monitor a setting of 1024x768 is recommended for most purposes. If your eyes (and the monitor) are good, you may be able to use 1152x864 or 1280x960 (best for 20 inch or larger). If you are still working with a 17 inch monitor, at least try 1024x768 to see if it is a readable setting for you. Settings below this will produce larger pixels and result in softer looking images that appear overly large and will make some decisions more difficult. If your system only has a Display setting with "DPI" choices, stick with "normal" (usually 96). DPI is a common misuse of the resolution terminology for monitors, even being used by Microsoft, probably as it is "recognized" by people.

Monitors are sRGB color devices and they function best at the 2.2 gamma setting, regardless of the platform you are on. The sRGB color space, current monitors and all printers are gamma 2.2 devices. You may only have access to gamma settings within the context of profiling software. Or, you may only have a choice of color spaces for your monitor. If so, stick with sRGB unless you discover that you have a need or ability to change as you progress.

Color settings should be set for a white point of 6500 Kelvin (D65) as that is the current standard, and more importantly, will get you to the best color. Color quality should be set for the highest value available for your monitor, hopefully no less than 24 bit color.

For the best results you should profile your monitor. The objective is to create a perceptual neutral balance for color. Preferable would be using one of the many profiling devices available today, some for under $100. Good quality profiling can start at as little as $200, a considerable bargain compared to years past, and an investment that will pay for itself it paper and printer cartridges in a very short time. If you cannot profile your monitor, attempt to provide yourself with a monitor setting that will make your images look as good as possible. On my website at the Learning Center there is a 600 x 800 pixel sRGB grayscale image you can use onscreen to see if you can see all the tonal values you should. Lines are provided at the separation points of the highest and lowest values. You should be able to see differences in tonal values at both ends of the scale, and especially at the darker end. If you can't, modify the brightness and contrast settings on your monitor until you can. You will likely be lowering both settings from where you are now, but the results will be better looking images on the screen, and a better chance at making good image decisions with your monitor.

When viewing images, you should run your viewer or editing software full screen, and avoid disruptive screen wallpaper, background colors, or icons that can influence your ability to make judgments of the color and contrast of your image.

File Formats

File Formats for Capture

These are camera formats, or files that your camera can produce when you make an image. All cameras will shoot jpg files. A few current Nikon DSLRs shoot uncompressed Tif files. A few compact cameras and most all DSLR cameras will shoot raw files.

JPG - Your camera probably captures a jpg image by default. This is a compressed 8-bit file (256 levels of information) produced by the camera's software from the original capture information on the chip. The file compression allows for a greater number of images on the storage device, but limits your control over the results. See Camera Settings for more information.

TIF – An uncompressed file used by a limited number of cameras.

Raw – The original capture information provided by your camera. Most current cameras capture a 12 bit (4096 levels of information) or 14 bit (16,384 levels of information) raw file and provide a processed jpg image to the camera for viewing purposes. However, the original file is not managed by the camera, and you will have to process the image yourself with special software. The format does not lock in decisions such as color temperature, for example, and offers the photographer the opportunity to produce very high quality final images with a lot of control. Except for noting the ISO, shutter speed and aperture settings, a raw file essentially ignores camera settings, but puts those settings into the file's metadata for use by some processing programs, which is usually optional. It is the preferred capture format for most professional and a growing number of amateur photographers.

File Formats for Output

JPG – The jpg file as an output format allows the photographer to compress the file information in 12 optional quality settings after other processing steps have been taken in the editing software. Compressing the information, even in the highest quality setting, substantially reduces the size of the file. This makes the format popular for web and email images, but less desirable as an archiving medium as it removes image information in the process of compression. Even so, files for output to the printer can be made into jpg files as the initial step reveals little loss either on screen or on a print. Jpg files should be made in addition to full sized Tif files or native Photoshop PSD files for archiving purposes, not in place of them.

TIF – The preferred format for archiving and transfer of files as all of the original file information is retained. While a lossless compression option is available, it is rarely

used for files to be transferred to another person as it may be less compatible with the receiver's software. Otherwise, it is the most usable file format. A Tif file contains as much information as possible.

GIF – A file with limited (256) color used primarily for graphics, and logos. A well made jpg may actually be smaller and will be definitely better at rendering the color and continuous tones of a photograph. Gif files are less used than in the past except for some web purposes like logos.

PSD – An Adobe format, literally a **P**hoto**S**hop **D**ocument, that preserves the state of the information in a file being edited, including layers and channels. This makes it possible to reopen and continue the editing process at another time. Not generally a format shared with others, but primarily a production format. Very useful for the photographer.

