

Calibration: How it Affects Colour Management



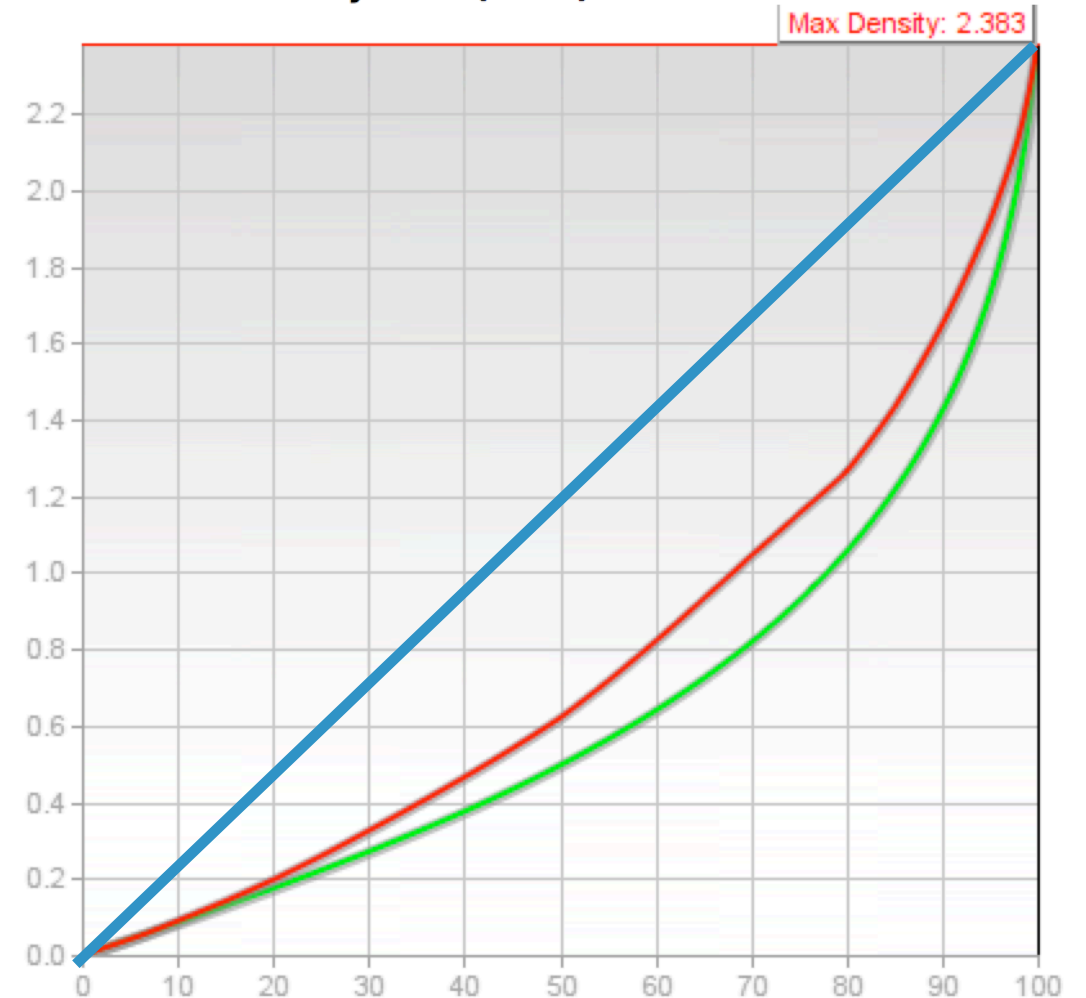
Steve Upton
CHROMiX



What Are We Talking About?

