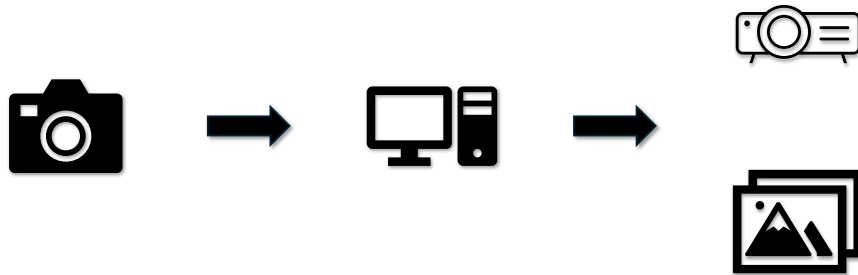# Colour Management

Mark Taylor – January 2025

Photography is the same in terms of capturing an image – light, composition etc.
BUT we have moved from analogue to digital
From chemical processing to data processing
That means we can improve our photos before we output them much more easily
That means we really need to understand what we are doing to avoid unexpected results

Colour Management

The simple answer... have your camera produce a JPEG using your preferred output eg vivid, portrait, neutral... at low compression using sRGB or Adobe RGB depending on output

Simply resize for projector or print. Club projector is max 1920 x 1200 pixels. Canon printers use 300 dpi x the required print size eg 10 x 8 = 3000 x 2400 pixels

Output should match "in the camera" photo if everything is calibrated in the chain

If you always get it right in the camera, why worry, just output to DPI or print...
Yes, but, you have choices, especially when printing
Different papers will produce different results

Colour Management

1. Intro to colour management
   a. Colour model
   b. Colour space
   c. Gamut
   d. ICC

2. Colour Managed Process
   a. Calibration at capture
   b. View & edit
   c. Soft proofing / ICC profile
   d. Clipping

3. Workflow
   a. Capture
      i. White balance (corrects for lighting)
      ii. Colour calibration
   b. Edit
      i. Black and white points
      ii. Usual edits
   c. Prep for output
      i. Make copies for each output
      ii. Understand destination, colour space, gamut
      iii. ICC profile for printer & paper (sources)
      iv. Soft proof
      v. Make corrections
      vi. Save JPEG or print

Assuming you want to manage your output, especially if you want to improve your photos along the way
You need to understand colour management to avoid disappointing outputs
Talk though agenda

3

Colour Model - RGB

Which red?

- Colours are made from different levels of red, green and blue, from 0 to 255
- 0 / 0 / 0 = black
- 255 / 255 / 255 = white
- X / X / X = grey

R

G   B

Which green?

Which blue?
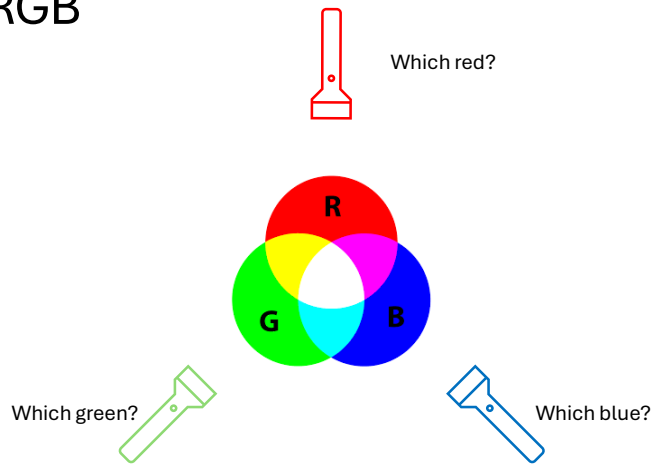
ICC = International Colour Consortium

Computer monitors originally only displayed mono and no graphics – each pixel was either on or off
Eventually we had GUIs and colour
The colour model was RGB so manufacturers made colour displays using RGB
BUT, they didn't match – have you seen TVs in Currys – do they all look the same?
All devices can have an ICC profile assuming there is a mechanism to use it to correct colours to ICC standards

