

TITLE: COLOUR MANAGEMENT/ COURSE NOTES

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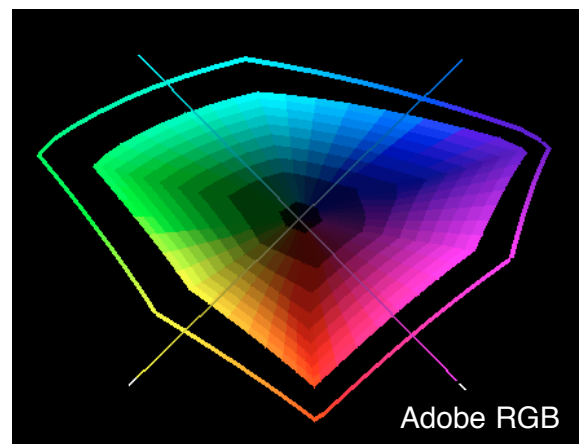
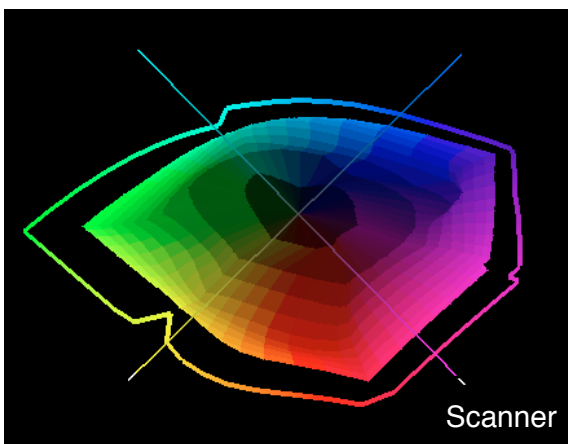
DATE: 2011

Colour Management Course

Setting up a Colour Managed Workflow

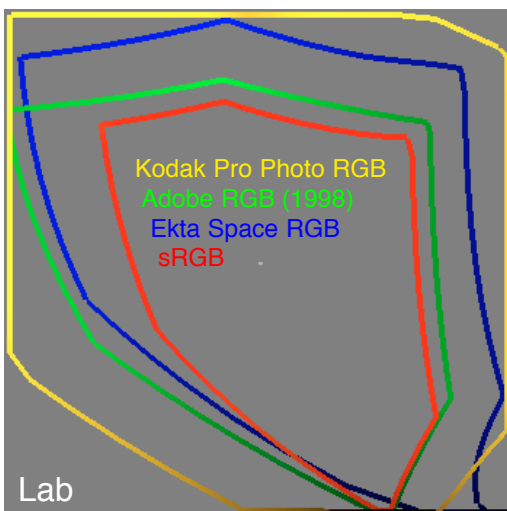
Choosing an RGB Working Space

Because the capture colour spaces (for scanners and cameras) tend to not be perfectly perceptually uniform or grey balanced, we convert the image into a Working Colour Space that is grey balanced and perceptually uniform for editing and archiving our images. Grey balanced simply means that equal RGB numbers always produce a neutral gray, and perceptual uniformity ensures that the same number adjustment produces approximately the same degree of visual change anywhere in the colour space.



Kodak Pro Photo RGB, Ekta Space PS 5, J. Holmes, Adobe RGB (1998) and sRGB are examples of gray balanced and perceptually uniform RGB Working Colour Spaces.

An ideal space would not 'guillotine' colours from either your input or output gamuts.



However a very large colour space (eg. Kodak Pro Photo) may be wasteful if it contains many colours that can't be captured, displayed or printed. Excessive editing may visibly increase the image posterization unless it is encoded in 16 bits.

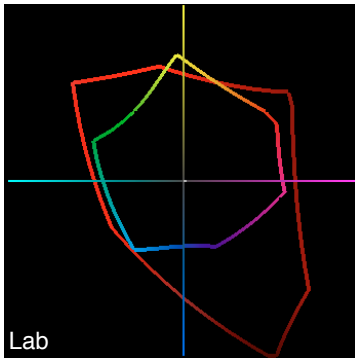
It is practically impossible to find a perfect Working Colour Space. Therefore consider the likely gamut of your images and choose a space that reduces any potential editing or work flow problems. It is also possible to work with multiple RGB spaces.