- Calibration
- Linearization?
- Differing types
- Many use in-RIP / default
- G7
 - A calibration technique

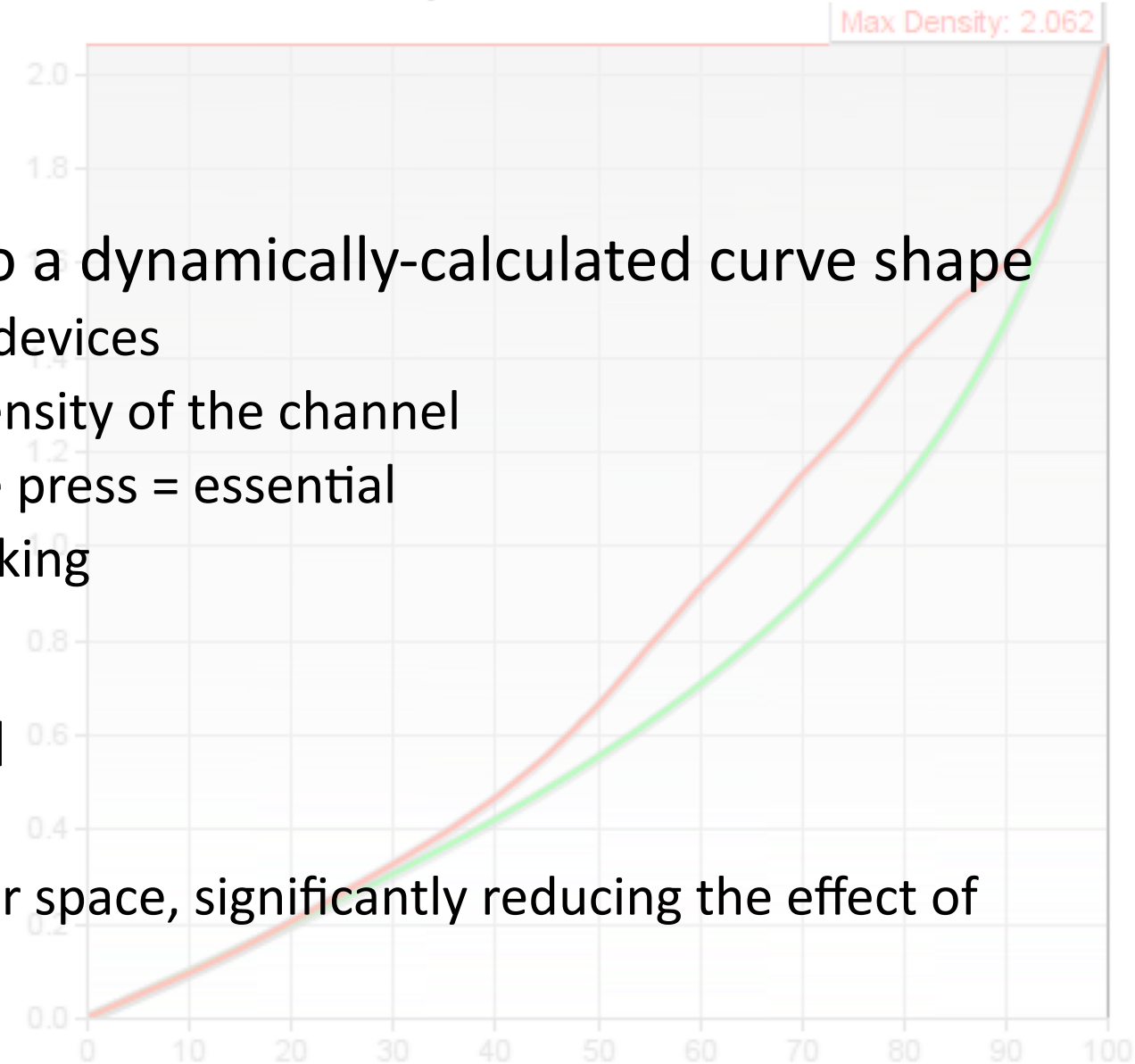
K Neutral Print Density Curve (NPDC)



A Bit About G7

- Each channel of CMYK adjusted to a dynamically-calculated curve shape
 - 0-50% shape very similar between devices
 - 50-100% scales to the maximum density of the channel
 - Dynamic with dynamic range of the press = essential
 - No density limiting, no gamut shrinking
- CMY channels then gray balanced
 - Gray balance is a very good thing
 - “Normalizes” the center of the color space, significantly reducing the effect of differing colorants

CMY Neutral Print Density Curve (NPDC)





Benefits of Stable Calibration

- Why bother with a consistent tone curve in the highlights?
- Why bother with a standardized calibration at all?
- Profiling targets sample better when used on a calibrated system
- A well calibrated system usually varies more predictably
- It's more easily / quickly brought back to the calibrated state with fewer patches being read
- Preserves carefully built ICC profiles



