

What **Y**ou **S**ee

vs

What **Y**ou **G**et

Part 2 (Color Management)

Howard Fingerhut

Color Management (Terms)

- Complicated
- Confusing
- Frustrating



What to Expect Tonight



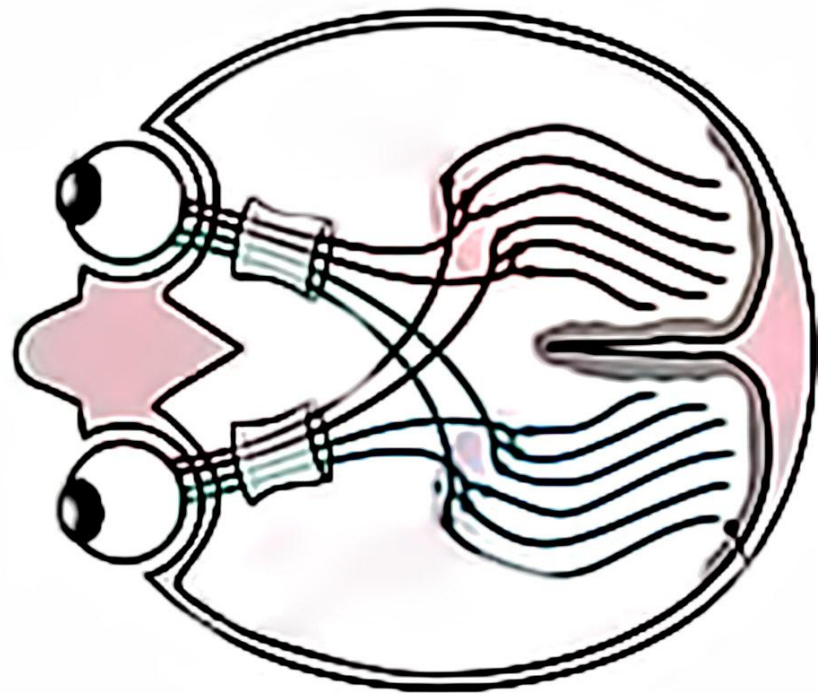
- Color Management Overview
 - Minimal math
 - Minimal tech talk
- How to use it in your workflow

What We Won't Cover Tonight

- How to set up and use specific applications and features for color management.
- Member are using:
 - Photoshop Elements (17)
 - Photoshop (15)
 - Lightroom (19)
 - Aperture (4)

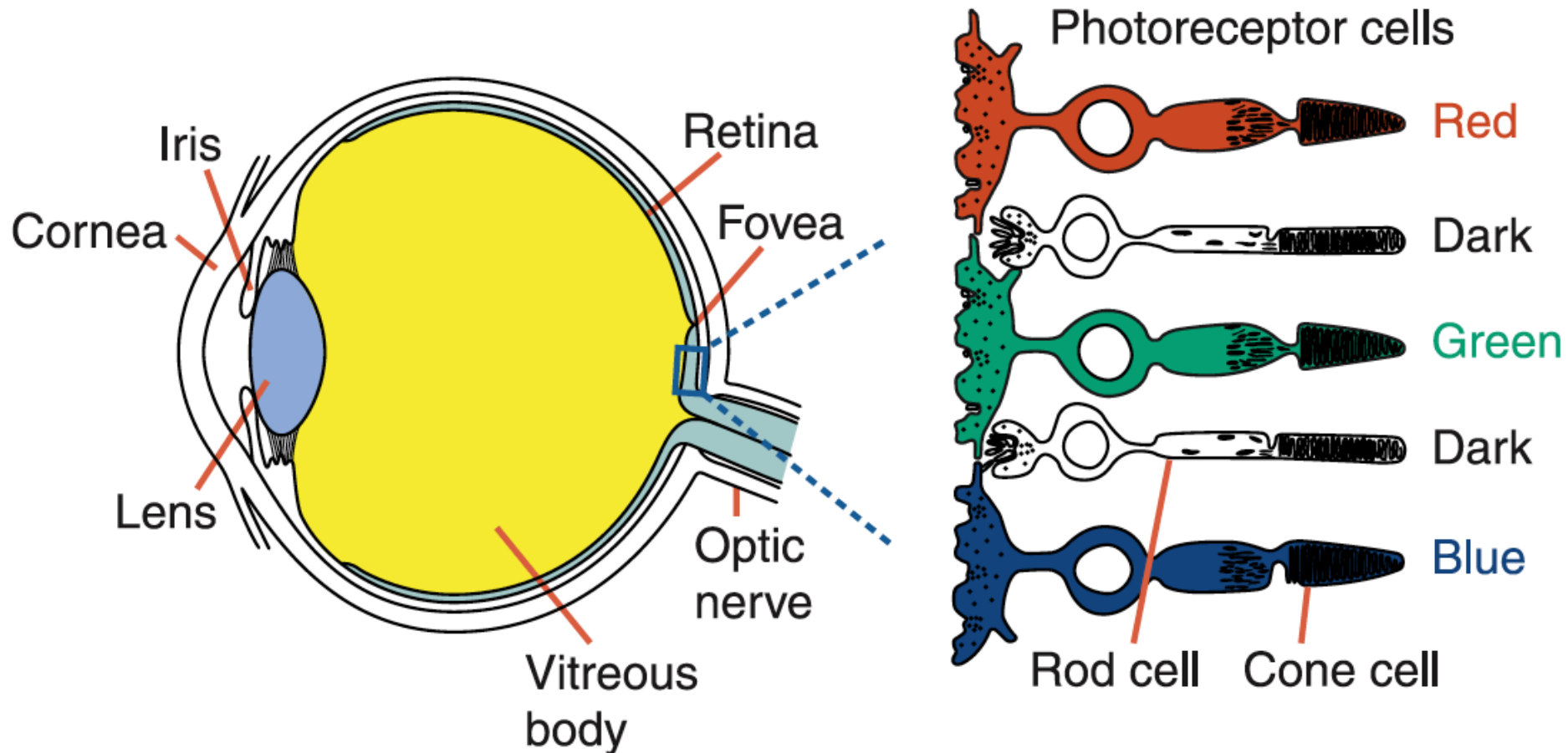
How we See and Process Color

- Although we see light and color with our eyes.
- We interpret it in our brain.

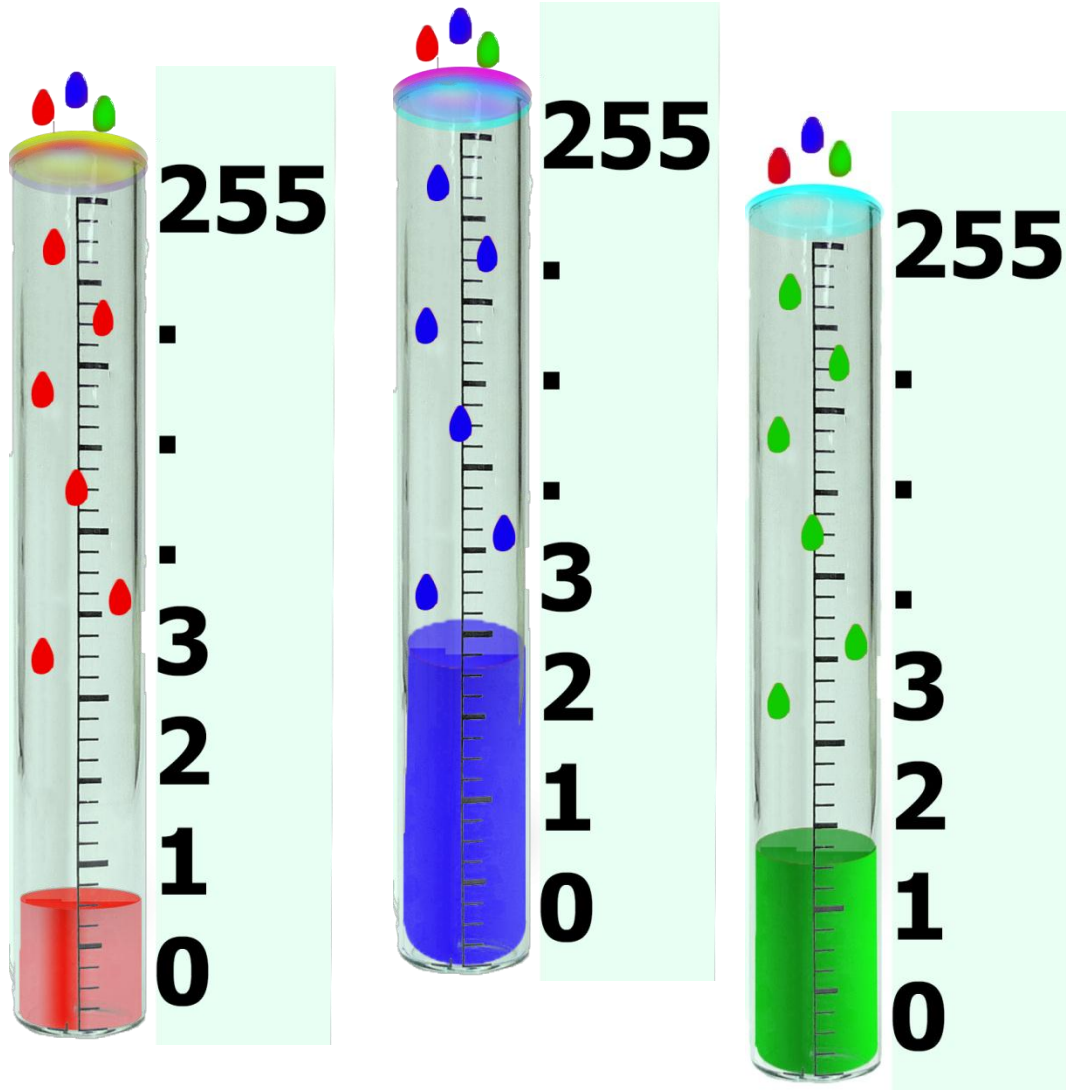


The Digital Camera Sensor

Designed to mimic the eye.

