

Choosing a Colour Space

Last month we looked at matching the colours between your monitor display and the printer output. This is one of the biggest challenges in digital imaging. However, as we saw, just a few simple steps will eliminate the usual trial-and-error guesswork and should give you a close and reproducible colour match. I also mentioned something about selecting a colour 'working space'.

When choosing a colour space we only refer to the working colour space. We don't choose monitor, camera, scanner and printer colour spaces. These are fixed by the hardware and we select the best monitor-, printer- and scanner profile to match our image colours between all those hardware devices. But for the working colour space we do get a few choices.

By the way, I assume that we are all working in RGB. Years back every digital image file was born in a drum scanner and those machines were programmed for direct CMYK output. Nowadays digital cameras and scanners give us RGB files, and they should stay that way until they go to a commercial offset printer.

What colour space are you working in?

Do you know? Speaking with a number of photographers, publishers and printers, most of them highly skilled in Photoshop, many could not tell me what colour space they are using. Some didn't even know what I'm talking about.

If you haven't changed your colour setup in Photoshop then you are working in sRGB. This is Adobe's default setting. The 's' stands for 'standard', but it could also stand for 'small', because sRGB is a rather small colour space with a narrow gamut.

Most digital image experts recommend working in a larger colour space. Over the last few years the Adobe RGB (1998) colour space has grown into something like the standard for professionals, printers as well as photographers.

The following two images show you how the two colour spaces compare. The larger Adobe RGB is shown as the wire frame and the solid block represents the sRGB space. We need to view colour spaces in three dimensions. The first image is a view from the side with the a axis (magenta-green) and b axis (yellow-blue) running across the base. The vertical axis is the Lightness (L), with the top being white and the bottom black. The second image is a head-on view with the L-axis sticking out of the paper.