Benefits of Stable Calibration

- It's much easier to move jobs between (similar) presses when they calibrated in the same manner
- Calibration should not to be confused with color spaces
 - G7 ≠ GRACoL, though GRACoL is based on G7

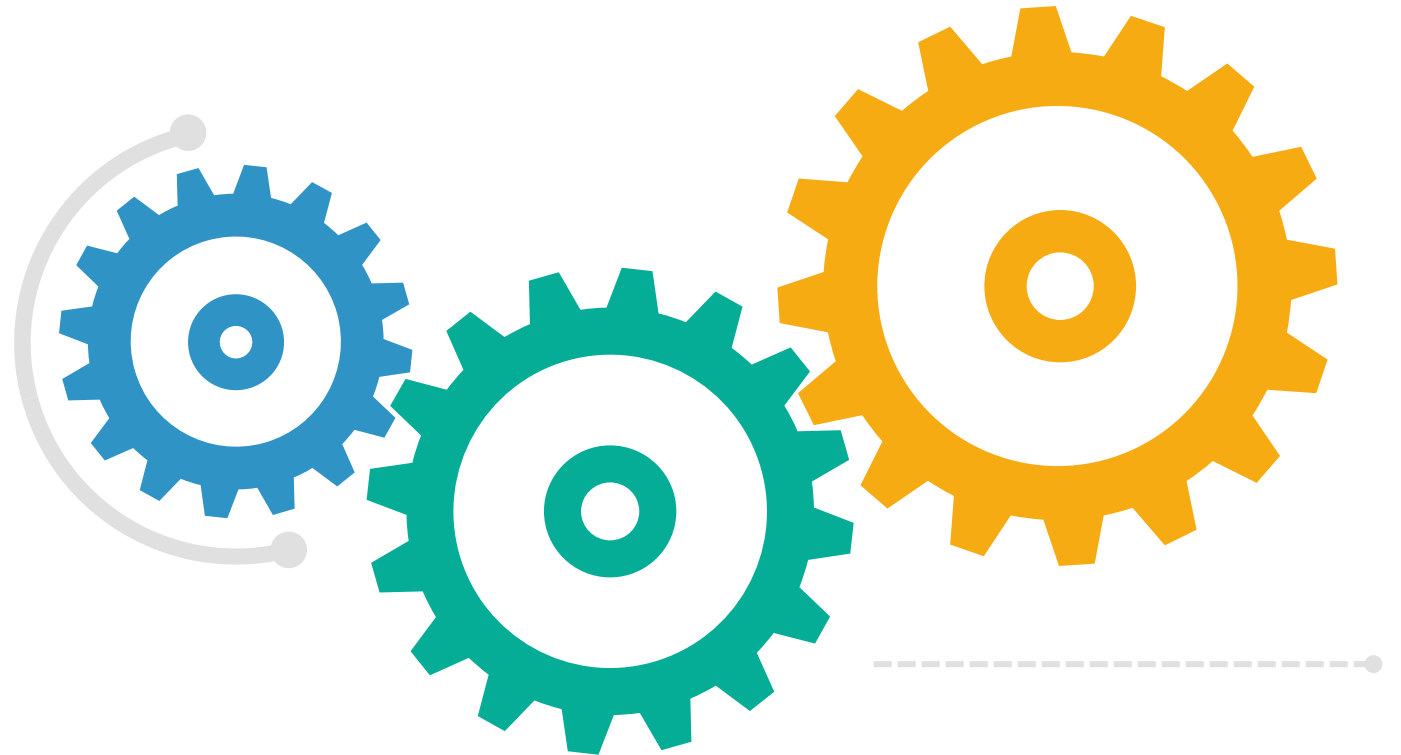
 ≠ 



Is G7 is in conflict with colour management?

