How To Make Your Projected Images Look As Good As You Expect

At club showcases we fairly often hear the exclamation, “Well, they look much better on my computer!” or “they are darker/lighter than I expected”! Some frustration is understandable, because no doubt the person’s photos did look great on their home computer. So, what’s wrong? This article is intended to help clarify the mystifying business of colour and digital photography. The causes of dissatisfaction are often:

- The photographer has not calibrated his or her home system, or they have not calibrated for a good while.
- If calibrated, monitor brightness or contrast has been altered since the last calibration.
- On an uncalibrated system, the photographer has the brightness of contrast set incorrectly. Beware; this can be a very significant factor.
- The photographer uses a Mac OS older than the current Snow Leopard v. 10. Gamma set to 1.8.
- Their computer display settings are incorrect.
- The images sent in the Adobe RGB colour space instead of the recommended sRGB setting.
- The photo has severely blown out highlights, has insufficient resolution, poor focus or other photographic defects (for example noise) which are made more obvious by projection.

NOTE: The bulk of information after the next paragraph is quite technical. Some may find that discomforting. If you simply want a quick check of your display, and some simple adjustment, follow the advice given below and skip the many pages that follow.

This link that has some easy-to-do checks < http://www.imaging-resource.com/ARTS/MONCAL/CALIBRATE.HTM >. (Note that you may have to copy/paste this link into your browser.) If these tests indicate a problem, check out this site which guides you through some simple remedies, found at: http://www.dmcphoto.com/monitor_calibration.htm

These are quick, if useful fixes that will educate you as well. They do not guarantee superb results, but may be good enough for many. One may not need to actually use a calibration tool (though that is very desirable and the club even has one you can borrow to try out.) Also, check out the Frequently Asked Questions at the end of this article.

So, the meaty stuff follows, but first a clarification. The word calibration can be confusing. A part of the process, which I will call monitor setup, is the setting of your display's brightness and contrast along with adjusting a few values related to the computer graphics card. Profiling, something rather different, requires the use of a hardware device to precisely measure colour patches; so that your system matches colour standards established by the graphics industry. This can be confusing. In short, everyone needs to do the monitor setup. The steps can be done very simply with nothing to purchase. Profiling is done with a tool along with software which you must either purchase or have the loan of. The software also sets up the monitor. This is what is most often meant by calibration. The key thing to know is that setting up your monitor for best results is not entirely dependent on calibration. There are things one can do that are simple and which may have considerable benefit.

A Detailed Exploration of Colour and Calibration

Preface:

While the information in these paragraphs is generally useful, you might intend to use a hardware device (Spyder, Color Munki, One Eye or other). If so, you can skip much of this, since the checking of gamma, colour temperature and black and white points (monitor setup) are included in the device software. I suggest read the introduction that follows and then jump straight to Calibration/Profiling, page 6 in these pages.

If your projected images at club showings are much different than how you see them on your home computer there are several possible causes. The most probable is that club projection is calibrated while your system may not be. Calibration is the use of a hardware measuring device, coupled with software that sets up the computer graphic card to deliver standard colours with the correct shades of grey. (It's possible that a computer which has never been calibrated may be near to correct but more likely it will need some adjustment and often a lot. Computers are all over the place when it comes to displays. Your home computer may look great to your eye but look pretty bad when viewed or projected with many other computers, especially a calibrated one.).

We will discuss other potential causes, but let's begin with the first possibility. In order to ensure your images look good when projected (and that they look good as you wish in your club gallery) the best thing you can do is to use a calibration device to make your system conform to standards. You should do this every few

months but certainly at least once a year. A very serious photographer might even do the process more often. (Warning: Once calibrated, do not change your display brightness or contrast without expecting to calibrate again. The functions are intertwined. Making your screen brighter or have more contrast because the ambient light is much brighter - you opened the blinds say - means you have altered your calibration.)