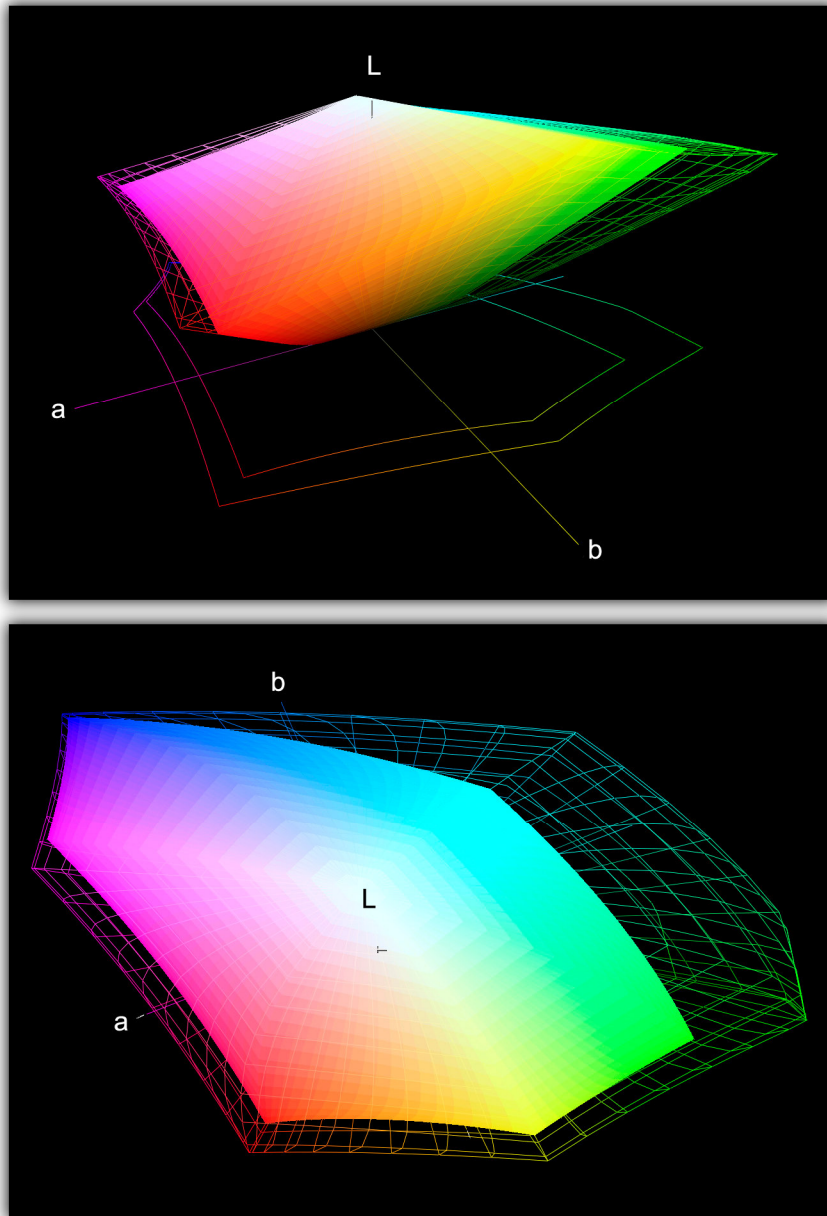


Image #1 - Comparing sRGB (solid) with Adobe RGB (wire frame)

The wider colour range (gamut) of the Adobe RGB space is obvious, especially in the blue/green regions. This simply means that we have a wider range of colours, in particular more saturated shades of blue and green, but also more intense magenta, orange and yellow tones. Today's inkjet printers can print most of those extreme colours and it does make sense to switch to a larger colour space.

How do we select the colour working space? Go to 'Colour Settings' under the Edit menu (or under the Photoshop menu for Mac users) and you will get the following interface:

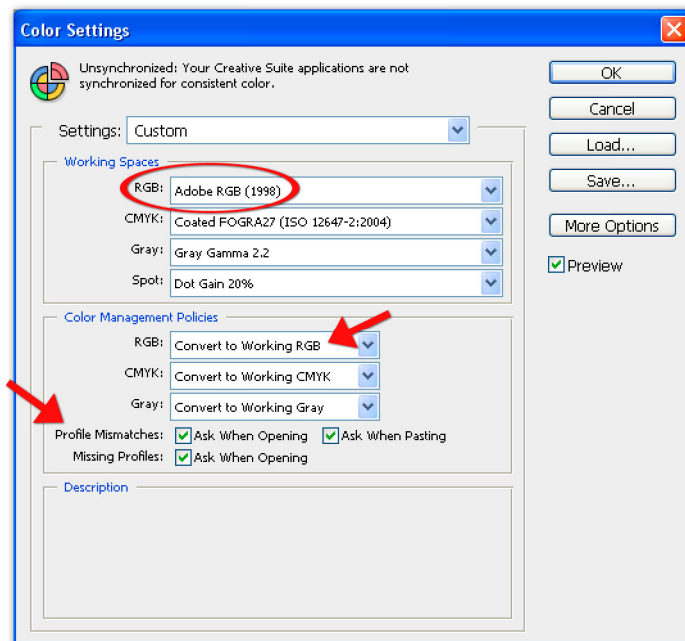


Image #2 - Colour Management Setup in Photoshop

Look for Adobe RGB (1998) in the dropdown menu for the RGB working space. Under the 'Colour Management Policies' I recommend to switch to 'Convert to Working RGB'. This will convert all imported images into your working RGB if they are not already in the right colour space, no matter what profile they have attached. It is also a good idea to tick the 'Ask when opening' if there is a profile mismatch. This ensures that you always know what Photoshop is doing in the background.

You also need to make sure that the images coming from your camera and your scanner are in Adobe RGB. Look at your scanner settings. Under colour management you should find an option where you can select the colour space.

All professional digital cameras, even some point-and-shoot cameras will give you a choice between sRGB and Adobe RGB. The default is always the sRGB setting and you need to change this in order to get the best out of your camera. This is not strictly true because if you shoot in Raw the colour space setting in the camera is irrelevant. The colour space is chosen during the Raw conversion - we are going to look at that later. But if you shoot in JPEG the colour space setting is critical and you will not get the full potential of your camera if you leave it at the default sRGB setting.

When do we use sRGB?

