

**Show Your
True Colors!**

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Why do we need Color Management?

Devices we use to view Colors are made by a wide variety of manufacturers and create Colors using wildly differing techniques. For example, a monitor is backlit, creating Color using LCD technology while a printer organises tiny drops of ink or dye to recreate those Colors on paper. Subsequently the paper will be viewed using differing light sources. With so many variables it is little wonder that not all devices create Colors that look exactly the same.

Profiling attempts to 'join the dots', and resulted from research begun by the *International Commission on Illumination* who, in 1931, announced an international standard for recording Color values numerically. Adopting the method used in human vision, this is achieved with varying values of red, green and blue.

When information is sent from a computer to a printer, it doesn't say '*print this shade of orange*', it says '*print x value of red, y value of green and z value of blue*'. A profile is a look up table (LUT) that just says '*If I send you this particular Color, correct it with these values, so that it looks as much as possible like it should, according to the corresponding international standard*'.

So by working to this established international standard, we should in theory all see exactly the same Colors on our monitors, and create identical prints regardless of what equipment we are using. In practise, because of the shortcomings of different dyes and inks, and the different ways in which images can be displayed electronically, we strive to get *as near as possible* to the international standard.

The Digital Darkroom would function best if we:

- Keep the lights dimmed in which we are working
- Close the Blinds
- Use neutral Colors on the wall
- Don't wear bright clothing
- Use a neutral desktop wallpaper on our mac
- Use a monitor hood

Some of which is, of course, impractical. However, the more of the above that you implement, the easier it will be to create consistent Color.

Monitor calibration

A colorimeter is incredibly simple to use, but don't be afraid to switch from the simple to the advanced option. You're more likely to be able to set your monitor brightness level there. Try the following numbers (if asked) as a launch point for your settings:

Color Temperature: D65

Gamma: 2.2

Brightness: 100 - 120 cd/m² (fwiw my own monitor is calibrated to 100)

ICC version 4

Contrast ratio: Set to native if this option exists

Don't be alarmed if your monitor brightness takes a nosedive - many new monitors (iMacs are fine examples) are set to much higher level (because it makes them look nicer!). Your eyes will quickly adjust.

Print longevity

If print quality is important, always use printer manufacturer's own inks and print on high quality paper. There is an enormous difference in cost, but if you want your prints to last, aim for paper that is acid free, has no lignin and no optical brighteners.

Acid causes paper and photos to disintegrate. This ageing process is significantly slowed when the acid is removed from paper during the manufacturing process.

Lignin is the natural bonding element which holds wood fibres together. Newspaper contains lignin - you will have noticed that newspaper can become brittle and discolored with age! Like acid, lignin can be removed during the manufacturing process so suitable products should be labelled lignin-free or archival.

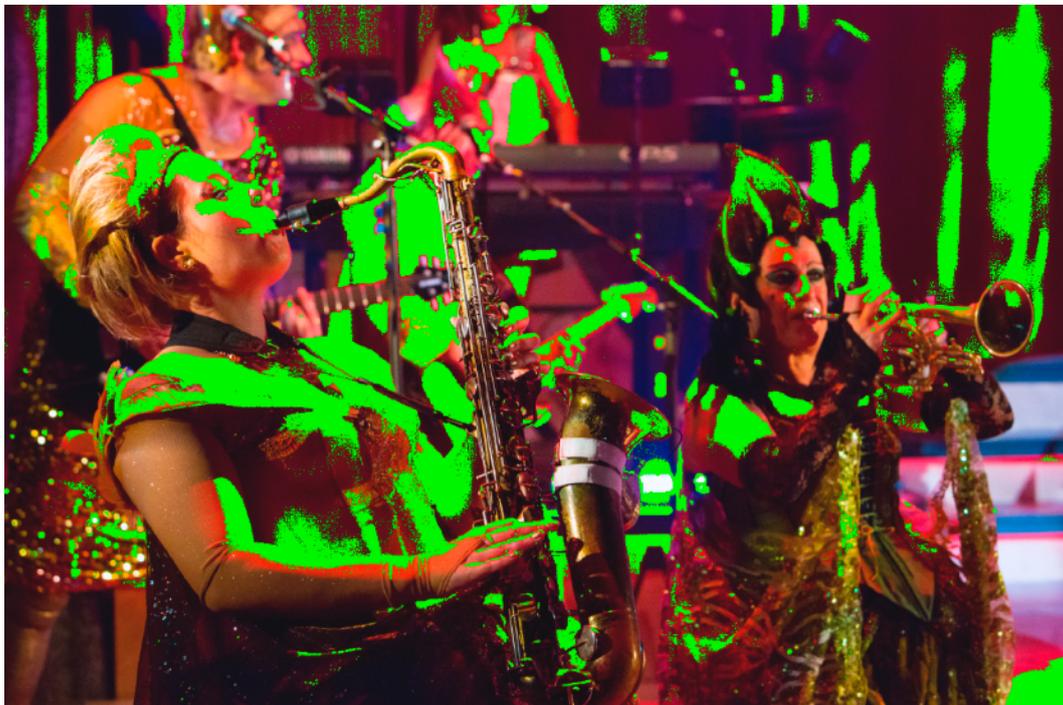
Optical Brightener Additives (commonly referred to as **OBAs**) are widely used in paper coatings, textiles, and laundry detergents to increase the perceived "whiteness" of the treated products. OBAs work by absorbing light from the (invisible) ultra-violet end of the spectrum and emitting light in the (visible) blue/white range of the spectrum. This "shift" in the frequency of light energy, results in a whiter and brighter appearance of the treated product. OBAs can pose a serious threat to the integrity and longevity of a fine art print by accelerating color shifts, and yellowing over time.