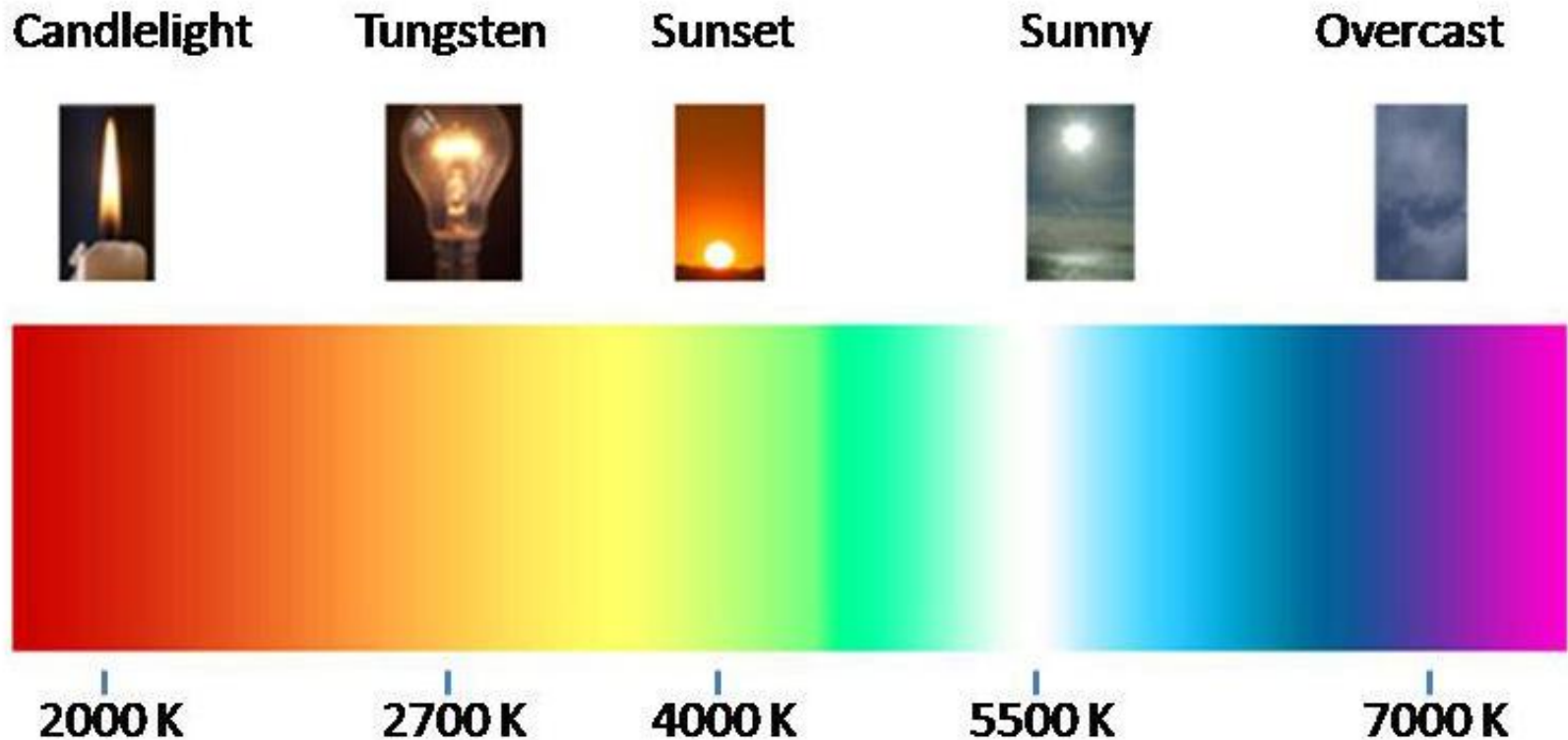


Both the Camera and Eye Measure Luminance of each Color



White Point or White Balance

- In theory white contains equal parts of Red, Blue and Green.
- However, our brain adjusts for variations lighting.



RGB – CMYK

Additive - Subtractive

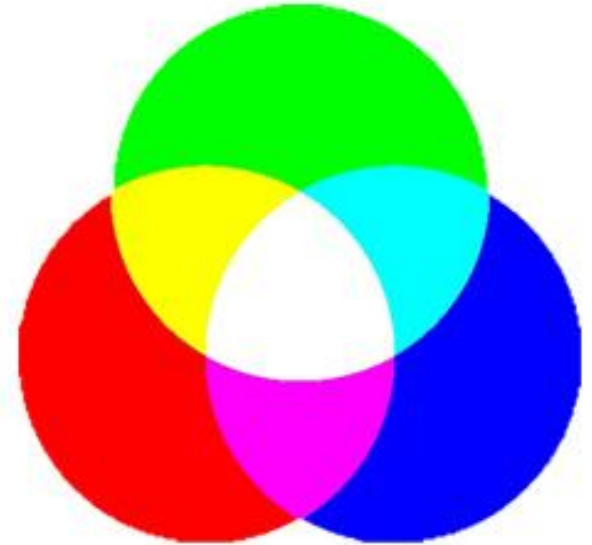
RGB

Additive
Color



mixing light

RED **GREEN** **BLUE**



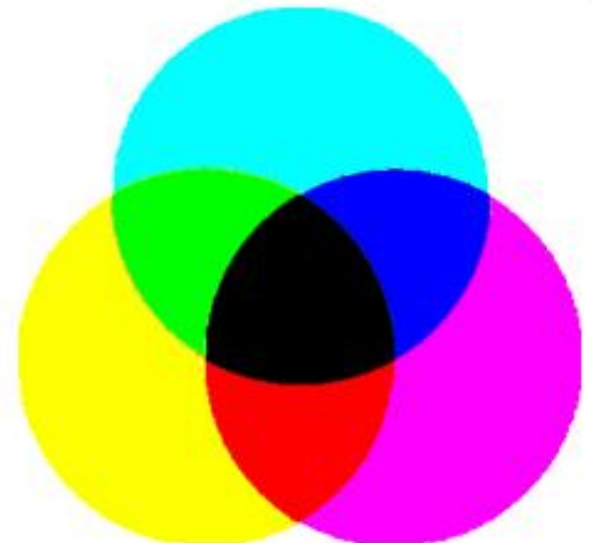
CMYK

Subtractive
Color



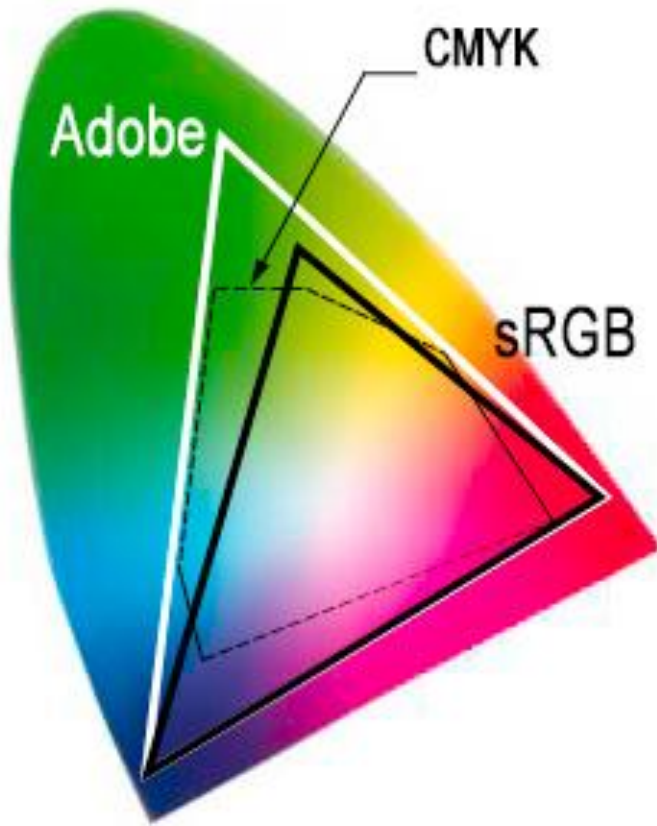
mixing ink

CYAN **MAGENTA** **YELLOW**



JPEG 8 bits/color

16.7 million colors

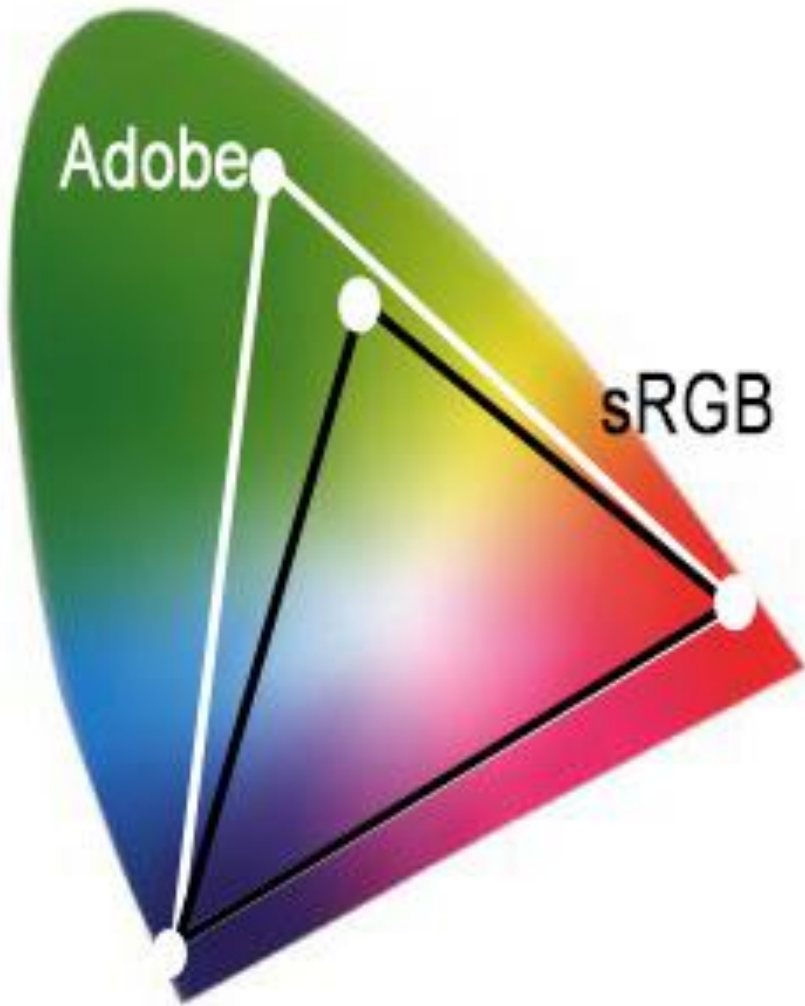


- Only 16.7 million crayon to color your pictures.
- sRGB and JPEG combination is more than adequate to render photo quality images.
- Adobe is an expanded RGB space that includes both CMYK and sRGB.

Do We Need More Colors?

- Use the sRGB color space when creating images that will be reproduced by a pro lab or 1-hour print shop, or for images you will print, display or project with most current consumer devices.
- Use the Adobe RGB Color Space when creating images for commercial offset printing or your printer/service can print in the extended color space.
Catalogs, magazines, and brochures ...
Be aware that you will not be able to see the full range of RGB color on your computer monitor.