Colour Space

- As you can see, not all combinations of R, G and B can be viewed on all devices or prints
- Greens and blues are problematic
- Many lower cost laptops, for example, claim ~60% sRGB coverage but more expensive ones cover sRGB or even Adobe RGB
- BenQ and Eizo screens are expensive but give the widest colour coverage
- Fine-art printers cover Adobe RGB
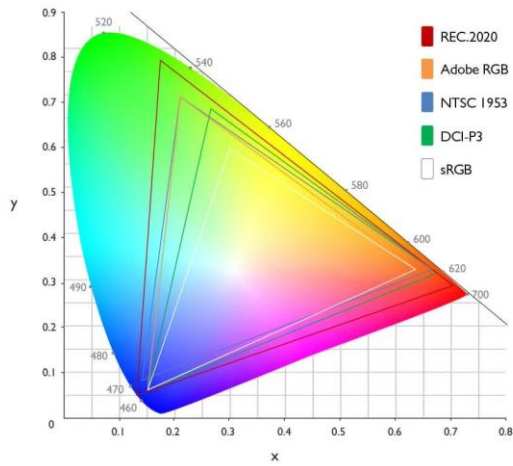
Gamut

- A colour gamut describes the colours that can be displayed, or printed for a given medium.
- A lower cost laptop or typical office use display will probably not be able to show all sRGB colours (check specs)
- A particular printer & paper combination will have a specific gamut and Gamutvision can show where the limits are
- Lightroom can show where colours in your photo are outside the available gamut, whether it's a printer/paper combination or the sRGB gamut of the projector.
- You can use this to select the paper which most covers the range of colours in your photo or to see if a projector will show all the colours in your photo
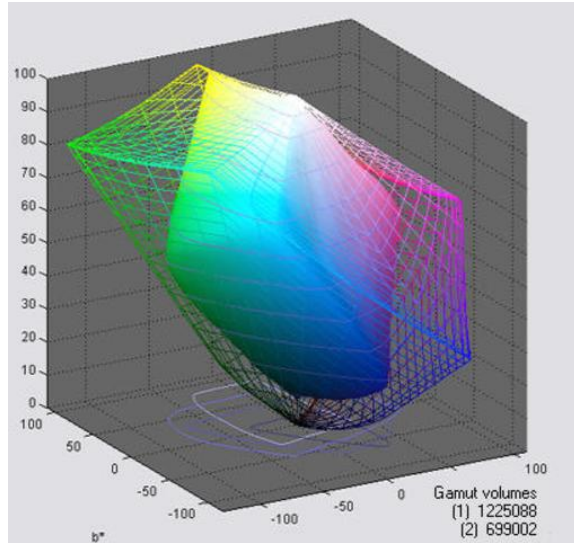
ICC profiles

- The International Colour Consortium set out to standardise colours for different devices – they use the same red, green and blue as each other
- ICC profiles are used by Lightroom to simulate the appearance of image output to different devices or printer & paper combinations
- A standard for devices (especially screens) to be calibrated to show colours in a consistent way. An image on a calibrated screen should look the same on another calibrated screen if they cover the same gamut
- A calibrated screen, with a wide gamut, allows for reliably simulating other outputs from sRGB DPIs to giclee prints

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Colour Management Process

An approach to capture, edit and output images within know colour spaces so that the end result is as predictable as possible in terms of colour reproduction

Image Capture

Most camera / lens combinations will record a slight colour cast and this is further affected by lighting conditions. In most cases only correcting for light is necessary.

Calibration of image:

1. White balance – allows for colour shifts due to light colour
   1. Bright daylight gives a blue tint
   2. Morning & evening – yellow/orange
   3. Tungsten lights – yellow
   4. Flourescent tubes – green
   5. Etc...

2. Colour calibration
   1. Only necessary for critical colour matching from real-life to output, especially commercial work. For example, portrait for correct skin-tones, product or food photography...

Switch to LR showing Manor with different white balances

View & Edit

Most screens have limited ability to accurately display colour nor cover wide colour spaces.