The setup of a monitor does not directly involve colour (but the settings may well affect it). The brightness and contrast of the display are set so that black and white are as true as possible. In addition to black and white, the properly adjusted projector will display as many possible shades of gray from black to white on a scale which contains some twenty or so shades of gray fading from black to shades of white. What this means in practice for displayed images is that blacks will be rich, whites white (as opposed to gray or some other tint) and all the subtle nuance of tone will be present - including and importantly the fine details in deep grays, whites or very light colour tones.

While I want to keep this as simple as possible, there are several other terms that we have to know about: colour management, profile, gamma, colour space, Adobe RGB and sRGB. Colour and related devices are extremely complex having many technical terms and we only need to be aware of these few because I will use these words in my descriptions.

Colour Management – A system for ensuring that the eventual output (screen, web, print or projection) looks quite similar to what we see on our computer display. Technically speaking, colour information from a specific device (your camera or computer for example) is converted via a device profile to a standardized colour definition. From there, it can be converted into values for a specific output device (a printer or a projector say) by using the profile created.

Profile – A colorimetric (done with an instrument which measures colour) description of the behavior of a specific device. This description can be used by another device to ensure the accurate transmission of colour between the two. The profile amounts to a set of mathematical instructions.

Gamma – The relationship between input and output levels for an image reproduction process. For our purposes, gamma most often refers to the difference between input levels for a computer monitor (pixels if you want) and output as relates to the luminance of the display medium.

Colour Space – A description (expressed mathematically as a two dimensional graph or model) of the full range of colours that can be achieved by any single device in the image reproduction chain – along with all of the tonal and colour deviations. There are millions of colours in the visible colour spectrum but they

cannot all be reproduced on a certain devices. For instance, the colours on a monitor cannot all be reproduced on a commercial four colour press, and vice-versa the press can print some colours the monitor cannot see.

Gamut – The full range of colours that are available within a particular colour space. In simplistic terms, how good it is in particular for printing. Adobe RGB is a colour space that was much favoured for the prepress industry. SRGB, the standard for the web and Windows computers is though perfectly adequate for most printing requirements and it is excellent for all other computer uses.

Adobe RGB – A large colour space developed by Adobe corp. Adobe RGB accommodates the majority of printer gamut. This space gained widespread acceptance amongst pro photographers who intended to print their output on commercial press or for other sophisticated use.

sRGB – A common RGB colour space with a relatively small gamut, originally designed to represent a typical computer monitor. Srgb is now gaining widespread acceptance, since it is the standard colour profile for most consumer level cameras and for many display devices. Its limited gamut does not limit it as a working space for typical applications including the web, computer screens and most consumer printers.

Monitor Setup

Bit Depth and Display Settings: While likely a minor factor and not of consequence for most systems, since most are set up for the default, this is worth knowing something about and worth checking in your initial setup. The display settings for Windows based machines are found under the control panel, display, settings or right click anywhere on your screen to see the Display Properties/settings. Ensure that the Color Quality is set to Highest 32 bit; you may have an alternate choice of Medium, 16 bit or some other. Bit depth refers to the amount of data (or colour information) that can be contained within each and every pixel that lights up a fraction of your screen. The setting of Highest 32 bit ensures that the finest nuanced tones are displayed with the smoothest transitions between different tones. Ages ago, in computing terms, displays were set to 8 bit. The result when doing certain adjustments to images was unsightly banding in certain colours and scenes.

Gamma: Gamma, another computer graphics card setting. Gamma is best understood as a setting (you set and forget it, basically) which has great impact on the mid tones in your images but little effect on the blacks and whites. The standard for the web and on all Windows based machines is a gamma of 2.2. Until recently, the gamma for Apple machines was 1.8. With the latest OS, Apple computers now are 2.2. Images generated on Macs with a 1.8 gamma setting when

projected from a Windows based system would typically be washed out, lack punch as it is expressed. This is mostly a platform issue and ironic as Apple computers were originally the choice of many graphic and photographic professionals. There is a simple test to see if your gamma is set correctly. You can find it at: < http://epaperpress.com/monitorcal/gamma.html >and here is another site with further information: < ww.drycreekphoto.com/Learn/Calibration/monitor_gradient.htm > and for the technical extremists check this one out: http://www.graphics.cornell.edu/~westin/gamma/gamma.htm . For the completely nerdish or printing perfectionists here is all you need: < http://www.normankoren.com/makingfineprints1A.html >.