Why buy a printer with eight or more Colors?

Using a technique called soft-proofing, here is an illustration that explains what you get for your money. Here's a richly saturated image, opened in Photoshop:



Next is the same image with **Gamut warning** switched on. The Professional printer will not accurately reproduce any of the areas highlighted in green:



And here is the same image with Gamut warning switched on, but using a profile created for a cheap and cheerful (less than £50) amateur printer:



Quite a difference!

In sophisticated photo applications like Photoshop and Affinity Photo, there are two ways to control how the printer deals with those out-of-gamut areas...

Rendering Intent - The difference between Relative Colorimetric and Perceptual.

Although there are four different Rendering Intents, only two apply to photographers - **Relative Colorimetric** and **Perceptual**, and it can sometimes be challenging to work out which will work best for a particular image.

Rendering Intent describes how a printer deals with Colors that are outside its gamut. In other words, how it deals with Colors - for example, bright, saturated Colors - that it is unable to print.

Relative Colorimetric leaves all the Colors that are in gamut (ie: printable) alone and clips Colors that are out of gamut. For example, if an image has a particularly saturated - unprintable - yellow area in it, the printer will just deliver the most saturated yellow it is able to for any areas outside its working gamut.

Perceptual attempts to preserve a relationship between in-gamut and out-of-gamut Colors, so in the same example, the furthest out of gamma point would be mapped to the very edge of the device's printing capabilities and everything beneath (all the less saturated tones) will be reduced in intensity accordingly. This can sometimes be an issue if, for example, an image includes a lot of very saturated Colors as well as flesh tones, which can become desaturated as the saturated Colors are dragged in to gamut.

Making the right choice can make a big difference to the printed output, particularly with images that contain highly saturated, bright Colors.

What is the advantage of using a custom profile?

All serious paper manufacturers provide generic profiles for their paper. If you are using a sophisticated program like Photoshop, Lightroom, Affinity Photo or Pixelmator Pro, you are encouraged to use these profiles as they will improve the quality of the printed output. However, all printers are not created equal, and tiny defects in manufacture mean that no two similar printers create exactly the same results - so the ability to choose a profile made especially and only for your printer/paper combination is potentially a huge bonus.

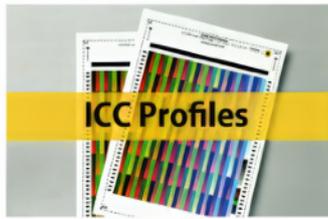
This was knocked home for me when a paper I had relied on for years was suddenly discontinued. I searched for a similar product, and downloaded their generic profile. At the same time I ordered a custom profile and a few days later, when I was able to compare the two, it revealed marked and easily identifiable differences.

Creating a Custom Profile

Obtaining and printing a test chart

In order to create a useable test chart it is essential to follow these instructions **precisely**. Remember - a custom profile is designed for one specific type of paper and one specific printer. If you use more than one type of paper, or more than one printer, you will need a corresponding number of custom profiles. Do not mix and match - it won't work!

Quality paper manufacturers provide generic profiles, and boxes of paper will always contain a link to download the relevant profile for your particular printer type. They may also contain a link that will allow you to print a test chart. Here is an example, taken from the instructions included in every pack of Permajet paper here bin the UK:



Ensuring you get accurate prints is important to us. PermaJet offer generic ICC profiles for all of our media, available to download immediately from www.permajet.com/icc-profiles

For optimum results with PermaJet paper, you can have a bespoke profile created for your printer using the **FREE Custom ICC Profiling Service**.