2D Color Map



- Color Space limits are defined by the 3 points R, G and B
- These define the:
 - Reddest Red
 - Greenest Green
 - Bluest Blue

available in that color space

RGB Color Mapping

The Same only Different

- Even when our camera and monitor are using the same color space the images can look very different.
- This is because the actual RGB reference points vary:
 - from device to device
 - from one product to another
 - from manufacture to manufacture
 - as a result of aging

Pigments and Dyes

are used in printing

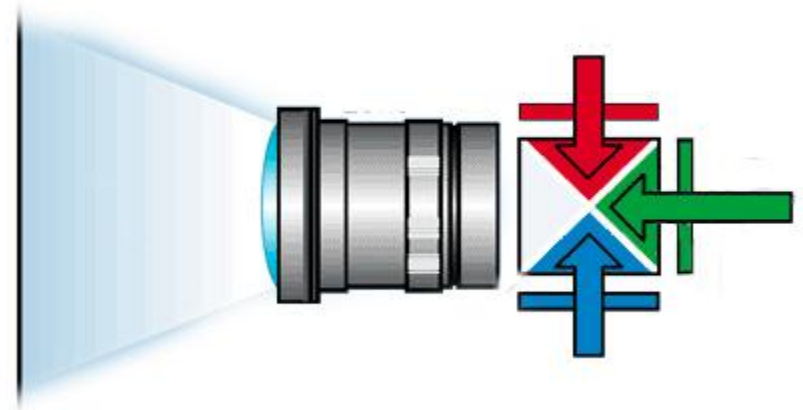
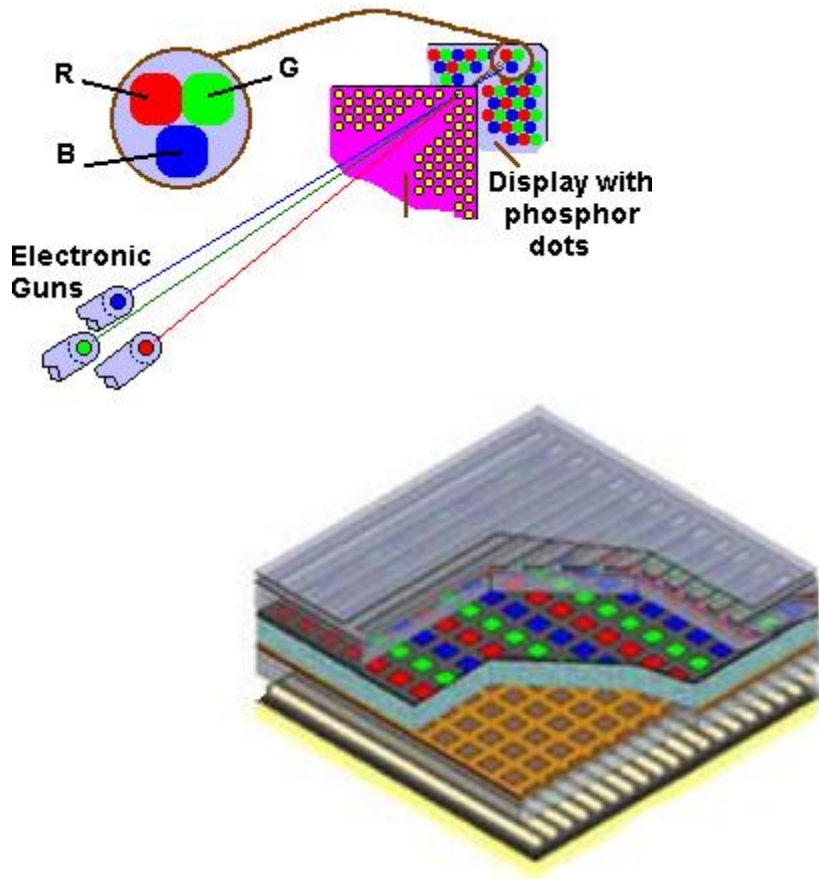
Don't provide a perfect color match.



And vary from manufacturer to manufacturer and can even vary from lot to lot.

Monitors, Displays and Projectors

Use many different and imperfect methods to render “Natural” color



Are we starting to get the Picture?

Need a Better Mapping System



Without good reference points the most accurate map in the world is not very useful.

We needed a device independent
model that could be used as a
reference

and

a way to render credible images
captured on one device on another.

Separate Color and Brightness

The “***white point***” depends on the color temperature of the light source and can fall anywhere in this area.

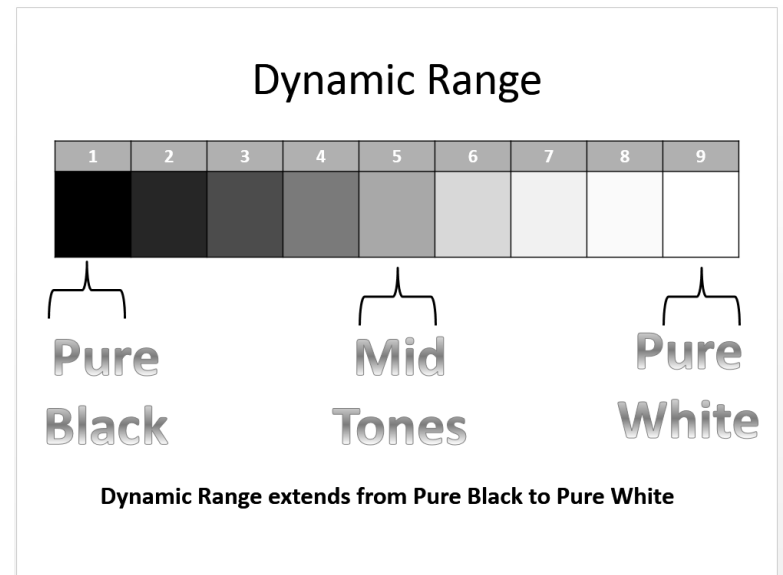


“***white point***”
our first reference

Black Point and White Point

We see no detail if a subject or scene is too dark or too bright.

- This is the “Dynamic Range” that we talked about in part 1 of this program.
- Remember that the “Dynamic Range” of what we can see vs what we can capture, display or print can vary greatly.



Brightness or Luminance

Values are relative to “Dynamic Range”

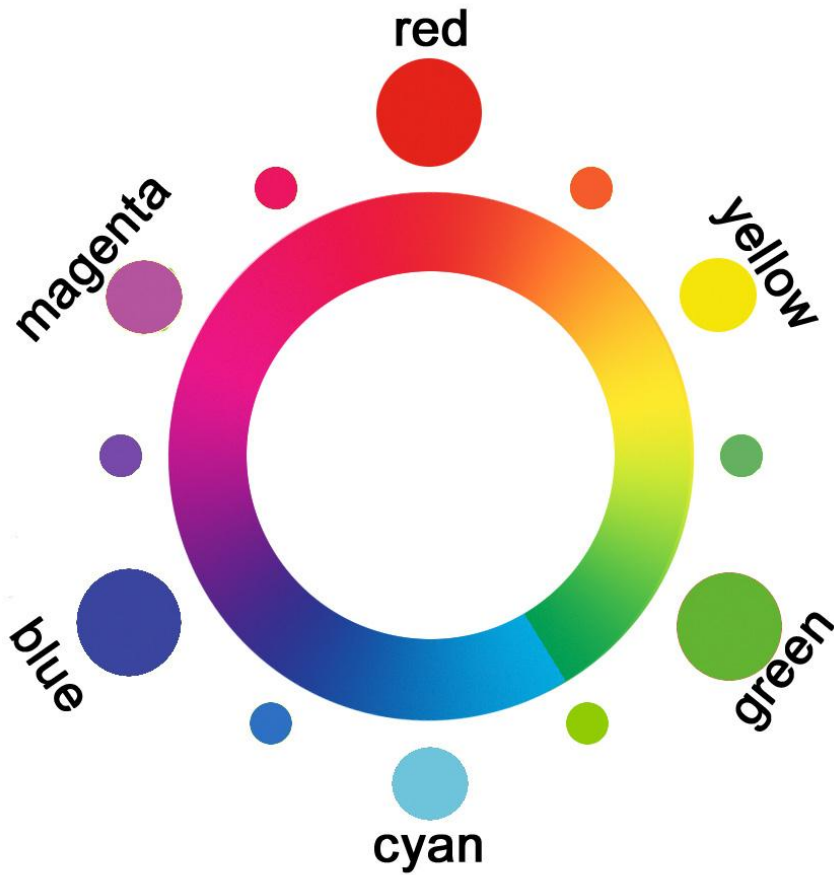


Brightness - Luminance



- Includes all values from Black to White through the point identified as the “white point”
- One end of the line is the Black Point the other is the White Point
- Points along the line have Luminance values:
 - 0 = Black
 - 100 = White

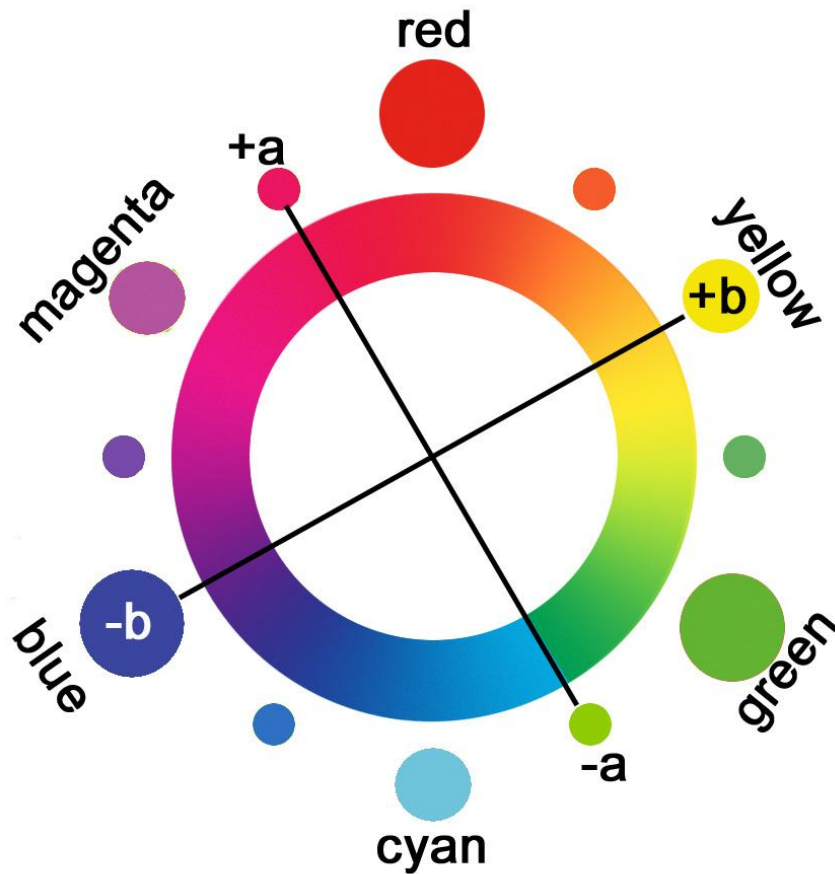
Color Opposites



Because they are
opposites,
a pixel that is:

yellow can contain no blue

Color Opposites

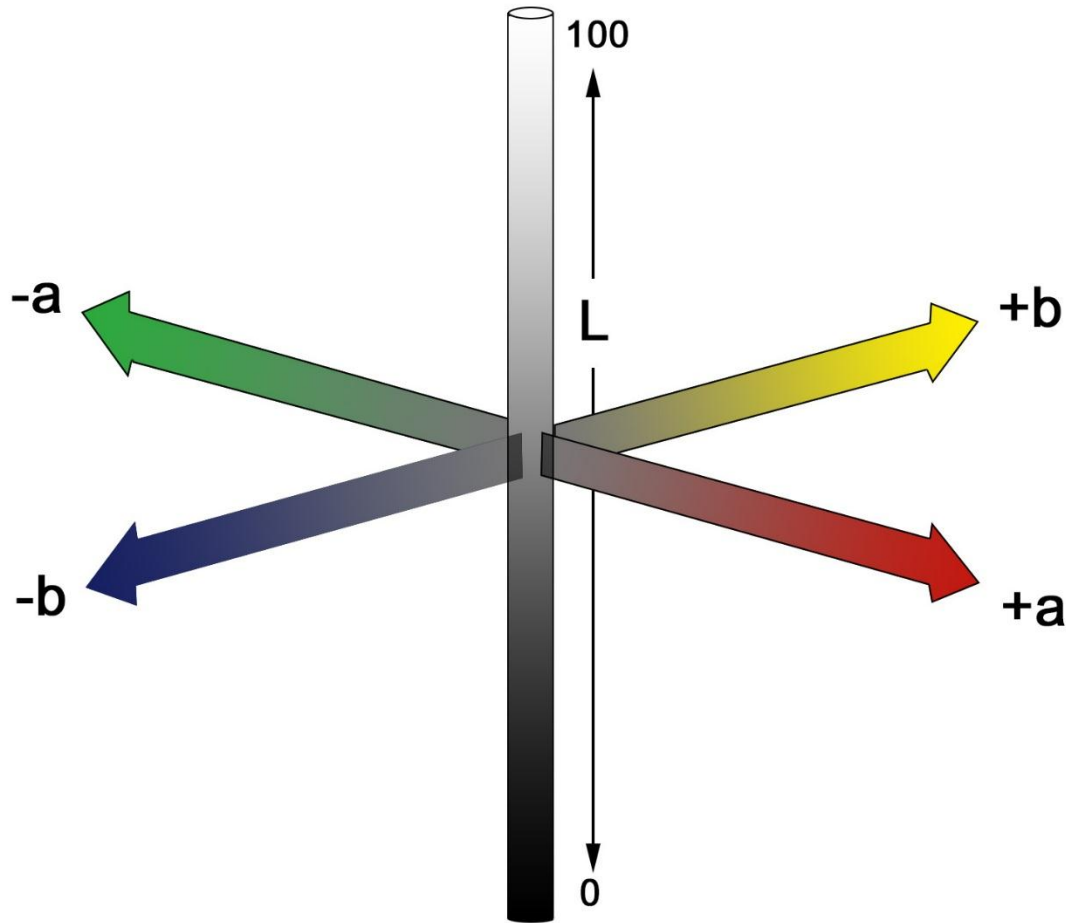


By selecting the two colors that are 90° from yellow and blue

we create a well defined color map

International Commission on Illumination (CIE)

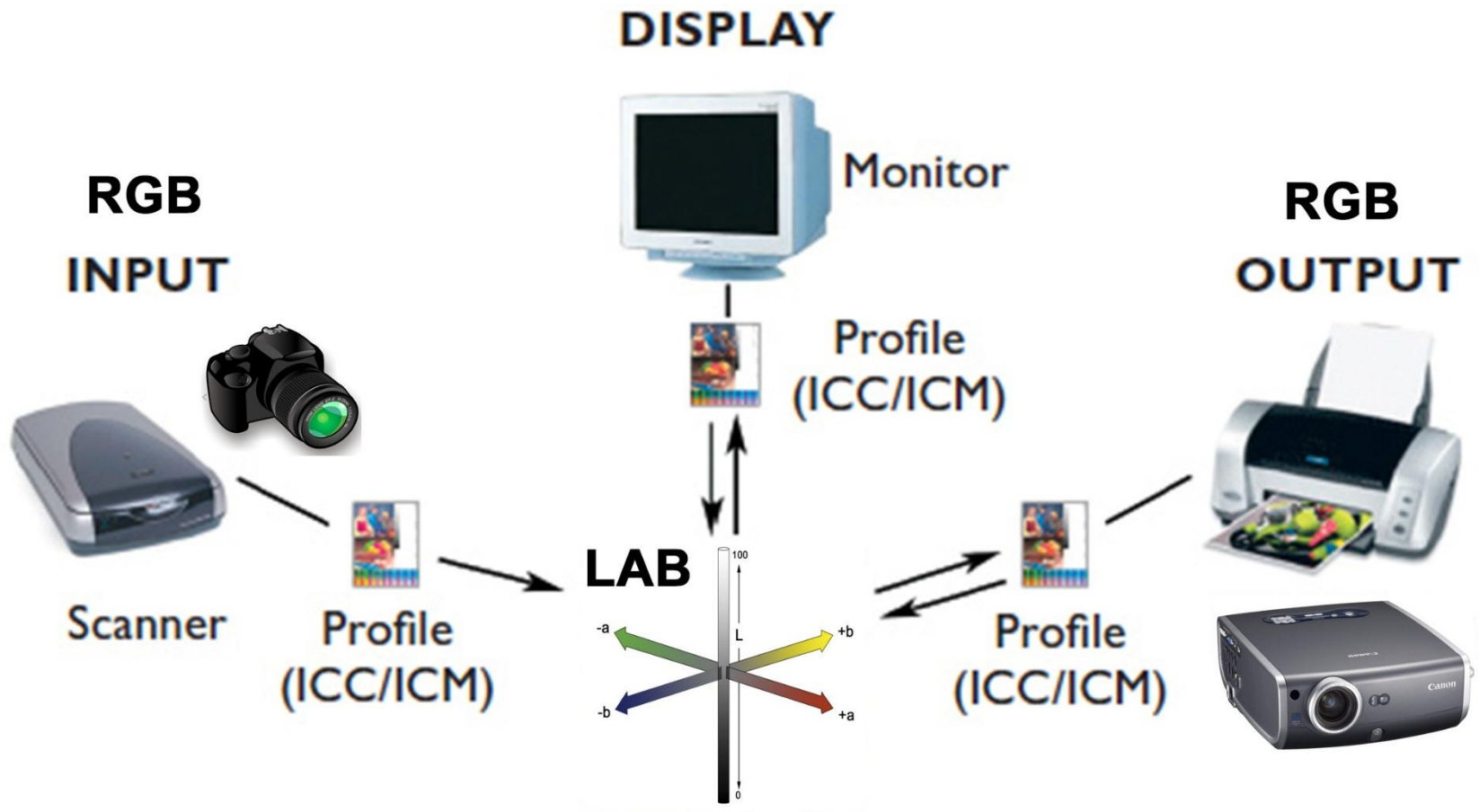
LAB Color Model



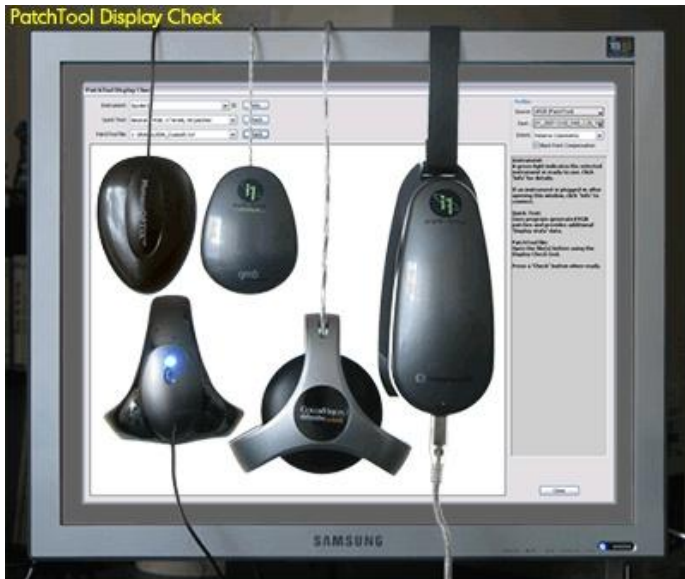
Our device independent model

Color Management

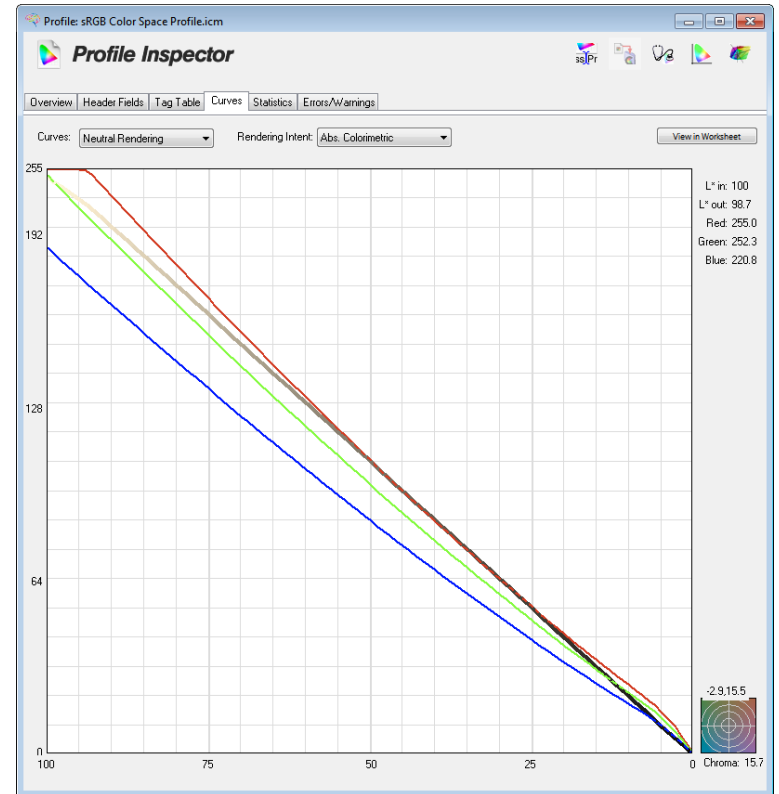
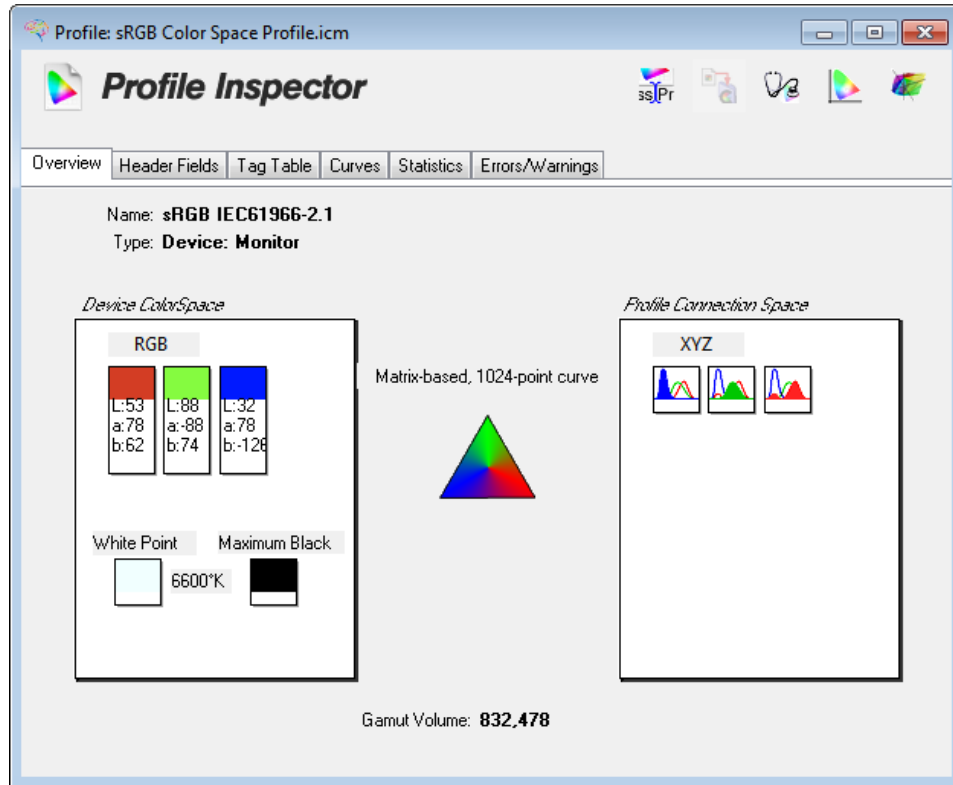
converting to and from LAB