No! Quite the opposite

Calibration provides the foundation on which effective colour management is built



New G7 Master Certification Levels

Grayscale

Targeted

Colorspace

Certifiable..... or not

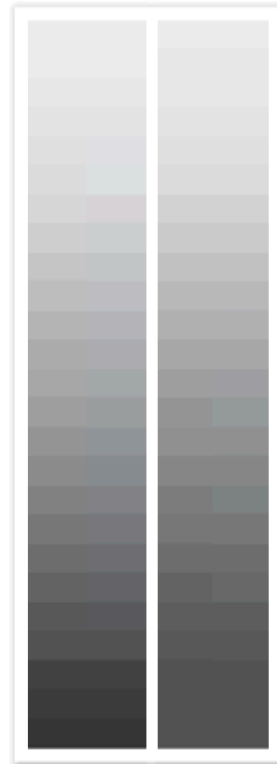
- depends on the industry
- some companies keep it a trade secret

Grayscale

All Metrics Pass

	w Δ L*	w Δ a*	w Δ b*	Tol.
Avg	0.11	0.16	0.3	1.5
Max	0.28	0.35	0.61	3.0

K C M Y



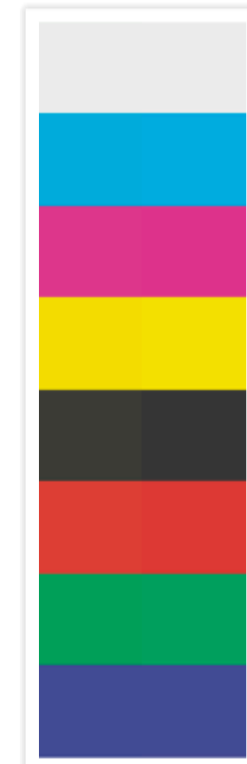
Tgt. Smpl. Tgt. Smpl.

Targeted

All Metrics Pass

	Max Δ E ₀₀		Tol.
S	0.53	1.01	3.0 3.5
K	1.25	1.68	5.0 4.2

Target Sample



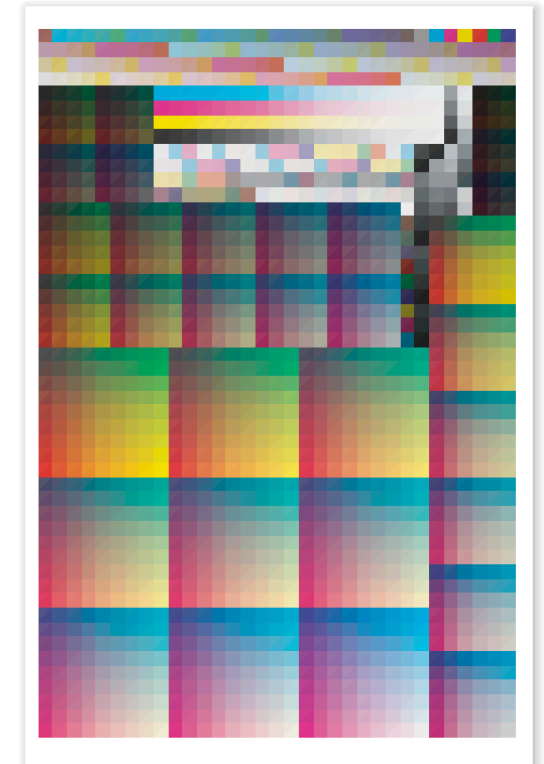
Tgt. Smpl.

Colorspace

All Metrics Pass

	Δ E ₀₀	Tol.
Avg	1.08	3.5
95%	2.19	5.0

Target Sample



Tgt. Smpl.