If sRGB is so much smaller why bother using it? It must have something positive, otherwise it would not be the default setting of all editing software and digital cameras. The reason is that sRGB is the standard for most common computer monitors. It is also the colour space used in all WEB browsers and any of the many non-colour managed programmes, such as word processors and most publishing software. It is also the default colour space in conventional photo lab printing.

And here lies the danger: if those applications get an image tagged with the Adobe RGB, the colours are going to come out dull. So, we get quite the opposite of what we expect. If you work in Adobe RGB, your workflow must be strictly controlled. All emailed photos or images going onto the WEB need to be converted to sRGB. The same goes if you use an external printing service (which does not expressly state Adobe RGB).

In the end, it does make sense when even Adobe Photoshop chooses the smaller sRGB colour space as default. If you do your own printing or hand your images to a professional publisher/printer, the larger Adobe RGB is the way to go. If you have one of the latest inkjet printers, you are likely to notice the enhanced gamut. On the other hand, the casual amateur is better served with sRGB and there is less danger of any colour mismatch.

If you need to change the profile of an image from one colour space into another you do that in 'Convert to Profile' under the Edit menu. Needless to say, you can run this as an action if you have a bunch of images to convert.

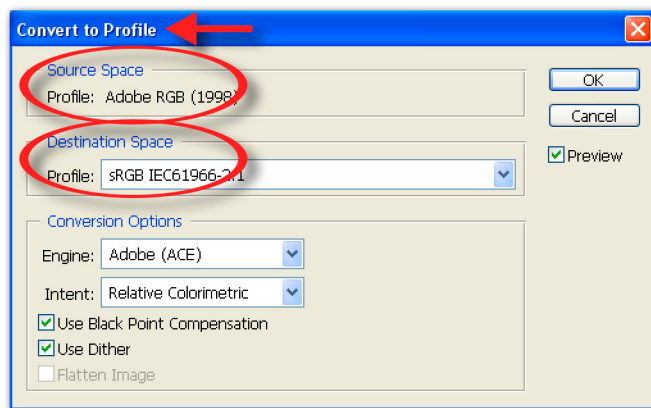


Image #3 - Convert Profile

Selecting a Colour Space in Raw Conversion

As already mentioned, Raw files don't have any colour space, but they do get one assigned during the Raw conversion.

In the latest Adobe Camera Raw converter you will find a blue line of text underneath the main preview image. It reads something like 'Adobe RGB (1998); 16 bit; 4000 by 3000 (12 MP); 240 dpi'. If you click on that line, you get to the Workflow settings:



This gives you four options for colour space: the already familiar sRGB and Adobe RGB, as well as two more. I have never come across anybody using the ColorMatch RGB, but the last choice, the ProPhoto RGB, deserves a brief discussion.

ProPhoto RGB is simply huge, much bigger than Adobe RGB. So why not use this one? If you work in 16-bit mode, each of the three channels can handle 65,536 shades of that colour (2^{16}). This is more than enough to accommodate even the huge number of individual colours that ProPhoto RGB offers. However, the moment you switch to 8-bit, you only have 256 levels per channel, and if you have some of those extreme colours in your image, you can get banding (posterisation) in areas where you would expect a smooth gradient.

Although ProPhoto RGB will pull even more colours out of your camera (at least in theory), workflow considerations also become even more critical than in Adobe RGB and it is recommended that you keep everything in 16-bit.

If you use Lightroom as your Raw converter you will find the colour management setting under the Edit menu: go to Preferences and External Editor.

We have covered a lot of colour management in the last two months, without having those dreaded words in the title. People love working with their images and adjusting the colours, but if you mention colour management and monitor profiling, their eyes glaze over. And as soon as they hear things like Lab, CIE XYZ and D50 illuminants, they drop the mouse and head for the door.

Colour science is highly complex, but technology has made colour management quite transparent and simple for us. With a calibrated monitor and good printer profiles you are almost there. Choosing your colour working space is also important.

Adobe's default setting of sRGB does make sense, although most Photoshop experts recommend switching to a larger colour space. The casual amateur is better served with sRGB. There is less danger of a colour mismatch.

On the other hand, the larger Adobe RGB does allow you to have a larger range of colours from your camera and printer, especially more intense blues and greens. But you must know when to switch to sRGB!