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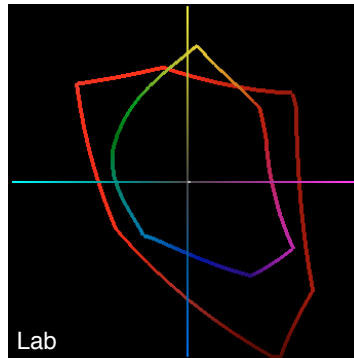
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sRGB

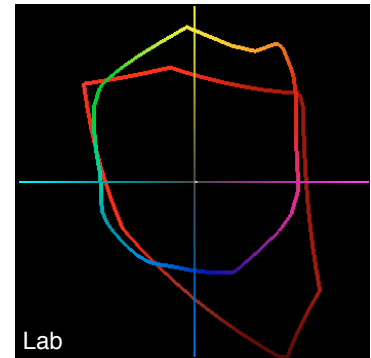
Because **sRGB** is the colour space of an average uncalibrated colour monitor it is a good space for work that will be distributed on the internet. But it is not an ideal space for printing as it significantly clips the output gamut of most digital and photographic printers. But if you are only printing low saturation images, such as studio portraits, it will probably not clip their gamut at all.



Offset Euroscale CMYK Coated Stock



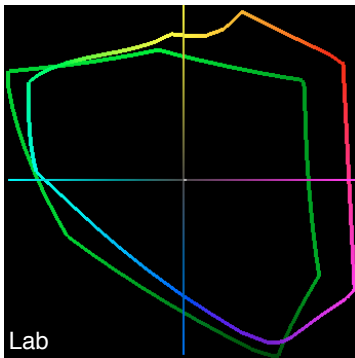
Durst Lambda and Kodak RA4 Endura E



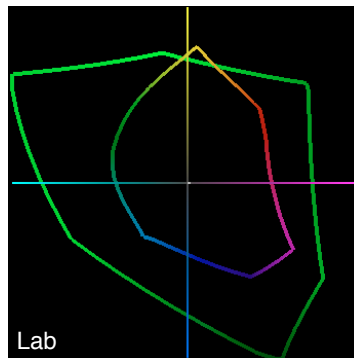
Roland Hi Fi Jet and Ilford Smooth Pearl

Adobe RGB (1998)

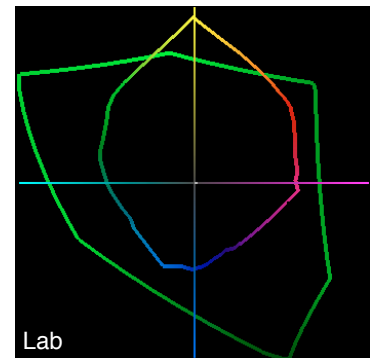
On the other hand **Adobe RGB** is the largest colour space that most DSLR cameras can output files to, so it is a reasonable choice for processed DSLR files. However it usually clips the Raw unprocessed DSLR gamut. Adobe RGB also covers the typical output gamut of Offset (CMYK) and most digital-photographic printers, but clips the output of wide gamut inkjet printers.



Canon 1Ds Raw File 5000°K



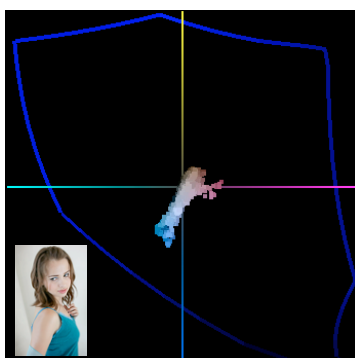
Durst Lambda and Kodak RA4 Endura E



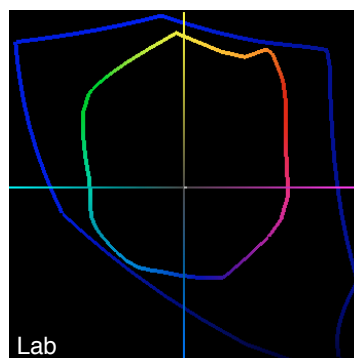
Epson 2100 and Hahnemuhle Photo Rag

Ekta Space PS 5, J. Holmes (Ekta Space RGB)

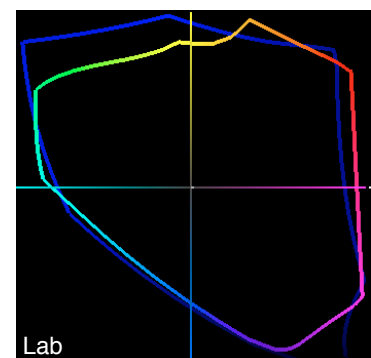
If you are scanning film then **Ekta Space RGB** might be a good choice because it will faithfully preserve all possible colours in the original transparency. It also covers all printer gamuts and most Raw DSLR camera gamuts. However it might be excessively large if your subjects are of low saturation (eg. studio portraits) or output is the internet or Web Uncoated CMYK printing.