Profiling is Simple and Painless



A Profile is a Map



Before Color Management

All monitors were assumed to have the same RGB colors.

We know this not to be true.

- OK for the internet viewing of photos and noncritical color applications.
- For printing and critical applications profiling is necessary

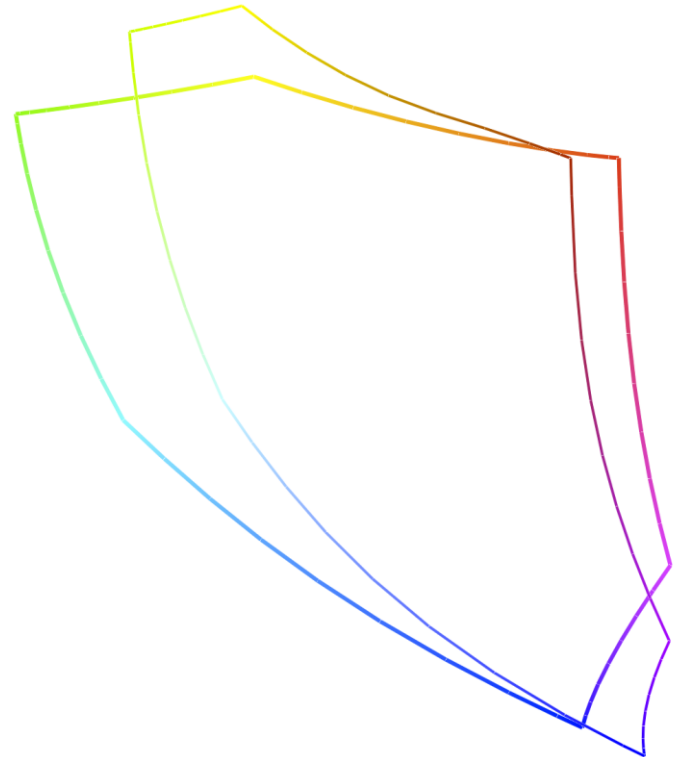


Image Tagging

- Tagged image will produce the most accurate rendering

If the profile used to edit the image was accurate.

- Untagged images are assumed to be sRGB and uses the generic sRGB profile.

Unmanaged Application

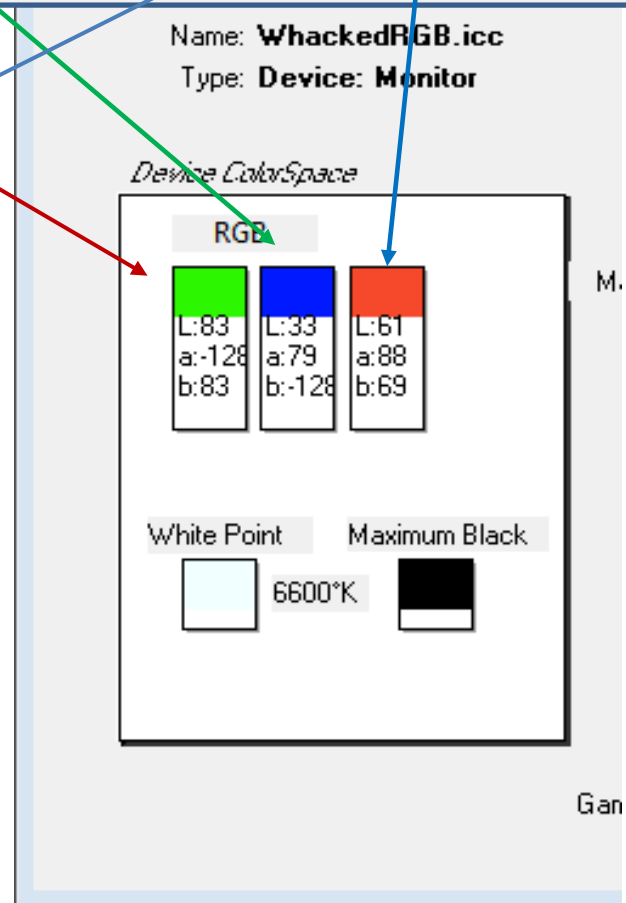
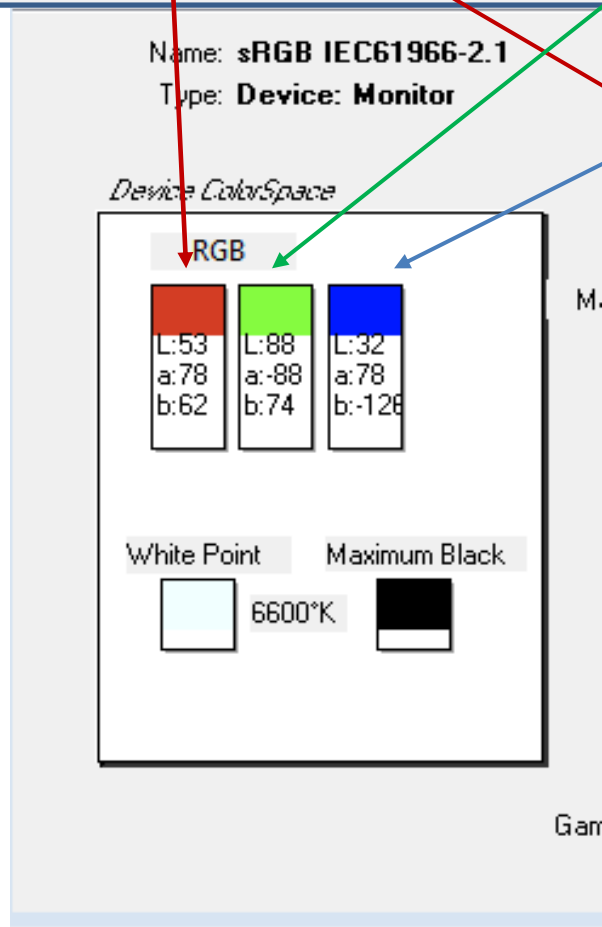
- If a tagged image is used in an unmanaged application the imbedded profile is ignored and RGB data is sent directly to the display.
- If the image does not match the profile of the display it will not look correct.

Power of the TAG

Red

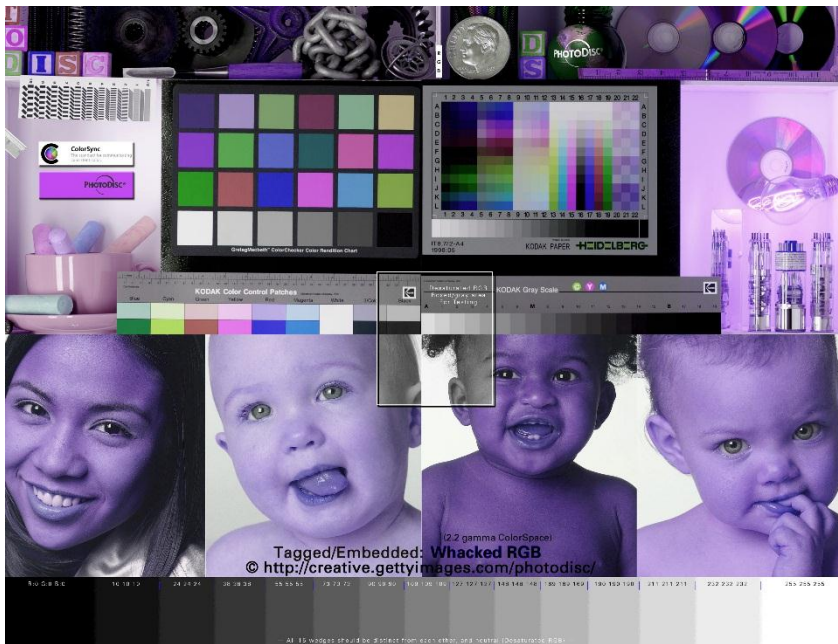
Green

Blue

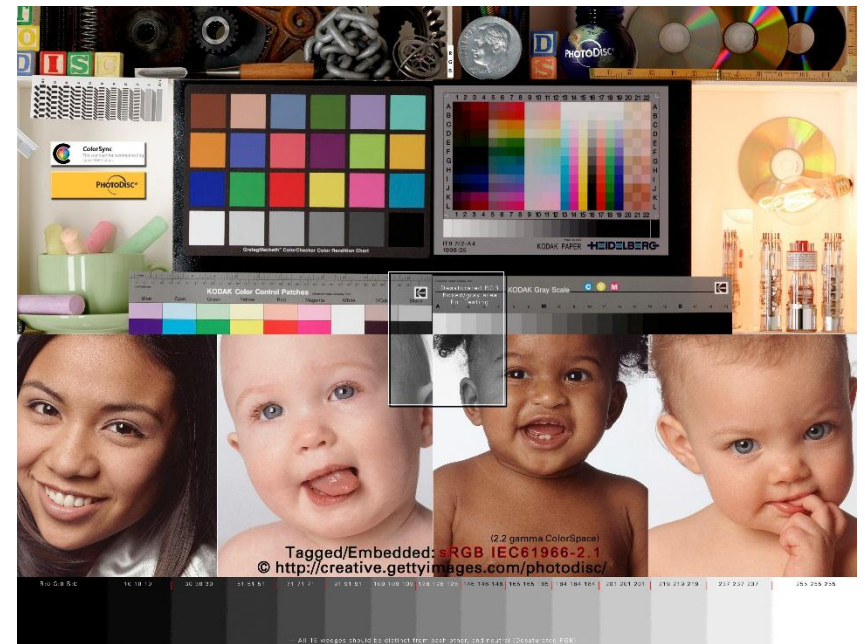


PPT is not Color Managed

If this image were color managed it would look like this:



Imbedded Profile is Ignored



Color Managed

http://www.gballard.net/psd/go_live_page_profile/embeddedJPEGprofiles.html

Or

Search for ICC Wacked

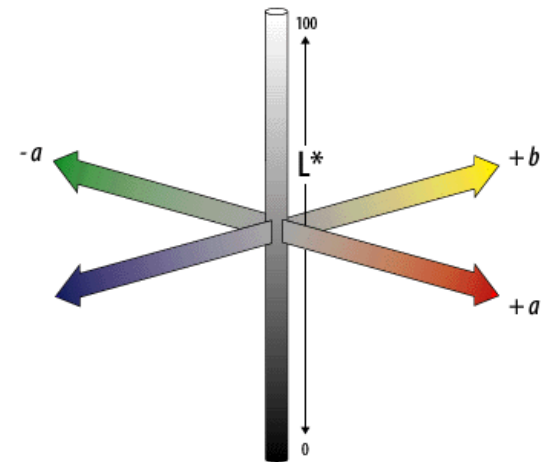
Color Management and Your Work Flow Suggestions

Proper Monitor Profiling is Key

If your monitor is not profiled, or profiled incorrectly then color modifications to your image may only look correct on your monitor.



⇌
Profile



Camera Profiling

- **Camera RAW**
 - Does not have a color space
 - Does not have a white point
- **Camera Settings**
 - Color space
 - White balance

Only affect in camera conversion to JPEG

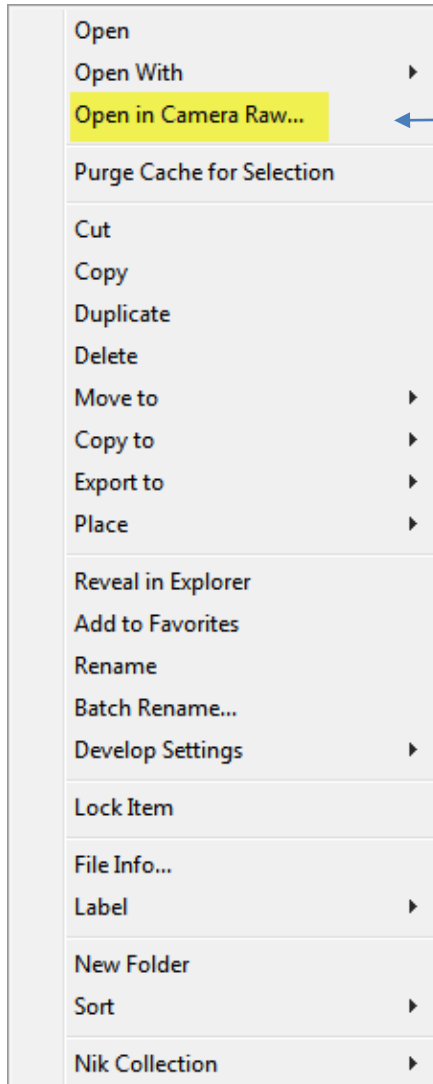


Profiling is not necessary but possible using Xrite Color Checker and software

Use All Color Data Available

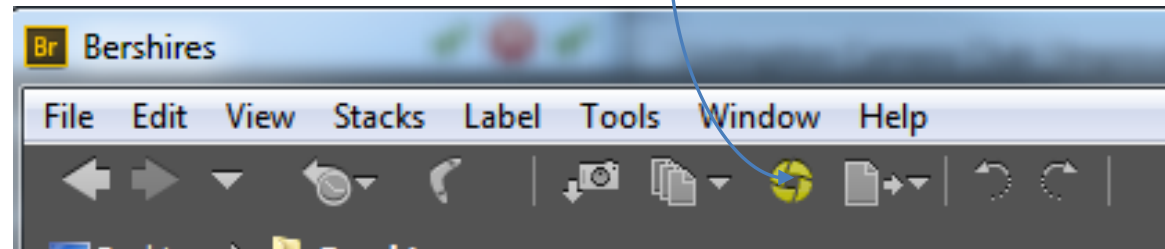
- Don't discard image data until you are ready to produce your final output.
- Use RAW data and 16 bit image processing to retain the most info.
- If you are using Elements, 16 bit editing is limited. In this case optimize your image in Lightroom or ACR before bringing it into Elements.

Optimize RAW Data in ACR or Lightroom

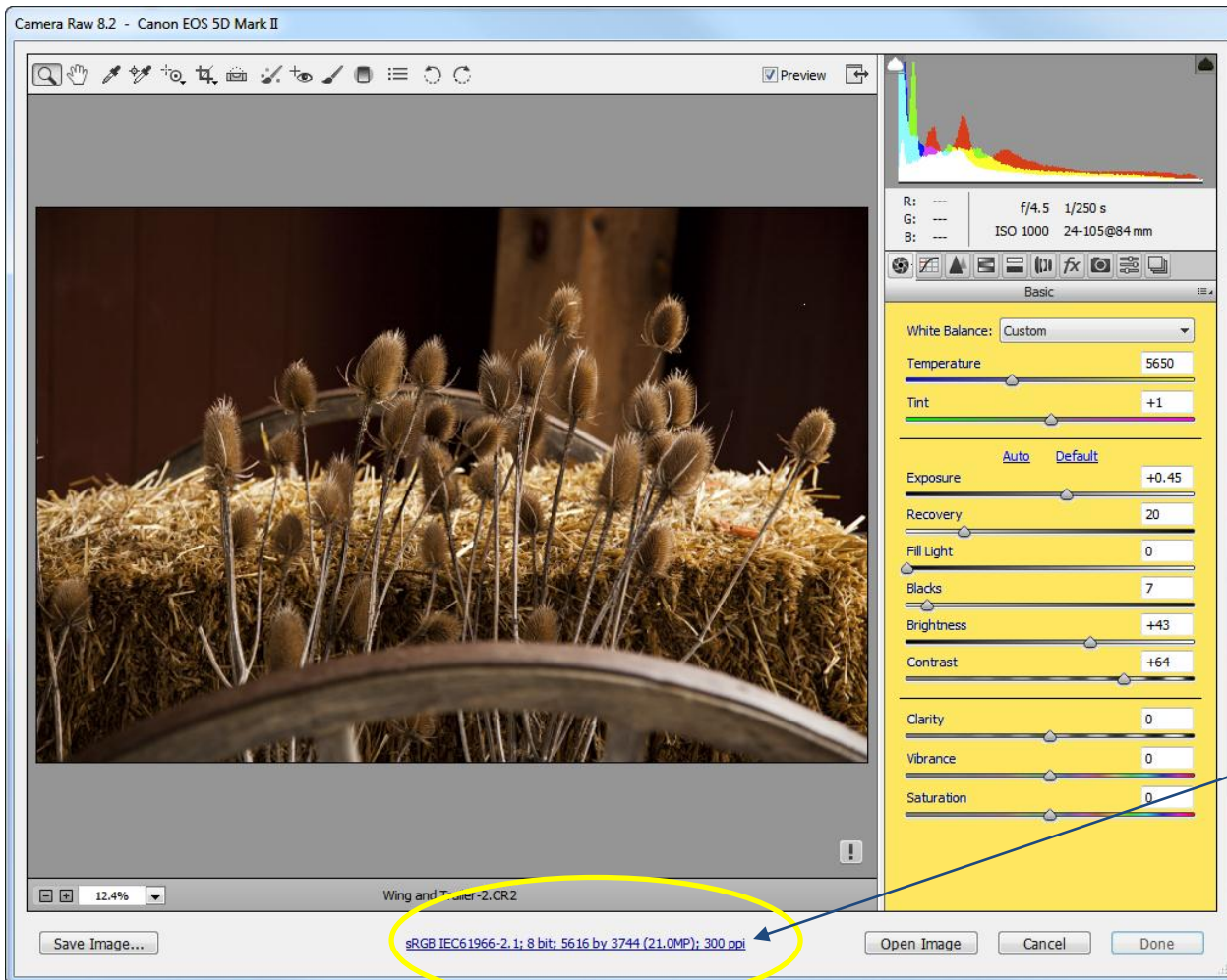


From Bridge
Click Here
Or

Here to open
image in ACR



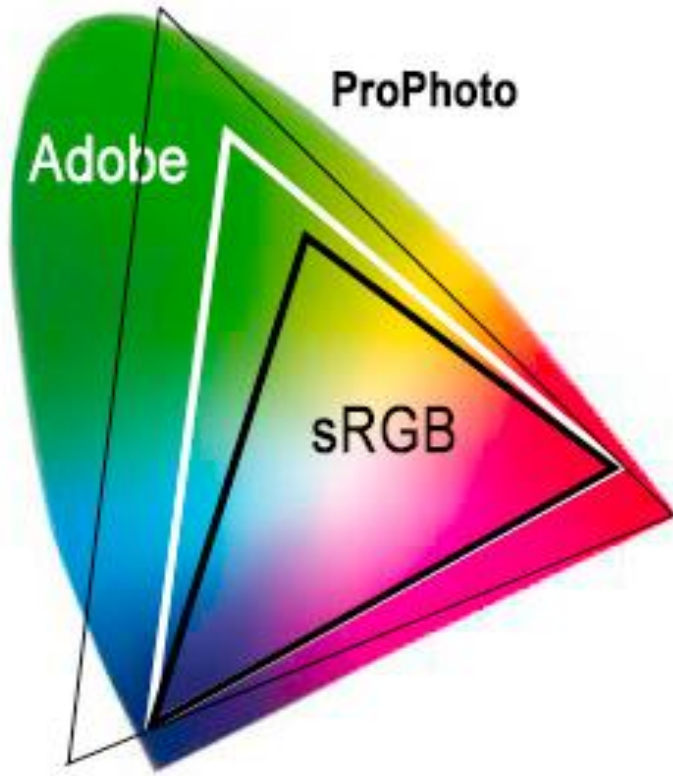
Make Color & Exposer Adjustments in ACR or Lightroom



- If Photoshop select Adobe and 16 bit
- If Elements does not support 16 bit select sRGB and 8 bit

Bigger isn't Better

When working in a colorspace that is larger than your display or printer can support.