Setting gamma requires software. For photographic purposes that usually means Adobe Photoshop (in its many incarnations). Typically (and this can vary with the particular version) the setting is found under Edit/Color Settings/ the setting for gray. In my experience, this can be set incorrectly

Black and White Points: Setting the black and white points is included early in hardware based calibration as part of the step by step process, but note that setting the black and white points (getting your display contrast and brightness set properly) is imperative even if you do not do hardware based (Spyder or the like) calibration. This adjustment can only be done using suitable targets – on screen graphic images – and by following a step by step process. Be aware that the two settings interact. You may have to go back and forth a bit.

Here is good example of the targets and process for the black point. (NOTE THAT THE INSTRUCTIONS SAY TO SET FOR 24 BIT. THIS SHOULD BE 32 BIT, AND ALSO THESE INSTRUCTIONS APPLY I THINK TO THE OLD CRT MONITORS, THOUGH THE PRINCIPLES ARE SOUND)

< http://scarse.sourceforge.net/adjust/black.html >

and for the whites < http://scarse.sourceforge.net/adjust/white.html > While there may be better sites for adjusting flat panel monitors (and some are suggested in this article) this 'Scarse' method puts proper emphasis on the importance of seeing detail in the black and whites.

And here is an interesting check of the black point alone: < http://www.drycreekphoto.com/Learn/Calibration/monitor_black.htm >

And another: < http://www.lagom.nl/lcd-test/black.php >

Colour Temperature:

Colour temperature refers to the fact that light has colour. We know that intuitively because light at high altitude or in winter often has a bluish cast. We are familiar with the rich warm (reddish) light in the magic hour around sunset. This is the reason we set white balance on our cameras.

The same is true of the light emitted by a computer monitor. The typical monitor has color temperature choices of 5000K, 6500K and 9300K on the Kelvin scale. Some have more options. Often lower end consumer models won't let you change the color temperature at all. Most monitors have a native color temperature somewhere between 6500K and 9300K. If you use an LCD that offers a choice of "Native" white point that may be your best choice. If you use a CRT however, and not many do these days, you will need to pick a color temperature. Most often the best choice is 6500. If your flat panel monitor offers a choice of color temperatures, chances are good that it came set at 9300K by default; for the simple reason that the cool blue white color looks brighter than the warmer light from lower color temperatures. Just like when you go to a department store and look at the wall of color television sets they have for sale, your eye tends to be attracted to the one that looks brightest. But simply being brighter doesn't necessarily make it more accurate. Still, since your eyes tend to adapt to what they see without something truly neutral to compare against, most any mid-range color temperature will likely look reasonably good after a while.

- Note * I still use a CRT, a high end Sony Trinitron. While mostly obsolete now, superb CRT monitors offered true blacks and a fuller more subtle range of tones. Their obsolescence came about because of the liquid crystal display invention and the fact that panel displays are lighter and slimmer – taking up less desk space. It was never an issue of image quality. Very high end flat panes used by imaging professional are now have image quality approaching or matching the best of CRTs.

(Here are LCD test images in the event you are really curious about all of this: < http://www.lagom.nl/lcd-test/ >)

So does any of this really matter? Setting the temperature too low can cause your monitor to struggle for adequate brightness and may result in banding or other artifacts. Setting the temperature too high though will cause increased eye strain, since the average indoor lighting from incandescent bulbs is down around 3400K. As a compromise, something in the middle is best for most uses. You will likely have a choice of colour temperatures in the control app. that governs your particular display. In my case, that is the software for my display adapter. Right click screen, display properties, advanced and under the various tabs, Catalyst for the Radeon AMD graphics card in my computer. This is not a big issue, so if you cannot find out how to check your display colour temperatures don't give it a lot of thought. You may have a friend or computer guru who can look into this for you, if you suspect it's a concern.