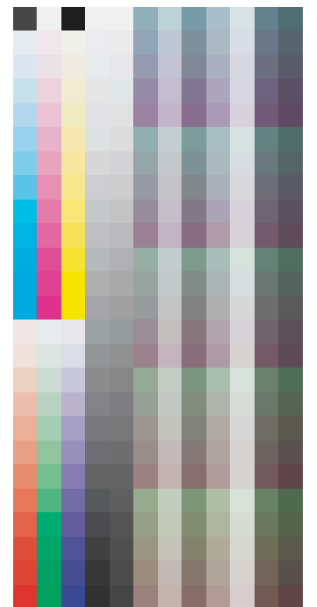
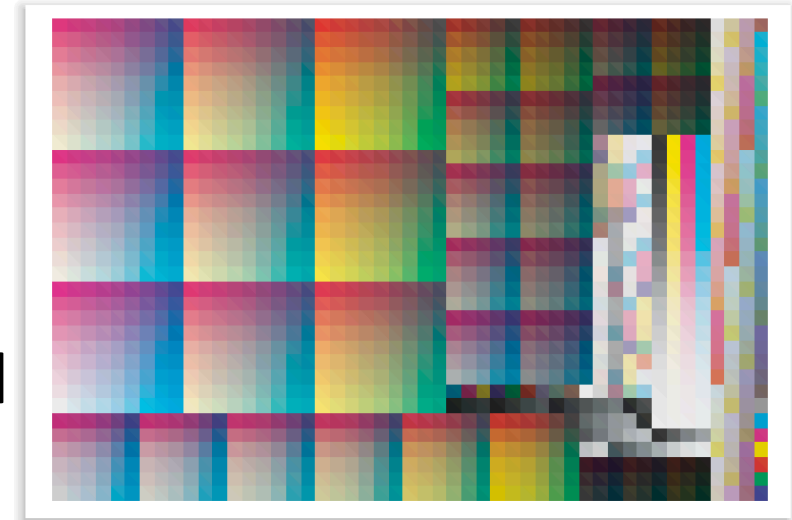
Differing from Profiling

Re-profiling (4D / 3D characterization) can be overkill

- Over, as in:
 - oversampling, wasting time, and over engineering
 - applying more fix than is necessary
 - Conditions that affect 3D problems may be better addressed in other ways or with greater sampling
- Kill, as in:
 - killing productivity and
 - possibly affecting gamut shape and color matches using insufficient data.

Re-profiling tendency is for smaller targets and fewer of them

- risky.....
- It can work, with very effective modeling



Re-Profiling

- With smaller targets and fewer of them
 - Measurement errors could create serious problems that are difficult to detect
- Curve adjustments:
 - Tend to have better sampling frequency
 - Errors are easier to detect
 - Also address the roots of most printing variation
 - (though ink trap issues have to be considered).



Re-Profiling

- A good analogy is in Orienteering:
 - Determining the goal and route off the trail.
 - Quick checks of the compass while on the trail are effective
 - Unwise to reroute your hike around a hazard without considering the implications
- Lastly, Re-profiling can mask equipment maintenance and failure issues
 - Press becomes more unstable
 - Unexpected failure point causes longer downtime.
 - We've seen dE value of 5 and higher between subsequent digital press sheets.
 - Detection of such a problem and correction through maintenance and consumables replacement is the only way to correct such things