Step 1 is to understand the limitations of your screen

Step 2 is to calibrate the screen so that it displays colours in conformance with ICC standards

Datacolor Spyder or Callibrite apply colour profiles which load on startup
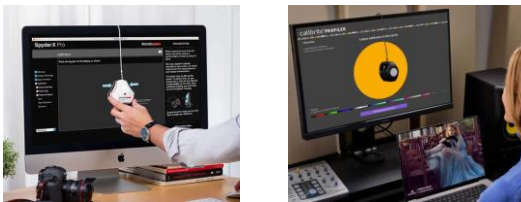
This is by far the most important part in colour management

Soft Proofing

Soft proofing is simulating the output you intend by applying an ICC profile. You would see how the colours would differ from what you see on your screen when the image is output to projector or print. Lightroom lets you switch between screen view and softproof, or put both views side-by-side. You can then edit the image to minimise those differences.

The profile could be just sRGB (to simulate our projector) or an ICC profile of a printer & paper combination. Paper suppliers such as Fotospeed or Hahnemuhle create generic ICC profiles for each of their papers and for each of most common fine-art / photo printers from Canon, Epson and others. They are free to download.

So, ideally you need to know which printer and paper a print shop will use for your photo. Of course, if you use your own printer and paper you will know exactly which ICC profile to use.

Many print shops simply request files in the sRGB colour space and provide limited paper options. In most cases this will be good enough to produce good prints. The biggest impact of following this process is gained by ensuring your screen displays colours accurately, at least covering the sRGB colour space.

Switch to LRc to demonstrate soft-proofing for different papers

Clipping – so what?

Clipping is the term for what happens when a device cannot display or print a colour outside its gamut.

Black and white clipping
Most of us are familiar with this and many cameras warn of clipping when taking the shot, especially in highlights. What happens? Black areas lose details and white areas are "blown" out.

Colour Clipping
As can be seen, there are colours (RGB values) that fall outside the output gamut. You can select options to decide how the clipped colours are handled: "relative" or "perceptual" colourimetric. This is called "rendering intent".
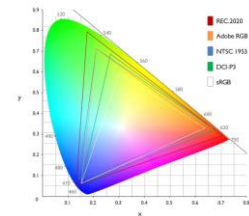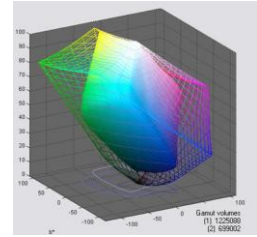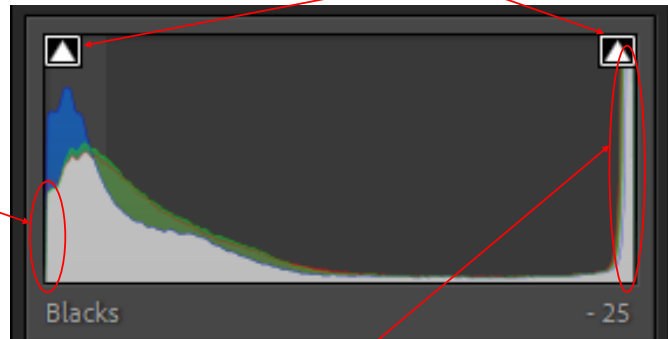
Using the Histogram
(Black & White Clipping)

Show clipping in image widow: Whites Blacks

Black clipping – Lose details in shadows

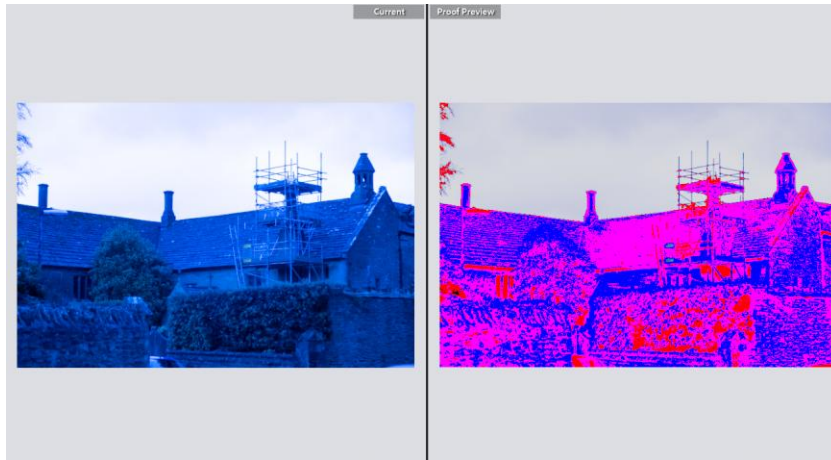White clipping – blown highlights

Switch to LRc to show

Soft proofing shows colour shifts due to paper & ink
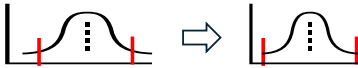
Soft Proofing to see colour clipping