For further information on colour management please visit the PermaJet website. Alternatively you can join us on a print workshop at our training school **The Photographic Academy** - scan the QR code to see the courses on offer.



1. Prepare your monitor and printer.

A properly calibrated printer requires a calibrated monitor (otherwise your prints might not match what you see on screen!) so grab your colorimeter and calibrate it now! Then make sure that your printer is loaded with the correct paper and inks. It's well worth running a nozzle check to make sure that the printer is working at 100%.

2. Download Test chart.

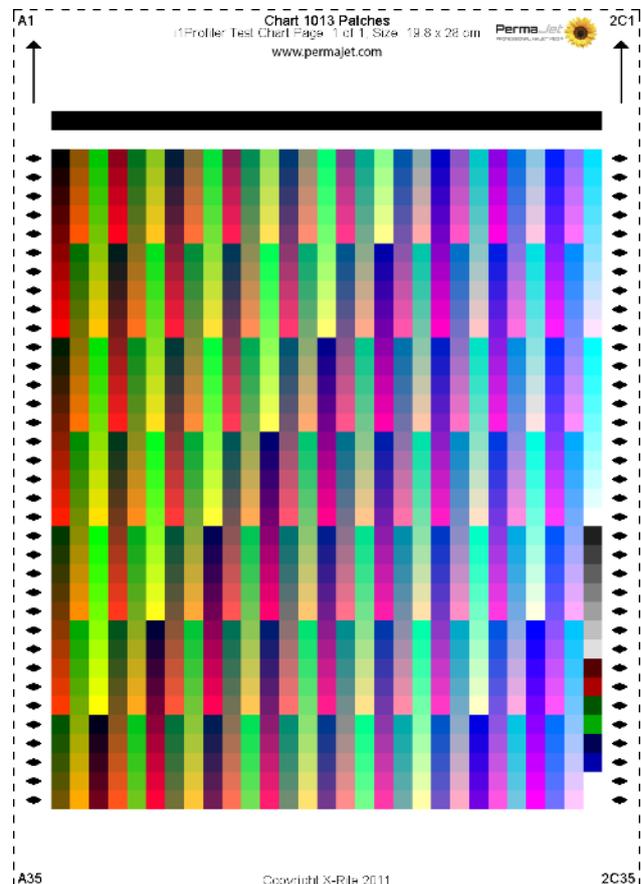
Most companies will provide a single test chart. This one is provided by PermaJet for their range of papers, but they all look pretty similar.

3. Print Test chart.

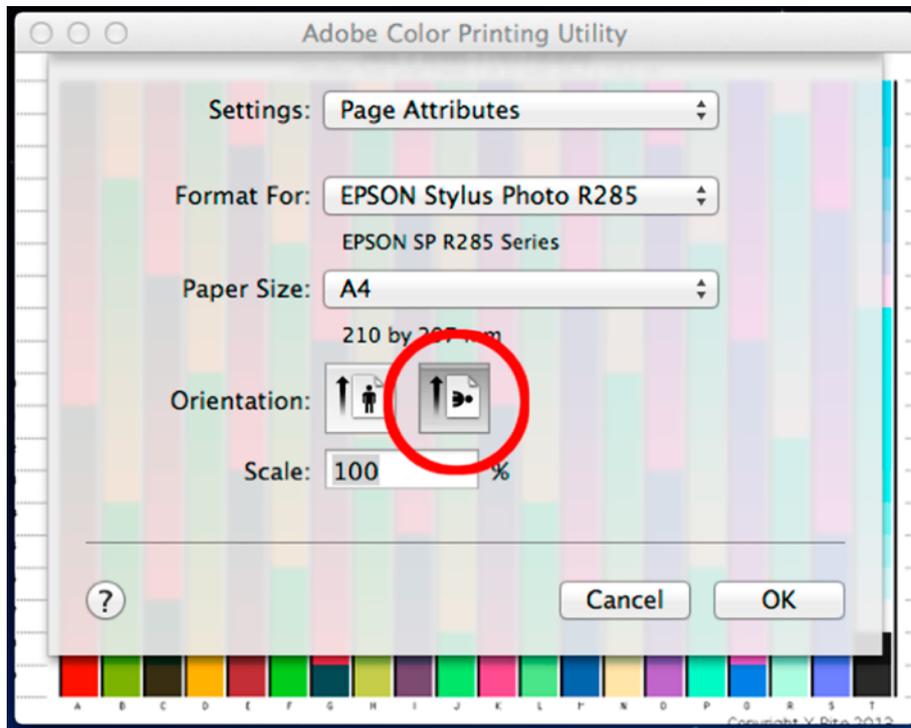
It is absolutely essential that the test chart is printed with no Color management. This is best done using Adobe's Color Print Utility. Some companies include it in the same download package as their test chart, but if they don't, it's available free on the Adobe website.