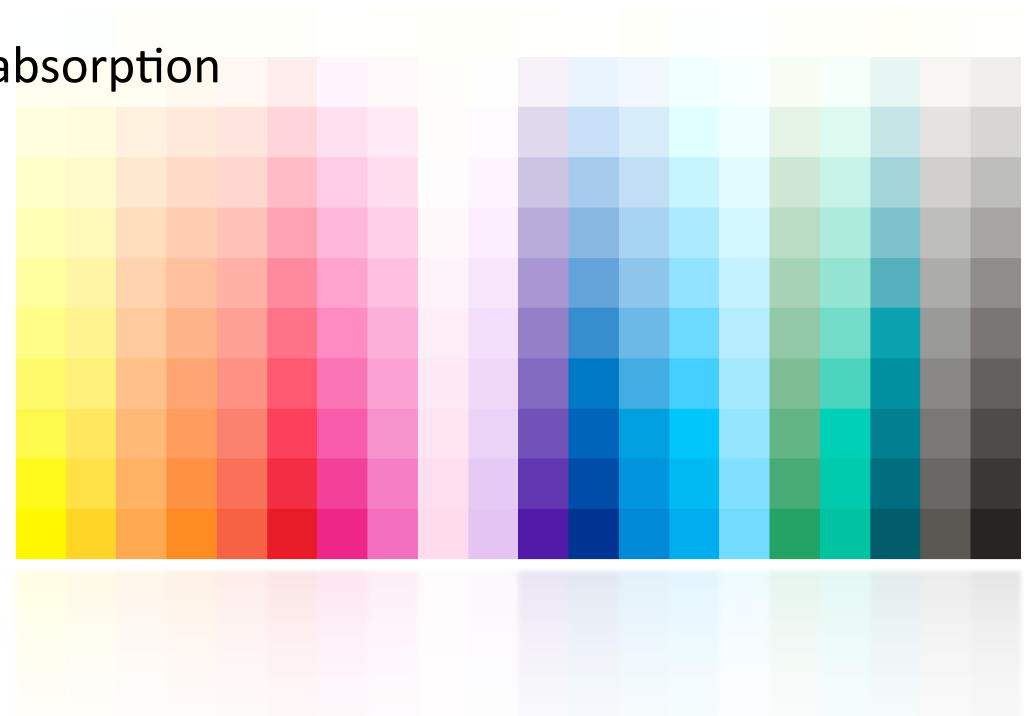
Progress in the Field

- G7 is reaching into unexpected industry segments, eg Inkjet
 - Production inkjet RIPs are notorious for cookie-cutter calibration that marginally improves results
 - Consultants in the inkjet world often have their "secret sauce" calibrations
- Dye Sublimation
 - Unique and interesting process printing to a transfer material, heat sublimating onto/into final products
 - Over-inking challenges, non-neutral K challenges
 - G7 tone curve and gray balancing actually increased the gamut



What About Spot Color?

- Non-CMY inks don't align with density filters well
- Numerous techniques over the years
 - “Just Pick One” matching an existing filter to the ink
 - “Max Lambda” λ
 - based on a single spectral band with greatest absorption
 - but which one?
 - How to pick the best tone value calc..?
- And now....



SCTV

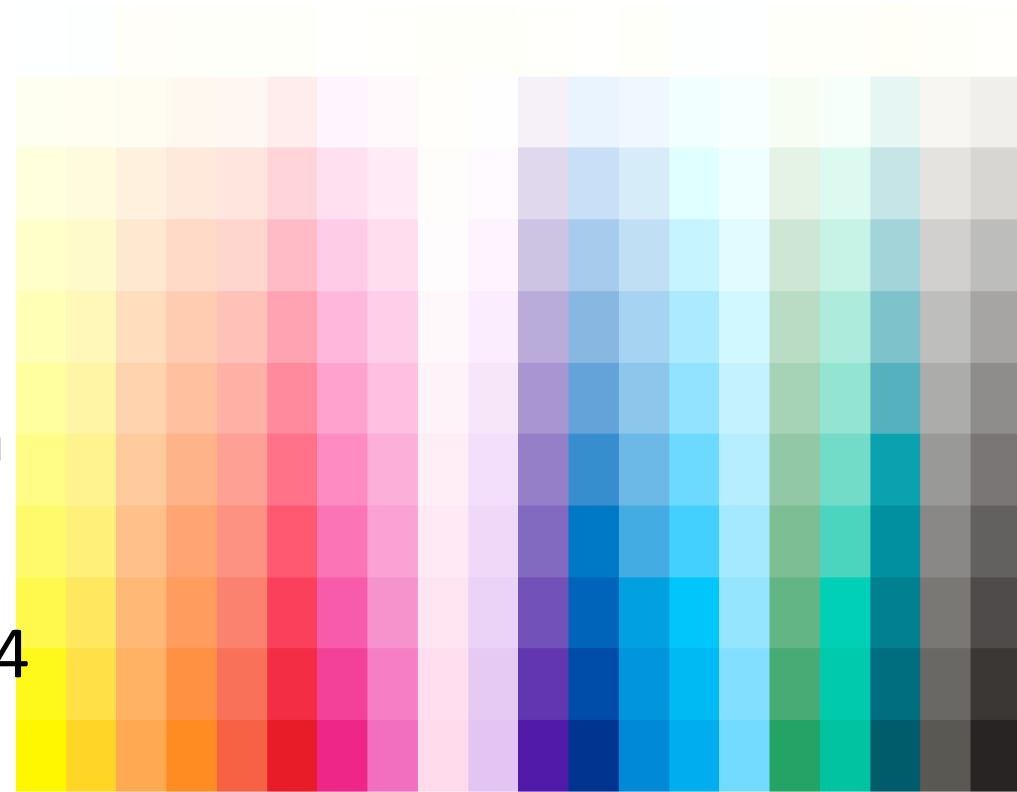


SCTV?