PNG – The "ping" was ignored for a long time as it was primarily "marketed" as a GIF replacement. However, it supports transparency and 24 bit color making it more image friendly than the GIF. The logos on my web site are PNG files as they are against transparent backgrounds and can be placed over any color without having a field of their own around the text. The popularity of the PNG is growing.

Other Formats – There are other specialty formats available for specific needs that are of little value to everyday photography, and you may never use more than what are mentioned above. Outside of the above formats, there are also proprietary formats that come with some imaging software that is provided free by some less expensive cameras. They are best avoided as they will not be usable by others, and may not even be usable by you as you move into better software. Keep it simple and stick with the formats described above.

Camera Settings

While less expensive cameras may restrict you to a jpg for capture, they usually allow you to set some parameters for the capture, such as the capture size, and quality. Tempting as it is on day one with the camera to try to get the highest number of images on a card that will not serve you well. The best images will come from setting the camera at the highest quality settings available. Using the highest resolution settings will guarantee you a file that will produce larger images, but you may decide to back down a notch if your only purpose is to produce 4x6 inch prints for your photo albums. Recent cameras capture incredibly high resolution images, often more than you need for many purposes. Use the resolution information from earlier to determine the best setting for your purposes.

As you move into better cameras, you may also have options such as color saturation, in camera sharpening, and contrast. If you take your image card directly

to a lab for printing, rather than processing images in Photoshop, Elements, Etc., then you may decide to choose settings that provide you with the output you like. If you intend to manipulate the images yourself, you will find that setting all of the parameters to the least of their values will provide you with a file that is less limiting. Increasing the contrast, saturation and sharpening is easily done, but dealing with a file that arrives with too much of any of these is more difficult. Make your decisions based on what the files look like in your computer, not what they look like on the back of the camera.

One aspect of many cameras, and all higher quality cameras, is the ability to set the color balance. Images made in sunshine have a different color than images made under indoor lighting, or fluorescent light. This is the setting most often referred to as the "white balance" and options include such things as daylight, cloudy, or tungsten, and perhaps even custom. Auto is always a choice, and for the casual shooter often makes an acceptable decision in normal circumstances. Just as often, it can make an image less than perfect, and one of the first things I recommend experimenting with is color settings as a good choice will get you a better image than Auto often enough to be worth learning about.

Even further up the digital food chain is the possibility of shooting raw files, or unprocessed files from the camera. This is a more complex decision, but provides you with files that are completely under your control. Processing the file for color, contrast, and even size, falls into your hands as opposed to the processor in the camera, and the results are what you decide they will be. The usual argument against shooting raw is that you have to process each image before you can use it, and that is time consuming. Current software for processing raw images is capable of processing multiple images in batches, and once you are familiar with the process, making a set of final images is not all that complicated. While you cannot use the images directly out of the camera like a jpg, fixing a bad jpg image can take more time, effort and expertise than working with raw images. The best distinction between the processes, while not entirely accurate, is that shooting jpgs is like shooting slides, and raw is like shooting negatives.

COLOR SPACES

Color spaces are the containers into which we put images to define what they look like. Files do not simply exist with a color, they exist with a set of numbers and how those numbers are translated into color depends on the display device and the related color space. One example of how this is usually described is a movie seen on multiple TV screens in a store. The color and contrast of the image depends on the setup of the TV set, and "messing with the controls" can change the appearance of the image of a particular set even as all of the sets receive the same picture.

My favorite description relates to musical instruments. If you give the same piece of music to several musicians, the trumpet, the piano, and the saxophone, among others, would produce different notes. This is because the piano would produce the music as written, but the other instruments are transposing instruments, and a modification must be made before the sound they produce matches the piano.

There are no “C” or non-transposing instruments in digital imaging. Each device interprets the numbers differently, and color spaces are used to “transpose” the image information so that it appears to be the same. That is the first step, getting the instruments on the same page, or in the same key.

Most cameras default to sRGB, the most common color space, and the one we noted earlier as the space in which our monitor lives. Output devices like the color printers at labs are also sRGB, so they are in the same key. But, even as two trumpets need to be “tuned” to sound alike, the printer and the monitor function in the same color space, but still need to be tuned, or “profiled” to be compatible with each other, and make beautiful music, or output that match each other.

SRGB – A relatively small color space (gamut, or range of reproducible color), but recommended for most people who do not have a specific reason to work in a larger space. Casual shooters and portrait and wedding photographers working with outside labs should work in sRGB. Working in a larger color space and sending files to be printed in sRGB will result in somewhat flat and desaturated colors as the expanded color range will be clipped off rather than used for printing.