1. Colors that can't be reproduced are said to be out-of-gamut.
2. Most monitors can't display colors outside of the sRGB colorspace.
3. When displayed on an sRGB device the total number of useable colors will be less than 16.7 Million.
4. Colors that are out-of-gamut on your monitor may look really bad on other output devices.
i.e. Grass that is oversaturated
Skies that are too blue
Flamingos that look unnatural

Out-of-Gamut

Even when working in the sRGB colorspace out-of-gamut conditions can exist.

- Products used to capture and reproduce color can't produce all of the colors defined by a given colorspace.
- These shortcomings are defined in custom profiles and are specific to a display, projector, printer/ink/paper combination.
- You can unknowingly create funky looking images if you are working in a colorspace that is greater than your monitor can display.

Rendering Intent

- **Perceptual**

tries to preserve the overall color appearance by changing all the colors in the source space so that they fit inside the destination space while preserving the overall color relationships.

- **Relative**

maps white in the source to white in the destination. It then reproduces all the in-gamut colors exactly, and clips out-of-gamut colors to the closest reproducible hue.

- **Saturation**

tries to produce vivid colors, without concerning itself with accuracy.

- **Absolute**

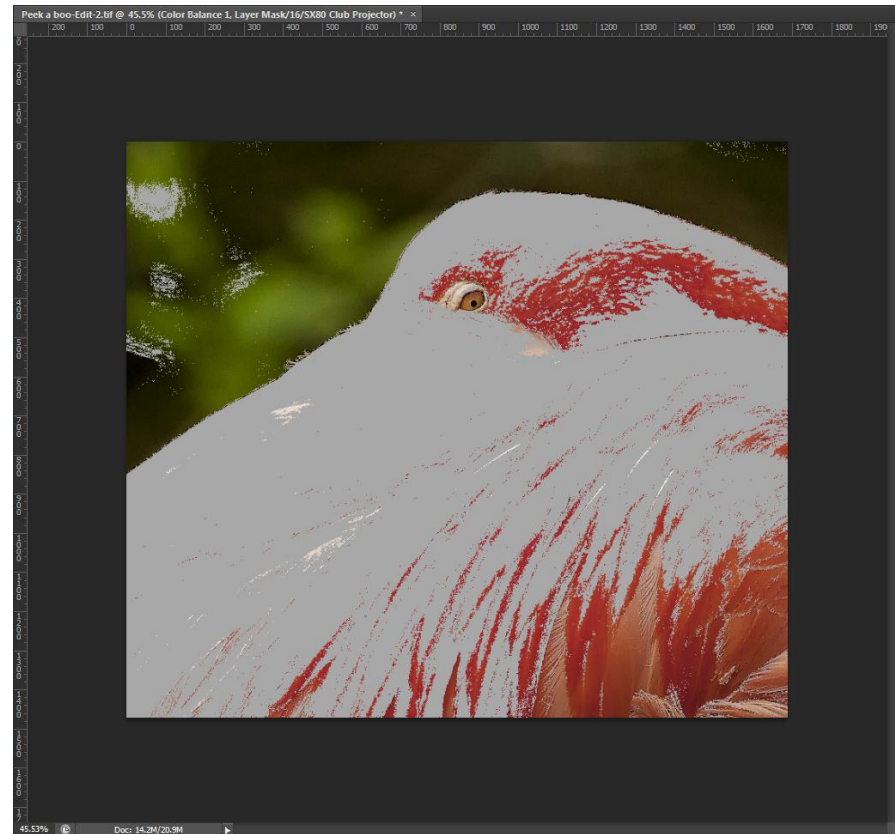
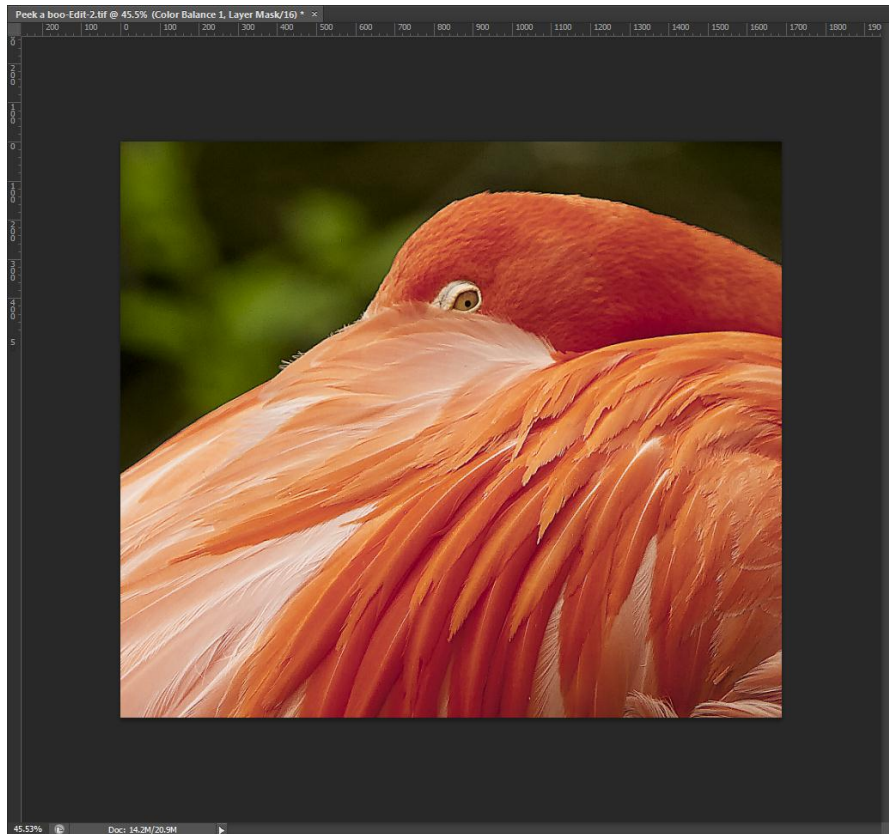
is designed mainly for proofing, where the goal is to simulate the output of a printer including its white point.

Soft Proof if You Can

- In the same way that your camera or editing software can show blown out highlights or shadows (blinkies). Soft proofing tools can show colors that are out-of-gamut.
- Soft proofing is available in:
 - Photoshop
 - Lightroom

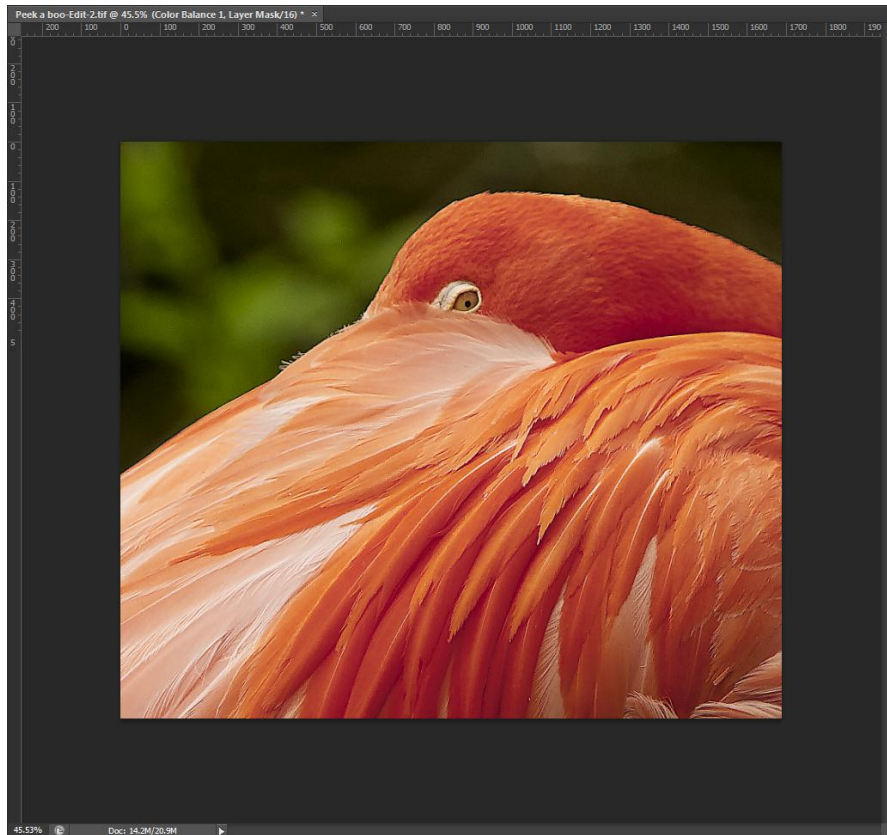
This process uses the profile of the targeted device and tries to emulate what it will look like. This is less than perfect (not WYSIWYG) for obvious reasons, but better than nothing.