Studio portrait (Canon 1Ds processed sRGB)



Roland Hi Fi Jet and Ilford Smooth Pearl



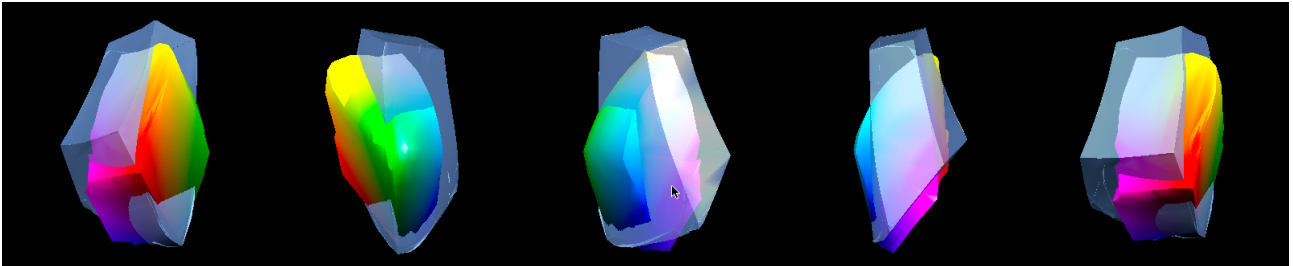
Canon 1Ds Raw File 5000°K



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The 'Problem' of Small Gamut Working Spaces

While 2D projections indicate the 'problem', a 3D gamut projection reveals the full story.

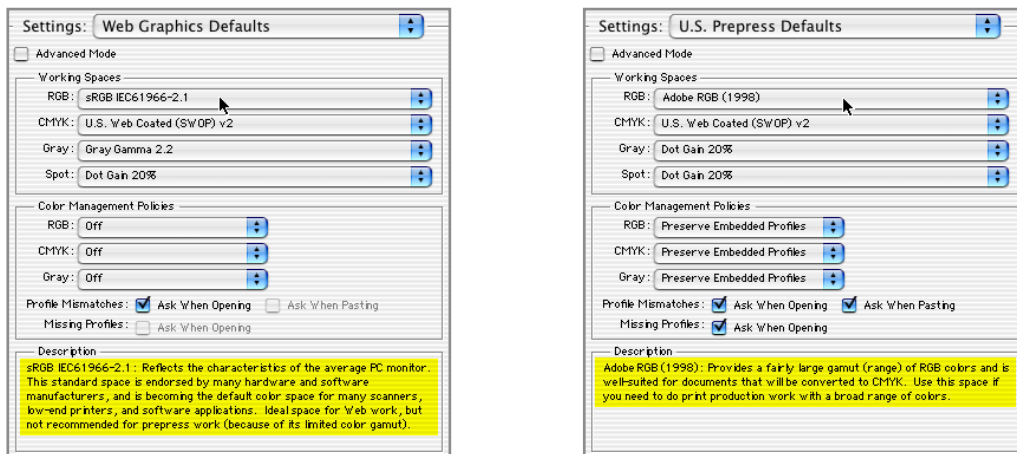


3D CIE Lab Projection: Nulab_V3  and Lambda_Kodak Endura E Surface 

If you initially reduce the 'potential colour gamut' of your images to an 'editing/archiving colour space' that is significantly smaller than your input and output gamuts, you are significantly clipping (reducing) the range of possible colours in that image. When the image is converted to an output gamut it will have permanently lost all those colours.

Default Colour Settings

Companies such as Adobe, Microsoft, Apple, Kodak, Fuji, Agfa, Epson, Quark, etc who subscribe to the ICC standard are well aware of this 'problem'. For example Adobe clearly acknowledges it within their Photoshop Color Settings default recommendations:



While Adobe recommends settings for 'Web Graphics' and 'US Prepress', they do not provide any default settings for photographers whose output is something other than the internet or an offset printing press. The 'problem' is that photographic output has a colour gamut **extending beyond** the boundaries of small working space profiles like sRGB. However this must be tempered by an examination of the image's colour gamut.

