Thinking Outside the Colour Profiling Capture Box

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WHAT YOU WILL <u>NOT</u> SEE

- NEW RESEARCH

- FANCY METHODS

- DIFFICULT IMPLEMENTATIONS

- FORMATS, SOFTWARE

WHAT YOU WILL SEE

- INTRODUCTION / BACKGROUND
  - WHAT'S INSIDE THE BOX
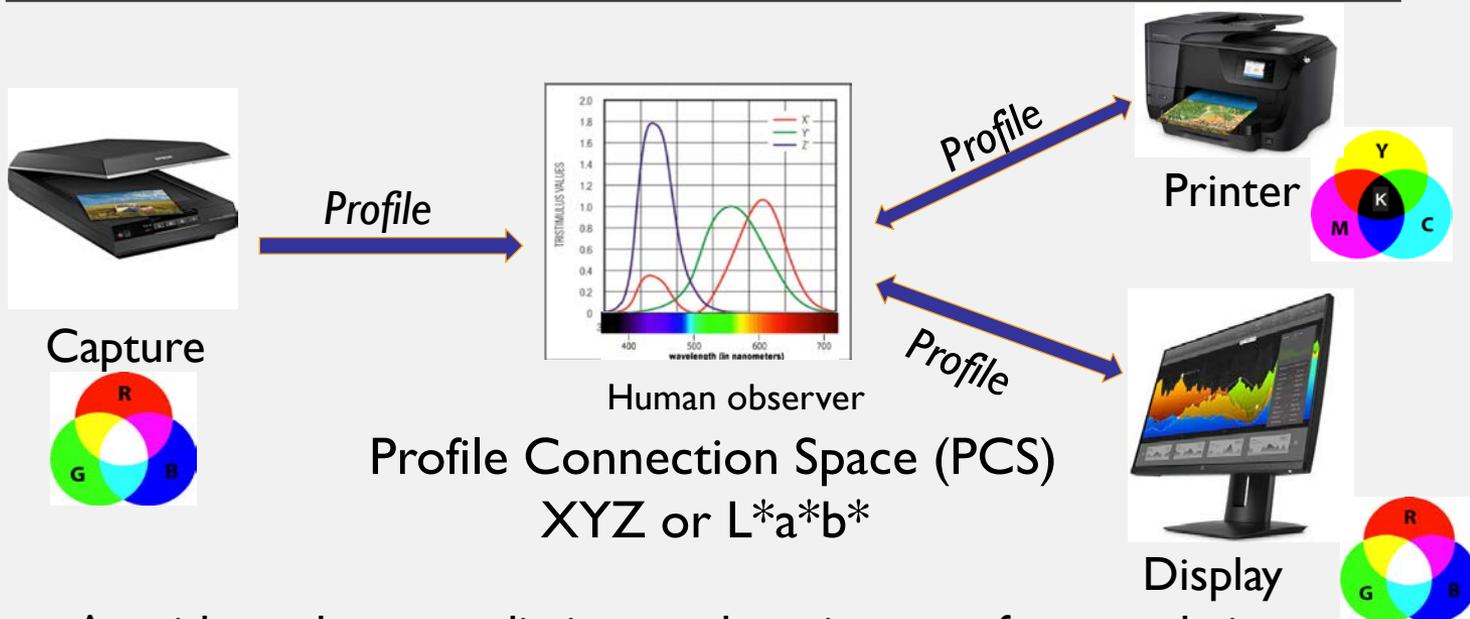 - WHAT'S OUTSIDE THE BOX
- THE DETAILS…..AS IN 'THE DEVIL IS IN..'

Articles by Ken Fleisher

End-to-End Imaging Workflow
Optimizing Conformance to FADGI and Metamorfoze

WHAT IS A COLOUR PROFILE ?

A COMPUTATIONAL DICTIONARY FOR DIGITAL TO COLOURIMETRIC DATA

Capture

Profile

Human observer

Profile Connection Space (PCS)
XYZ or L*a*b*

Profile

Printer

Profile

Display

As with any language dictionary, there is no perfect translation from language A to language B. We live with an acceptable and assumed risk. No conversions are perfect. We can quantitatively measure the goodness of those conversions with ΔE_{2000} formulas.