Install and open **Adobe Color Printer Utility** and go to **File > Open**. A finder window will open, from which you need to select the test chart.

(Note: Bizarrely, Adobe claim that the utility won't work in any Mac OS from Catalina onwards. This isn't true - it will!).



Go to **File > Page Setup**. Select your printer (if you have more than one attached to your computer), Paper Size (A4) and change the Orientation to landscape. Leave Scale at 100%



Next go to **File > Print** and set up the Printer Driver. **It is absolutely essential that all Color Management is switched off during the process, so follow the instructions below very carefully.**

In the print dialogue box, expand the dialog (if necessary) using the **Show Details** button towards the bottom of the box. Select your target printer from the Printer drop-down menu. The two important settings you need to find here are **Paper Type** and **Color Management** (the actual names will depend on your printer driver). These will be in the drop-down menu that is initially set to **Layout**. Set Paper Type to the paper that most closely resembles the paper you're trying to profile. If it isn't already set to **Off**, set Color Management to **Off** (note: It may already be off as Adobe Color Printer Utility will turn off Color Management automatically in MOST drivers). Now print the test chart.

Permajet have produced a short video detailing all the above steps (which are the same, whatever paper/test chart you are using):
<https://www.permajet.com/support/how-to-print-a-custom-icc-profiling-chart-on-a-mac/>

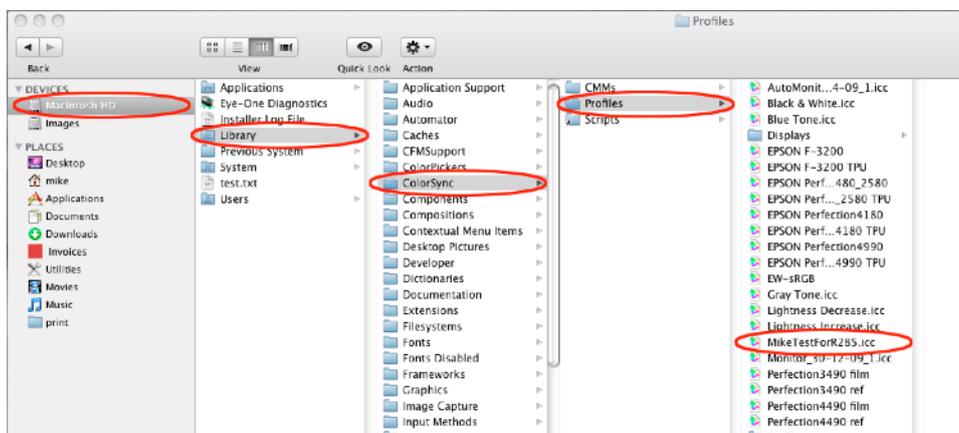
4. Post your print to your paper manufacturer.

Treat the print with care. Examine it carefully and print it again if there are any flaws - scratches, spots, dents, even fingerprints could spoil the final profile - and give it plenty of time to dry. Cover it with a sheet of white paper to protect it from dust, and NEVER store two sheets facing each other.

Pack it carefully and send to your provider.

As soon as your test chart has been scanned you will receive a link to download your new profile.

In order to use the profile it needs to be installed in to this folder:



Macintosh HD > Library > Colorsync > Profiles

Alternatively, if you wish, you can also store custom profiles in your own user library:

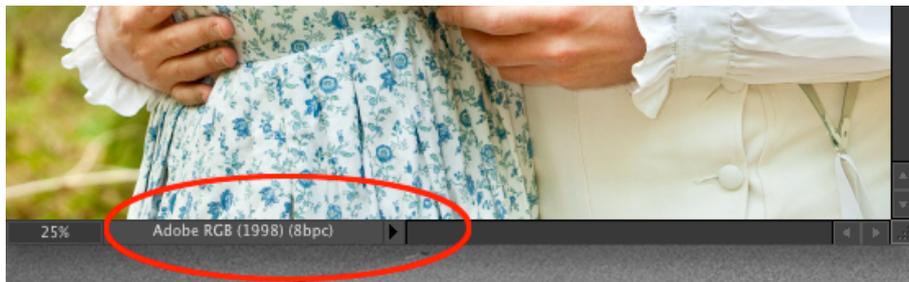
[Username] > Library > Colorsync > Profiles (note: to reach the user library, in the Finder, hold down the Option key and click on **Go > Library**).