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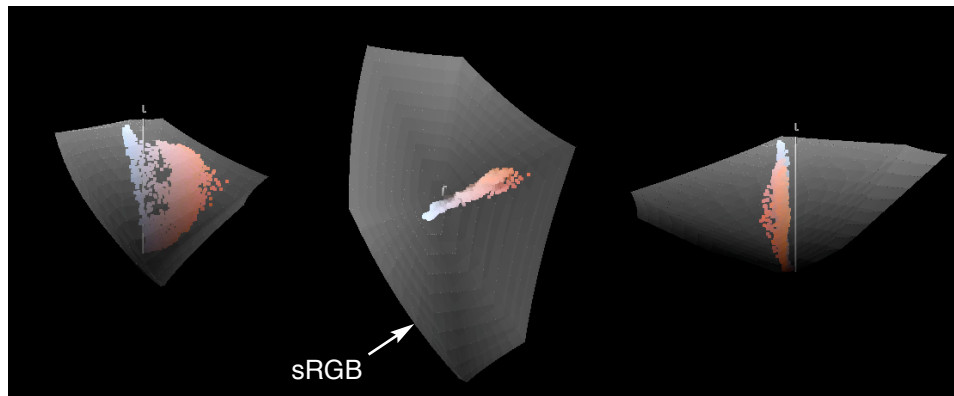
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Mapping Portraits - sRGB versus Adobe RGB (1998)

Human skin however comfortably fits within an sRGB colour space and most output colour spaces. Therefore when skin tones are the most important feature in an image, selecting sRGB as the working colour space will not distort the reproduction of skin tones.

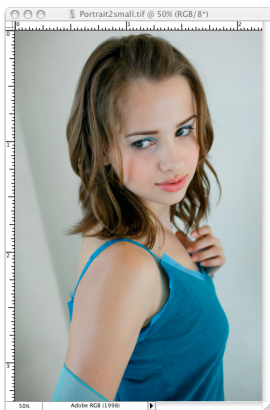


sRGB IEC61966-2.1.icm

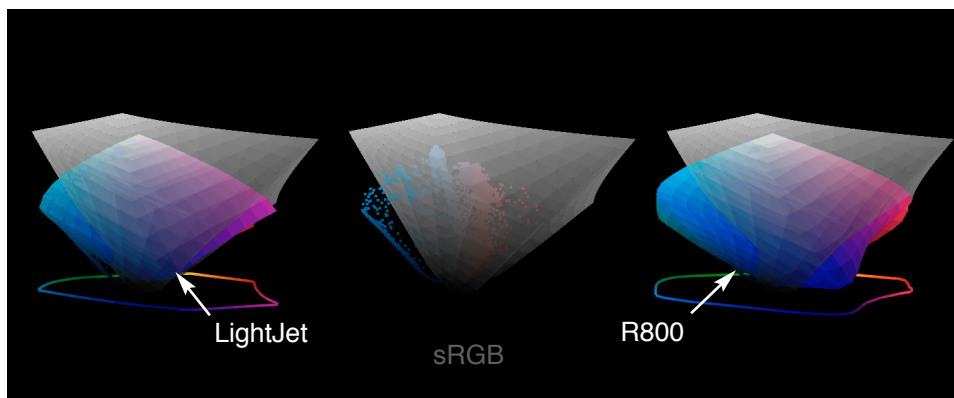


and individual skin tones/portraits

However even in a studio portrait there may still be colours that lie outside of an sRGB gamut. Therefore if in doubt work with a larger rather than smaller working colour space.



Adobe RGB (1998)



LightJet RA4 - Fuji Crystal Archive Gloss

Epson R800 - Premium Gloss Paper

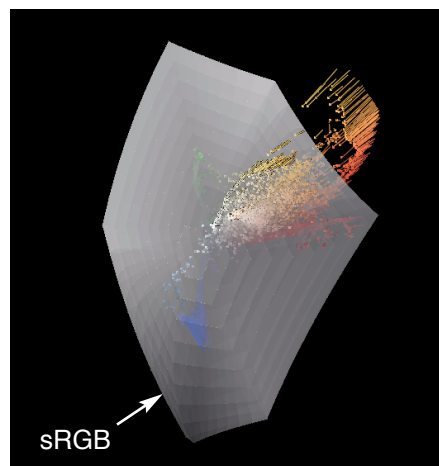
For example, the cyan-blue dress in this studio portrait can be accurately reproduced by an RA4 photographic printer (LightJet) or inkjet printer on gloss papers, but lies outside of the sRGB gamut. Adobe RGB (1998) encompasses both the input colours and most of the output inkjet and photographic printer gamuts. Therefore Adobe RGB (1998) would be the recommended RGB Working Space because it does not compress the subject's gamut, and will produce more saturated (colourful) prints as well as accurate skin tones.