In this talk we concentrate on input (capture) colour profiles and improvements on measuring and evaluating that goodness.
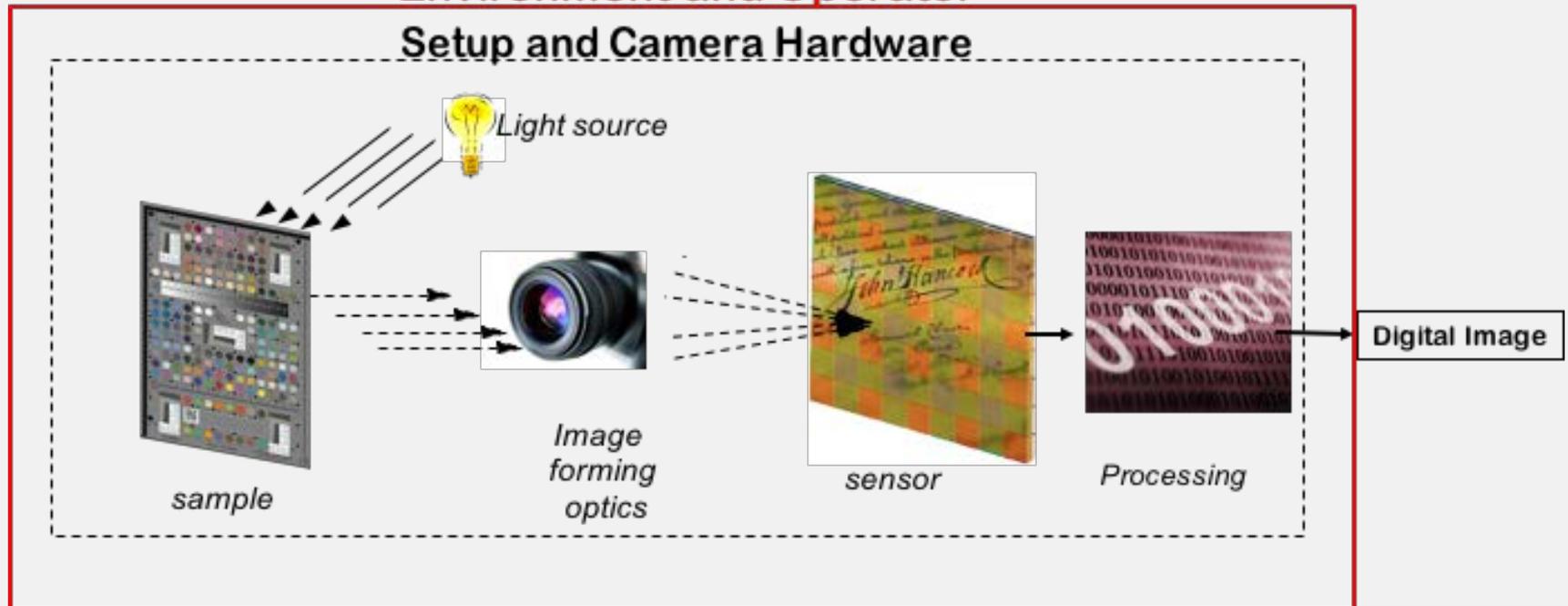