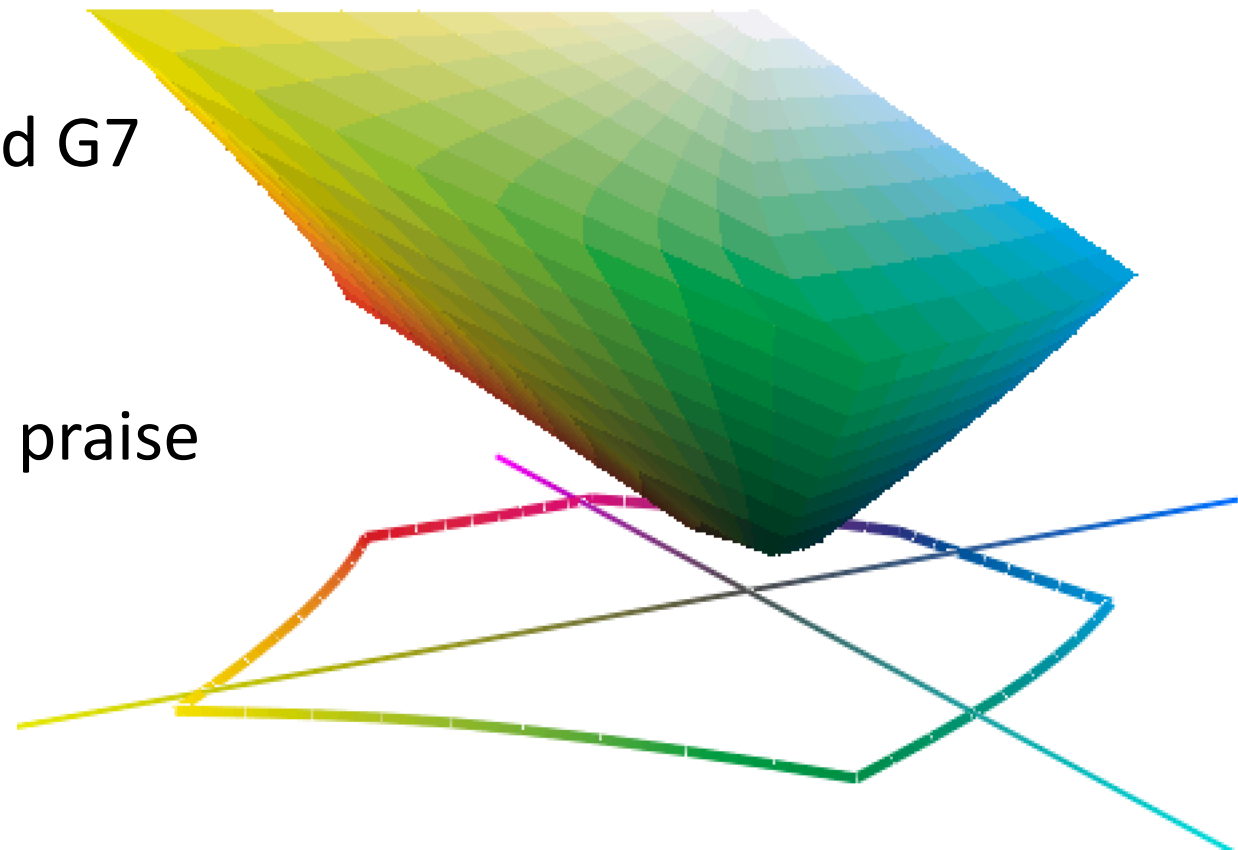
SCTV!

- Spot Colour Tone Value
- L*-like, calculated for each of XY & Z
- Linear enough for calibration / linearization
- Ratified in ISO 20654-2016
- Implemented in newest cal tools like Curve4
- Combining G7 for CMYK and SCTV for spot channels is an effective and repeatable calibration strategy.



I'm a profiler. How did I get to this point?

- We're nearing 1/4 billion measurements in our Maxwell system.
- We've helped bring ICC profiling and G7 into all major print segments
- We've seen the results & heard the praise



THANKS FOR LISTENING

upton@chromix.com

www.chromix.com