Just drag the file in to the **Profiles** folder and we are ready to produce our first print with our custom profile

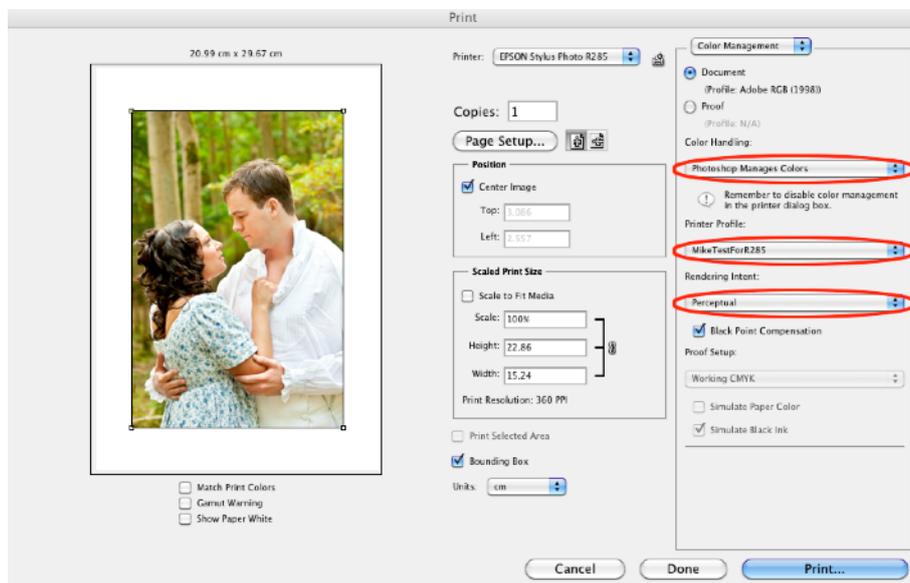
5. Creating prints using the new custom profile

Printing is just as easy as it ever was, but instead of using a generic profile created by your printer manufacturer, we will use the newly created custom profile.

Open an image in your photo editing application (in my example I am using Photoshop) and check that it has an attached profile - either an sRGB or RGB profile - by selecting **Color Profile** in the small drop-down menu at the bottom of the open image:



Next, go to **file > print**. In the Color Management column, make sure you choose the following:



a: **Color handling** should be set to **Photoshop manages Color** from the drop-down menu.

b: **Printer Profile** should be set to your new custom profile from the drop-down menu.

c: **Rendering Intent** If you are unsure what to do with this control, set it to **Perceptual**.

In the left-hand column, make sure you have the correct printer selected and the correct number of copies. Click on **Page Setup**, which will open the Printer Driver dialogue box. Use the Presets menu to select the Preset you created when you printed the test chart which you need to use **EVERY TIME** you print using the custom profile. This ensures that the correct paper is selected, and that printer Color management is switched off (because your photo editing application is looking after that).

Print!

An important reminder: Don't forget that a custom profile is designed for one specific type of paper and one specific printer. If you use more than one type of paper, or more than one printer, you will need a corresponding number of custom profiles. Do not mix and match - it won't work.

And an important piece of information: You can't rename a profile. It might look like you can, if you locate the profile, then click and highlight the name and change it - But when you search for it in your photo editing software you will still see the original name.

Checklist

Preparing the Test charts

- Open Adobe Print Utility
- Navigate to first test chart
- Go to **File > Page setup** and change orientation to landscape
- Go to **File > Print** and set paper settings and make sure Color management is switched off
- Save settings as a preset
- Print test chart
- Place a sheet of plain white paper over the test charts and use board backing in the mailing envelope

Installing and using your custom profile

- Make a note of the name of your new profile (so you can find it later) and Install your profile in **Macintosh HD > Library > ColorSync > Profiles**
- Open an image you want to print and go to **File > Print**
- Set **Color Handling** to **Photoshop Manages Colors** (or whatever your image editor is)
- Set **Printer Profile** to your newly installed custom profile
- Set **Rendering Intent**
- Open the Printer driver and set it to the preset you produced when creating the test charts (which turns Color management in the driver off)
- Print!