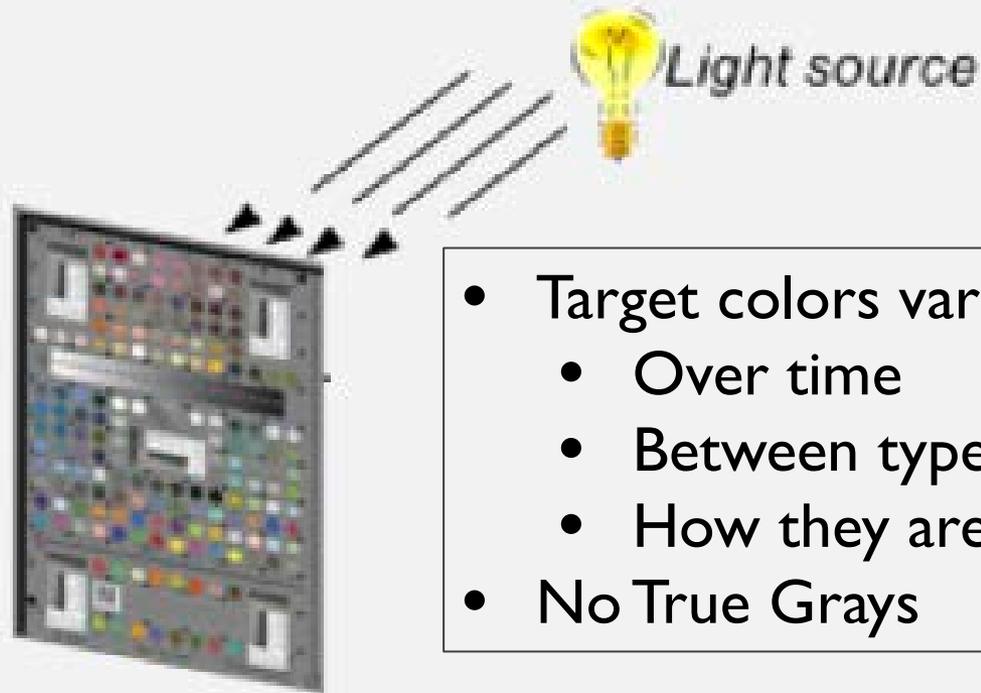
EVALUATION OF ΔE USING REFERENCE CHART
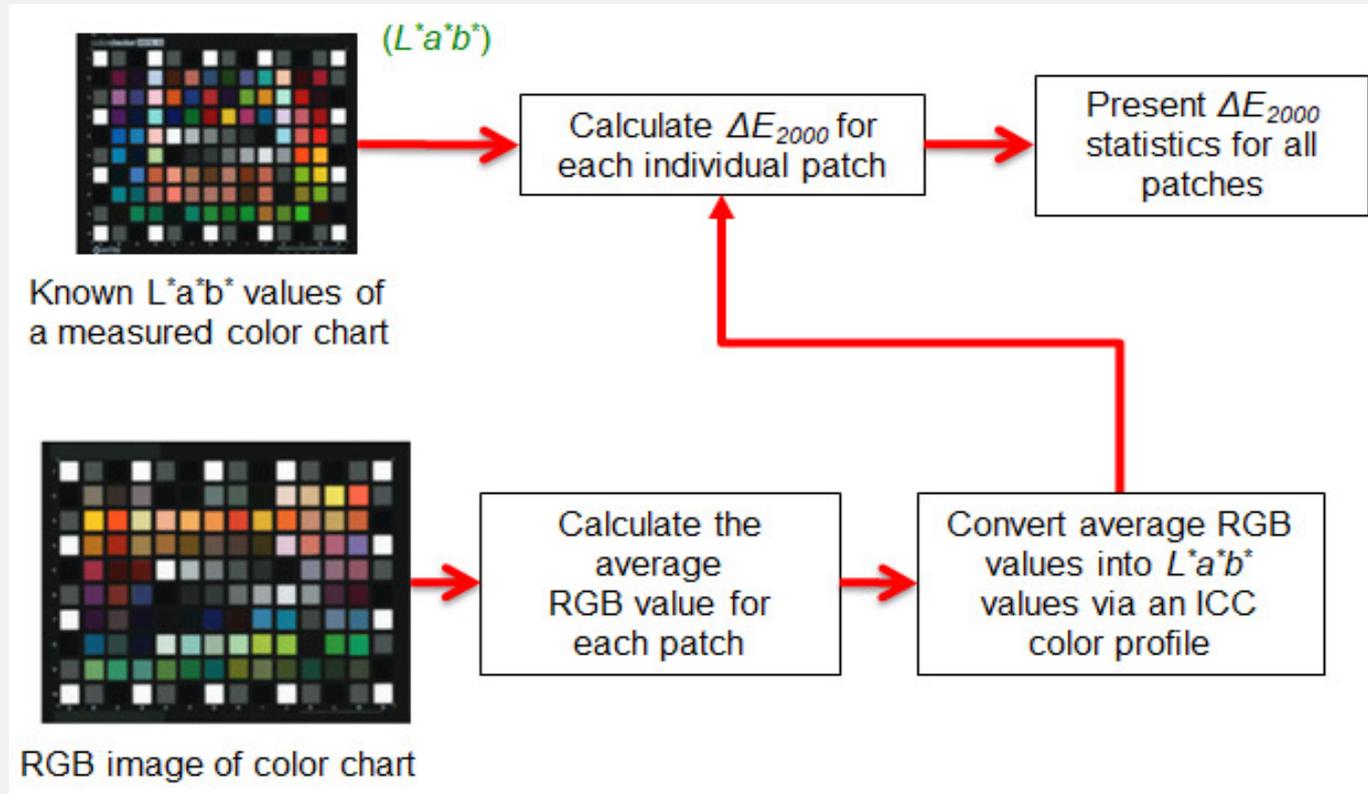
Each of these paths introduce their own variabilities