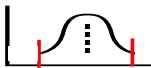Showing both screen and print colour clipping

Rendering Intent

Perceptual

Moves all colours to provide a relative spread inside the gamut leaving nothing out
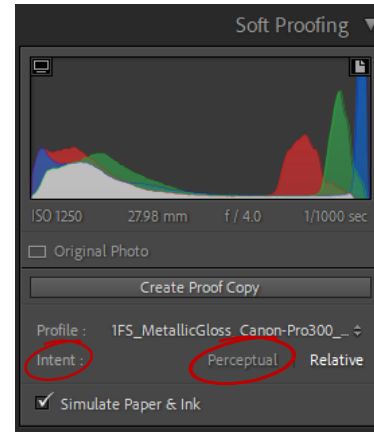

Relative

Out of Gamut colours are rendered as the closest colour

For photography, try each to see which looks best. Remember your choice when printing! The print module will need to be told too...

Workflow

Capture

- Minimum – set appropriate white balance on your camera before shooting
- Better
    - Set "custom" white balance using a grey card eg from Datacolour
    - If your camera does not allow that, take a picture of a grey card then, in Lightroom, set white balance using the eye dropper to click on the grey card in your photo, and you will see the temp & tint change

- Best
    - Photograph a calibration card then follow the manufacturer instructions to create a profile, or preset, to apply to all the photos taken under those lighting conditions
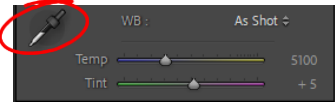
Don't forget to reset the colour balance for every change in lighting conditions
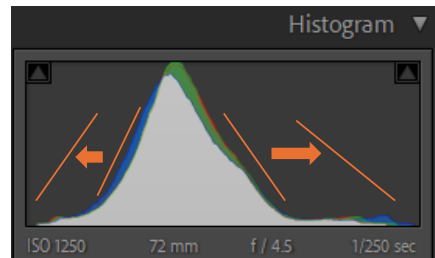
Edit phase

Usual edits for appearance, start with setting black and white points

"Flat" image – range of tones limited to some dark tones few light tones and mostly mid-tones

Increase whites will push the right of the histogram to the right

Decrease blacks will push the left of the histogram to the left

This is not a talk about editing but some basics...
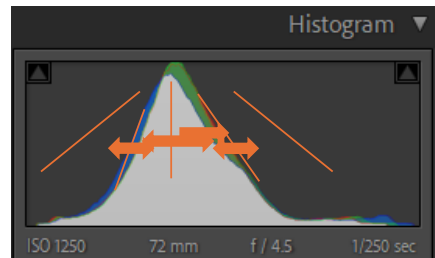Show in LRc

Edit phase

Usual edits for appearance, then move to exposure, contrast, shadows and highlights

Increase exposure will push histogram to the right

Increase contrast will spread it right and left

Change highlights will move the right hand side

Change shadows will move the left hand side

This is not a talk about editing but some basics...

Soft Proofing

- Use soft-proofing to see what differences, if any, there will be between your photo on the screen and how it will look when output
- This can help select the best paper to print your photo as well as possible
- For DPIs, you have the opportunity to edit out unwelcome changes (within the limits of the projector gamut)
- If you plan to use your image in several ways you can make a copy for each output, softproof and edit each one appropriately

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Output

- Export for each destination
- Print
  - Own high quality printer – eg Canon Prograf prints AdobeRGB
  - Print shop – often request sRGB. Higher quality ones will accept Adobe RGB and supply an ICC profile for your chosen paper. Set these options when exporting file
- DPI
  - Export with sRGB profile and resize to fit within 1920 x 1200 pixels - height x width

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Demonstrate how to manage colours and switch off colour matching
Create virtual copies or soft-proof copies for each output

THANK YOU