Colormatch – a color space closely matching CMYK and therefore is used by some designers. Photographers generally skip this color space in favor of Adobe.

Adobe (1998) – a larger color space containing a wider gamut of color, and the space preferred by offset printers, and therefore used by most digital image editors and photographers whose output will be reproduced in print. Many cameras allow you to capture your images in the Adobe color space (jpgs) instead of sRGB. Most photo quality inkjet printers have a sufficient gamut or range of reproducible color to take advantage of the Adobe color space. It is therefore a good choice for those making their own prints with better desktop printers. Note that raw files do not have a specific color space until acted upon by the converter, where they are considered to be in the largest color space, ProPhoto.

ProPhoto – A huge color space generally accepted to include all visible light and maybe a little more. Raw files opened in the converter are initially conceptually in the proPhoto color space until the output file converts them as determined by the settings you choose. It is also natively a 16 bit color space capable of holding all the available information from a raw capture.

Dealing with Color Management

Color management can be relatively hands off unless your output goes in more than one direction. Most people working with a digital camera may send images to a printer like Costco, and email images to their friends and family. Perhaps an image will end up on the web in a personal web gallery. All of these outputs can be dealt with within the sRGB color space. How well profiled your monitor is will determine how closely your images will match those of someone else with a profiled monitor.

A test of your system is pretty easy. Send a file to a printer, like Costco, and they will print it like a normal lab, chasing the color and density of the image as the machine sees it. Ask them to print the file with "auto off" and you will see the print as you prepared it with your software. If it doesn't match your monitor (within reason) it is your fault, not theirs. Send the same file to a friend in an email or post it on the web. Now, view the file on someone else's monitor, and look to see how it compares to your original file and the prints you had made.

Differences are inevitable, but they should be relatively minor, and not something that makes you wonder what happened to your great photo. The print is your better comparator, as it should appear close to what you created on your monitor. The further apart the appearance of the image on your monitor and the other one you use to view the file, the more you will become aware of what color management, and specifically profiling, are designed to do. If the file looks pretty good, then you are well profiled. Your goal is to have the neutral values, overall density, color and contrast appear pretty much the same everywhere. If things are really out of whack, you need to look for the flaw in your settings to see where you can make changes and get into line with everyone else.

If you work in more than one color space, like Adobe for printing on a good desktop printer and sRGB for email and outside printing, you need to pay closer attention to making sure your files are in the proper space when they go out of the computer. Start in the larger space (Adobe) and make modified files in the smaller space as needed.

Color settings in your software package are also important. Setting your color space and other preferences in Photoshop, or telling Elements you want to make your own decisions is the first of many steps in controlling your images. Turning color management off is simply not an option (well, it is in the Elements dialog box, but not one you should choose).

Printing at Home

Your desktop inkjet printer can come in flavors just like your camera. A $99 inkjet printer with color cartridges using three colors plus black will not produce consistent, reliable color or archival prints. That printer will probably make poor color photographs on less than high quality paper and is not good for photographic output. Feed it sRGB and take what you can get.

The next step up is a line of printers designed to print photos rather than just text with color, and will use at least 6 color inks and handle more sophisticated papers with a long life and better color fidelity. You are probably still better off in sRGB.

Moving into Ultrachrome inks in Epson printers, HP with Vivera ink or Canon Pixma printers gets you to true photo quality output, the ability to handle larger prints, and real archival quality. Even so, you have to move into wide format printers to get the best of the options and produce truly fine prints that cannot be distinguished from color prints from a darkroom or commercial printer. The Epson R1800 produces Hi-Gloss output, and the R2400 uses the current K3 inks for archival color, and high quality black and white images. The HP B9180 and 8700 printers, and Canons 9000 and 9500 provide similar pigmented ink, archival quality paper options, and the ability to make superior prints. These printers run between $500 and $1,000, plus the consumables needed to keep them running. In the long run they are a far more usable investment and higher quality output for the non professional photographer than a color darkroom could have hoped to provide.

Printing from Photoshop requires an additional stage of color management as the printer, paper and inks used all introduce more variables. Settings in Photoshop and the printer driver must be set to use the appropriate color space of the image, and the profile for the paper and ink combination. Even so, the process is pretty straight forward and has improved in simplicity and capability with each version of the software. A little attention to detail can allow anyone to produce prints from digital files that range from acceptable to downright wonderful, depending on the quality of the file, the printer, and the skill of the photographer / Photoshop artist to produce an interesting image.