Colour Calibration/Profiling: If you elect to calibrate your monitor with a hardware device you will avoid having to concern yourself with most of the setup issues. Display settings, black and white balance, gamma and colour temperature are all included in the process and it is remarkably easy. Here are guides to buying and using hardware for computer/monitor calibration:

< http://www.imagemaven.com/the-importance-of-monitor-calibration/ >

Equipment choices (from an Australian site but an excellent primer on the subject: < http://www.imagescience.com.au/kb/questions/49/Buying+Guide+to+Monitor+Calibrators >

And some reviews from a North American source: < http://www.drycreekphoto.com/Learn/monitor_calibration_tools.htm >

And importantly, the disclaimer follows. You should always take any suggested reviews with a grain of salt. Do your own searches and come up with a number of opinions. While I endeavored to find good, and easy to understand examples, I cannot be certain that the information is out of date or that it does not reflect some bias or other. Some sites lean towards promoting certain products. Most products are very good for the typical user.

"Frequently Asked Questions"

My display is not calibrated! The standard answer is you should buy or borrow a hardware calibration device to calibrate your computer and monitor regularly. They cost between about eighty dollars and up. A good one for average home use can be purchased for between eighty and one-hundred and fifty dollars. They are very easy to use and largely automatic. Adobe used to supply free software based utility called Adobe Gamma that was OK for average users to roughly 'calibrate' their system by eye, but they discontinued that with CS3. I understand that our club has a basic hardware calibrator for loan. You can try it out and see how easy it is to do.

I calibrated my system and my projected images still look lousy! Your monitor brightness or contrast settings may have been altered or your monitor has degraded. If so you need to recalibrate. These important settings can have detrimental effects on your image processing. Note that they should not be set by eyeball so a particular picture (or your screen wallpaper) looks good. Nor should

you (tempting as it is) vary your contrast or brightness because the ambient light in your work space changes.

Arghhhh!!! I can't be bothered with any of this! O.K., but at a minimum you must have the brightness and contrast controls of your computer screen (monitor) set correctly. This has a huge impact on how your photos look. Here is a good guide: < www.metalvortex.com/chart > /Follow the steps. And here is a more informative site, which you can copy/paste into your browser < http://www.poynton.com/notes/brightness_and_contrast/ > Note some LCD displays (especially those on laptops) have only a brightness control or screen backlight.

Do I really have to calibrate with a hardware tool? No, honestly, you may be one of the few lucky ones whose system colours pretty much work. However it is essential that you set brightness and contrast properly for your monitor (display setup). Calibration is vital for printing and desirable for other important outputs.

So You Use Photoshop Elements! Here is some helpful stuff:

< http://www.dummies.com/how-to/content/how-to-set-up-the-color-management-system-in-photo.html >

So how do I know if my LCD screen is set up well? Here is a site that can help: < http://www.lagom.nl/lcd-test/ >

How do I know if my monitor is OK or not? Do you want to know how good your monitor is or how badly it is set. Check out: < http://www.imaging-resource.com/ARTS/MONCAL/CALIBRATE.HTM > What else can I do? You can obtain a sRGB test target which is an excellent way to judge how your monitor is displaying. Here you can obtain a great one:

< http://www.gballard.net/photoshop/pdi_download/#downloads >

For fun or to even surprise yourself, scroll down this website until you get to Most Useful Target "Whacked RGB". You can download the file lower on the page under PDI TARGETS WHACKED . If you open this test target in your favorite processing program and it is blue all over you have no colour management. It really works. If your system is good, the test target will look great in all aspects.

Frank Dwyer, November 10, 2013