Out-of-Gamut Soft Proofing

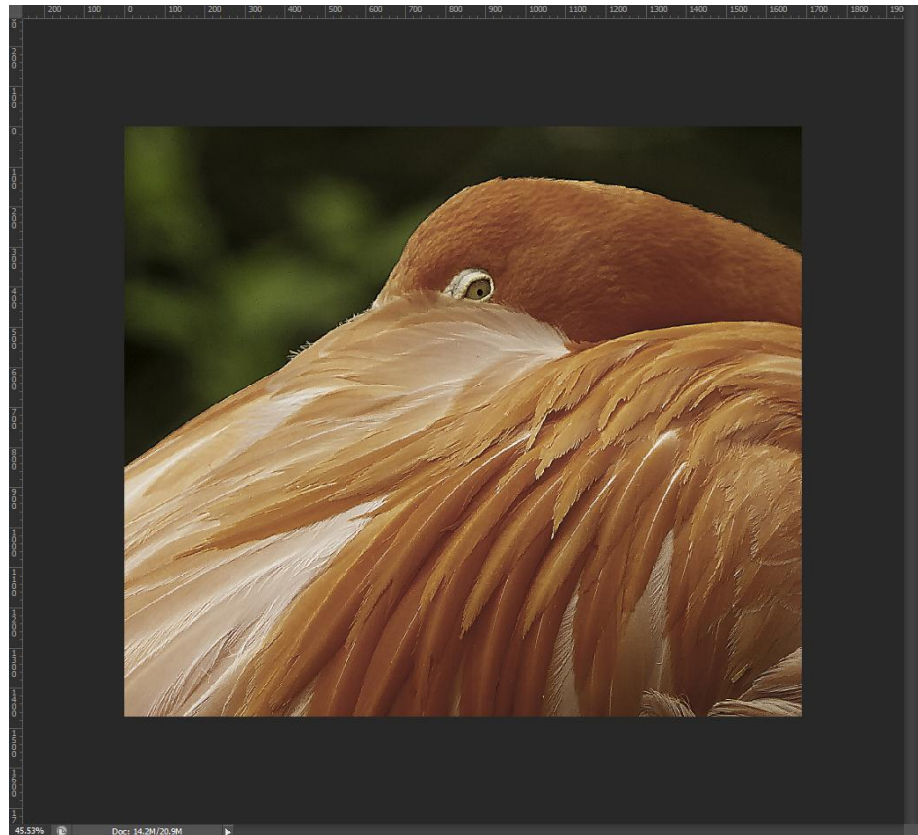


Wide Gamut image

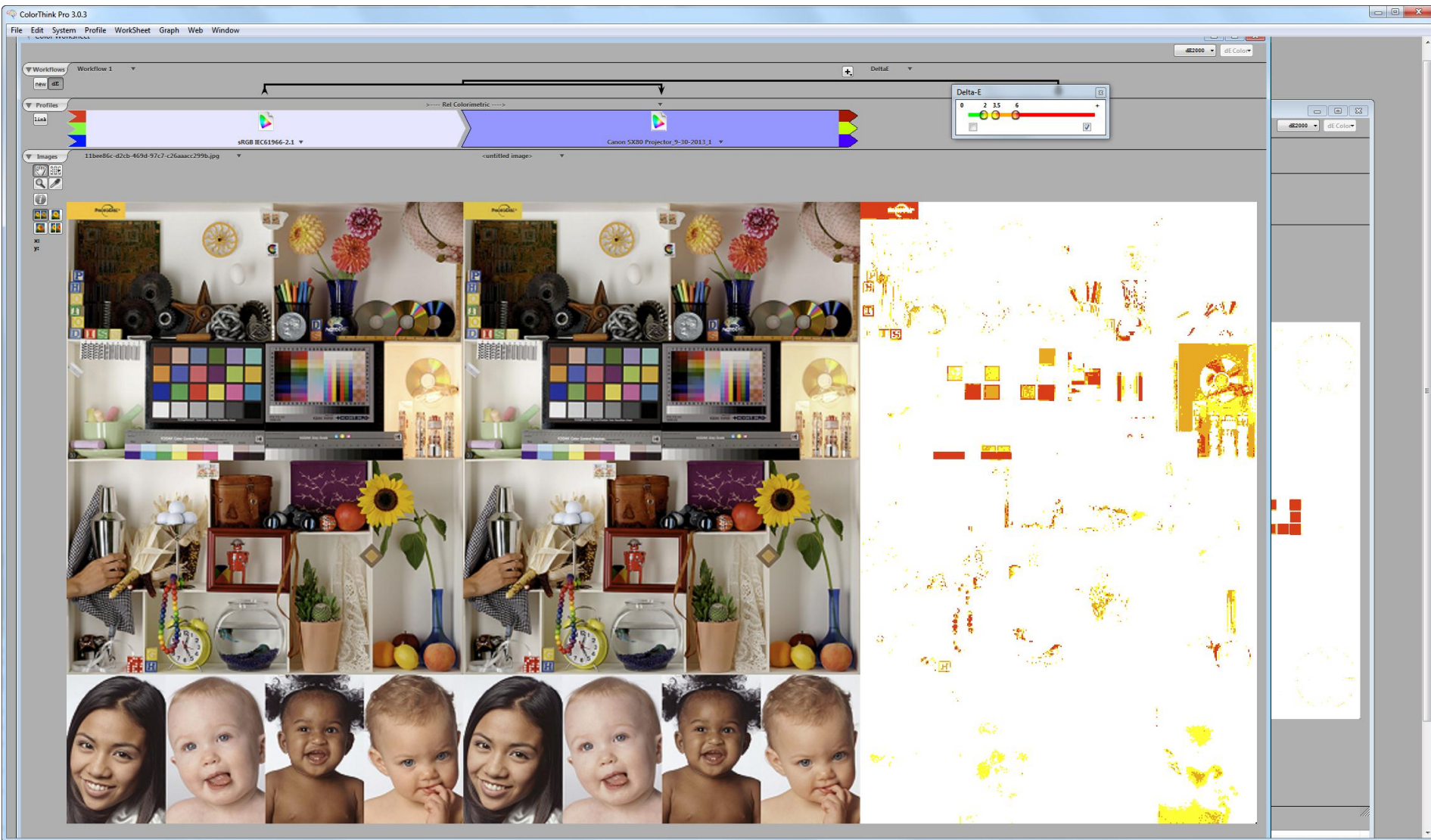
ProPhoto Image in PhotoShop



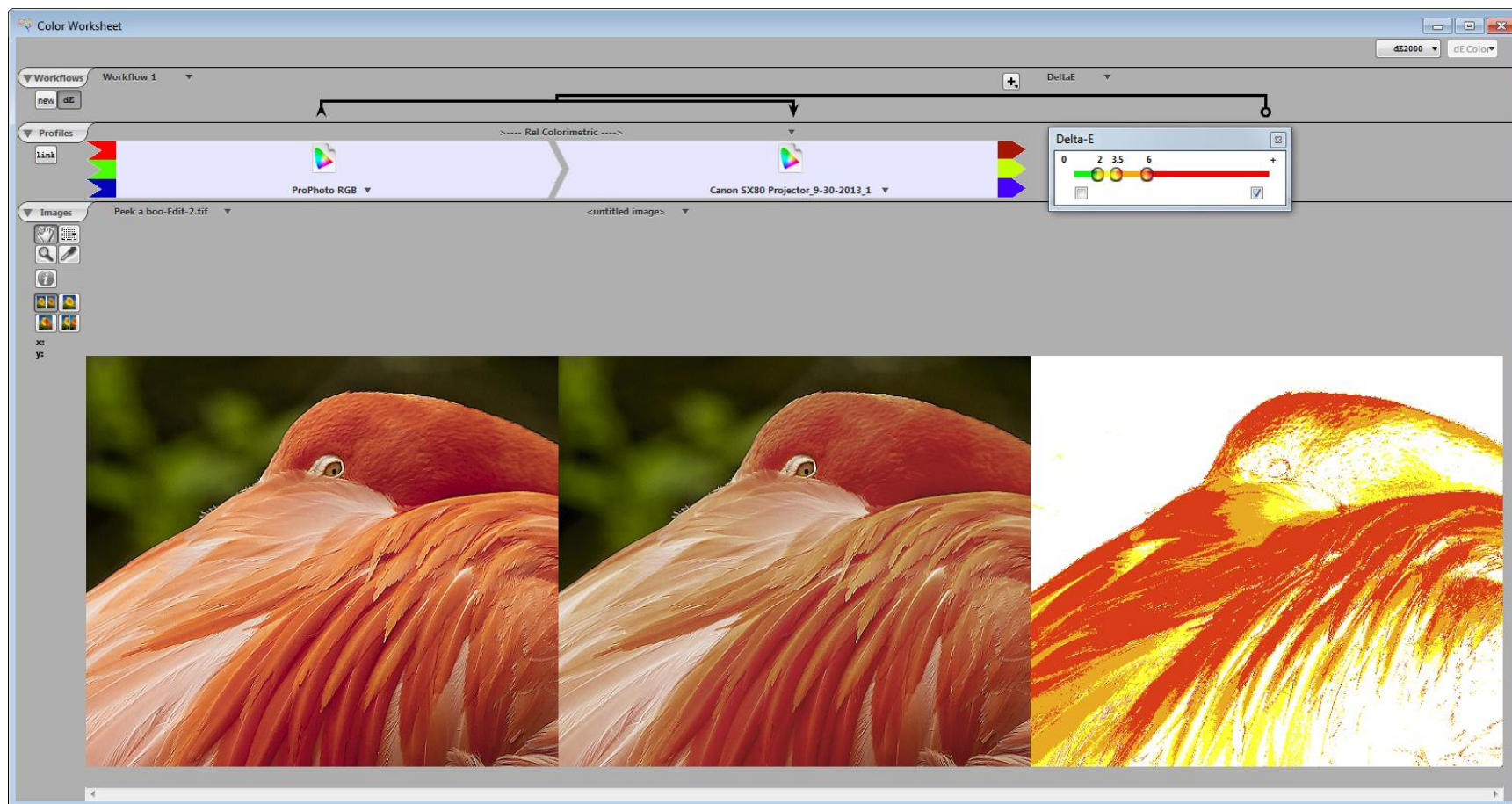
sRGB with no Color Management



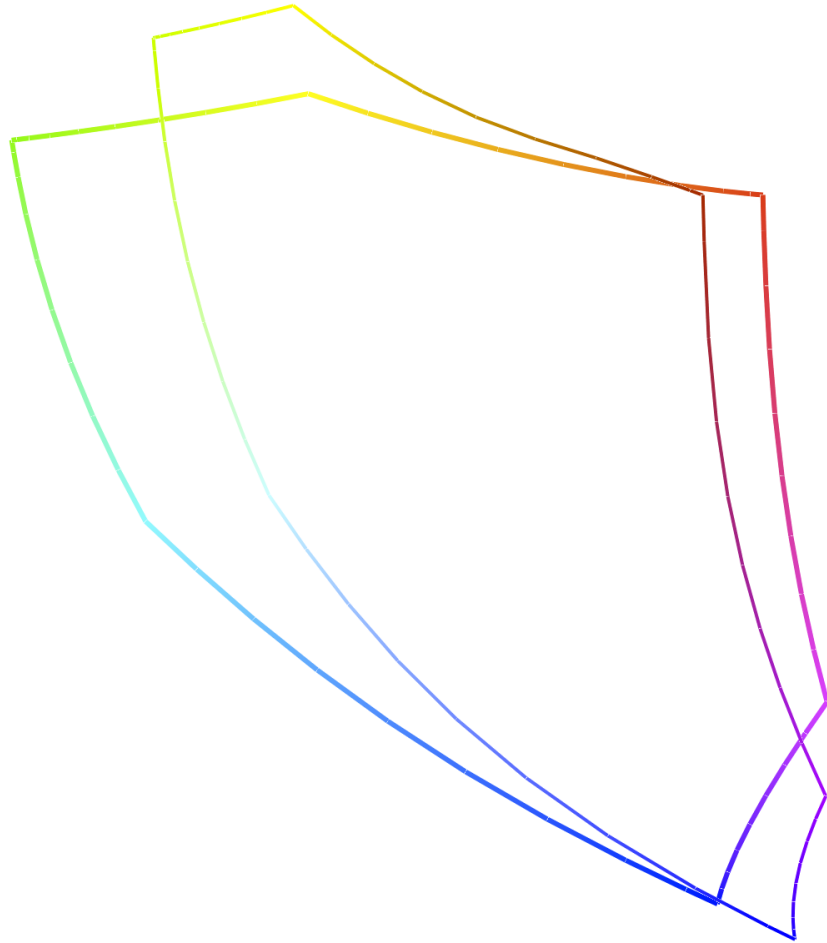
How bad is it?



How bad can it be?



A Funny Thing Happened While Preparing This Presentation



Questions