That said it will take you a long time to recover the investment in a home printer compared to what you can get from a lab for reasonable money these days. Custom printing used to be very time consuming and therefore expensive. With digital imaging, the time is negligible, and the results can be both stunning and inexpensive at the same time. That means the value and quality of the image are basically in the hands of the photographer. There are more good labs out there than ever before, and unlike the past, they are willing to work with both pros and non-pros alike.

Choosing a Camera

I won't spend time describing the various individual cameras available on the digital playing field – there are simply too many of them, and new ones every other week. Instead, I will look briefly at the various styles available and invite you to research the available options based on your personal needs and desires.

Compact / Point and Shoot – The least expensive cameras are in the Point & Shoot (P&S) group of cameras and are what most people recognize other than the typical SLR style of camera with a removable lens. P&S cameras are small; some ultra compact models are small enough to fit in your shirt pocket (not a good place for it, however). The really cheap cameras are exactly that, and sometimes moving up another $50 will get you a better camera. Canon and Nikon appear to have the highest market shares with the Panasonic Lumix being the exception as the second place camera. Sony and Fuji round out the brands that get the most attention and promise the best quality. There are some very popular models from Olympus and Pentax even though they are harder to find in an average store.

SLR Style – These are cameras that look somewhat like a traditional 35mm camera, but have a fixed zoom lens in a larger body than the compact style cameras. This is a tough category to discuss as there are a lot of options and serious comparisons have to be made with respect to individual features you may desire. They are popular with people who want something beyond a compact P&S without the investment in a full blown SLR.

D**SLR –** Like a traditional 35mm camera, these are bodies with interchangeable lens capability. They run the gamut from models starting under $500, to super cameras costing $5,000 to $8,000 for the body alone. The variety of options means you should have a concept of what you intend to do with the camera. Just spending more money doesn't guarantee you will get what you want.

Pixel Count – Current cameras run as high as 25 Mp capture. Higher pixel counts have their advantages for retouching, extremely large prints and such, but there are other considerations that may mean as much or more to you than pixel count.

The growth of the digital camera was initially based in higher pixel counts, coupled with lower noise, and the constant struggle to keep the price affordable. With the 6 Mp barrier broken, making a pretty good 8x10 possible right out of the camera, the pixel count race only really continues in the marketplace as driven by the advertisers. Some of the best cameras out there are based on 8 to 11 Mp capture, but they are exceptional as they are part of the digital camera elites from Canon, Nikon and Fuji professional lines. Even compact digital cameras are breaking the 10 Mp barrier and inexpensive DSLRs are in the 15 Mp range.

If you are choosing a camera for the first time, or moving up from something that is several years old, there are difficult decisions to be made, simply because there are

so many options available. I recommend that you list the needs and desires for owning a camera in terms of ease of use, output intentions, flexibility, price, and any number of other considerations you can think of. Then, visit a website like www.dpreview.com and start making decisions with their buying guide features search and side by side comparisons. The best place to start is deciding how much you can spend, and then seeing if you can get what you need within that budget. Eliminating cameras that simply do not match up to specifications you want will cut the market down to a select few in a reasonably short time. Looking at everything is a waste of time.

Once you have an idea of where you are in terms of the style and possibly some brand options, start looking at the local stores for the opportunity to put some of your choices into your hands. A camera is of little value if you cannot use it comfortably, and many cameras may fall from your list just because they don't feel right. That is as legitimate a decision making point as pixel count or price. Advice at a dedicated camera store can be valuable, but the guy behind the counter at a box store likely knows only a little more than you do and may have other motivations for suggesting certain cameras.

Particular brands are not usually important unless you are already invested in a lens system for an SLR, and even then you should investigate just how many of your old lenses will perform adequately on the digital platform. There are reviews and opinions available on the internet today, and it shouldn't be hard to find information about a model of camera you have in mind. The site shown above is a good source of information for all types of cameras. Sites like www.robgalbraith.com and www.fredmiranda.com are good sources of information on higher end equipment, lenses and software. Much of it may be confusing at first, and a grasp of the terminology of digital imaging should be your first goal. Learning to speak the language will help you ask better questions and understand the answers.

Please visit my website www.brysonleidich.com and look for the Learning Center and Digital Camps pages for additional information and how to attend half day and full day seminars on digital photography. In addition, I often speak to camera clubs in my area and to regional and state professional photography organizations on various aspects of digital photography and Photoshop. I try to keep details about those engagements on website as well in case you would like to visit a public session. Please feel free to email me with questions.

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