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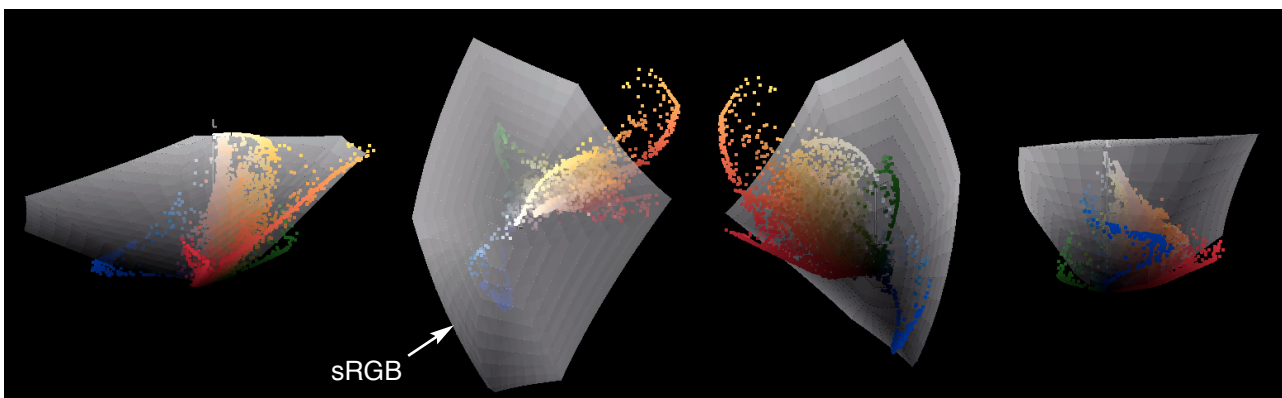
Mapping Images into Colour Spaces

The RGB working colour space should ideally be as small a space as it can be without clipping any of the input gamut (from the scanner or camera) or output gamut (monitor or printer). The only exception would be if the image requires its gamut to be significantly expanded, then the image might be converted to a larger colour space. Working in 16 bits with large colour spaces is also helpful when post scanning image editing is required.



Paint Tins (Ekta Space) mapped Absolute Colorimetric into an Epson R800 Ultrachrome printer with Epson Premium Semigloss paper.

This Ektachrome transparency comfortably fits within 'Ekta Space PS 5, J. Holmes', but contains many significant colours that lie outside of the sRGB gamut. However some of these 'out-of-sRGB_gamut' colours can still be printed, even in the relatively small colour space of photographic paper. Therefore scanning this transparency into sRGB would permanently clip (reduce) many of its colours, resulting in a less saturated or 'flatter' image.



sRGB IEC61966-2.1.icm and the Paint Tins image

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Mapping Colour Spaces to Images

Ideally all hue, saturation, tonal, scale, and resolution corrections would take place while transforming the RAW linear capture data (from camera or scanner) into RGB data. A working space would then not be required because the image can be directly converted into a destination profile, that is unless additional image (RGB data) editing is required.

The problem then becomes determining which RGB working space encompasses the image's gamut without wasting excessive bits on colours that haven't been or can't be captured by the camera or film/scanner.



Alwan ColorPursuit (www.alwancolor.com)

While 'Ektachrome Space, J. Holmes' encompasses 90.3% of my digital camera gamut and 92.3% of my film/scanner gamut (whereas sRGB encompasses 39.4% of my camera's gamut), I have found very few of my image gamuts captured on either CCD/CMOS or film to exceed this space, where as this has often happens with sRGB and Adobe RGB.

I therefore choose a working space with the smallest gamut (to facilitate image editing and reduce visible posterization) that doesn't significantly clip any of my input or output gamuts, tempered by the captured colour gamuts of the scenes I photograph.

Working spaces like EktaSpace PS 5, Don RGB 4, Beta RGB and Best RGB meet this criteria. According to www.brucelindbloom.com these spaces cover more than 65% of the Lab (visible) gamut with less than 4% of their gamut being wasted on 'unreal colours'.