THINGS ARE WAITING TO GO WRONG

Environment and Operator

Setup and Camera Hardware

Light source

sample

Image forming optics

sensor

Processing

Digital Image

COLOR GROUND TRUTH?

Light source

- Target colors vary
  - Over time
  - Between types
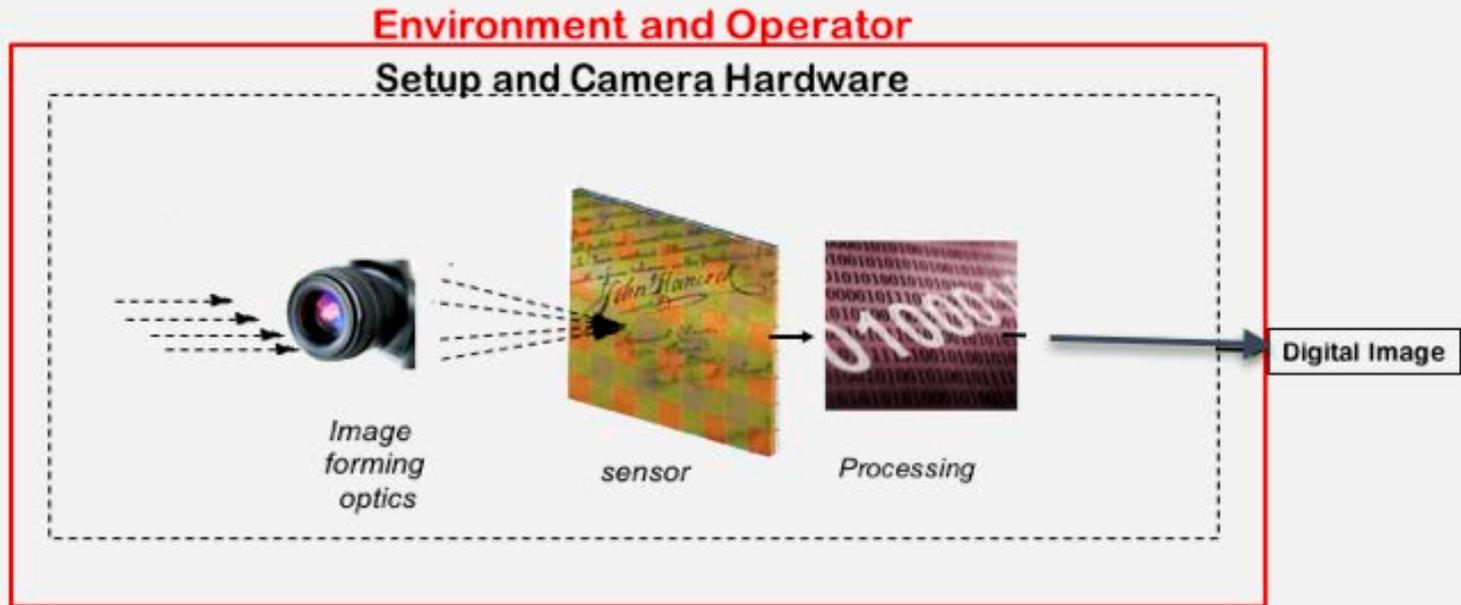 - How they are measured
- No True Grays

In the box
- Default color measures
- 0:45 Illumination geometry

Out of the box
- Custom target measures
- Consider different color measures

FORGOTTEN VARIABLES

Environment and Operator

Setup and Camera Hardware

Image forming optics — sensor — Processing — Digital Image

In the Box	Out of the Box
• Default color profile	• Operator lock outs
• 'What could go wrong ?'	• By the numbers
• Visual Display Evaluations ?	• Think Environment

COLOUR PROFILES FOR HEAVY LIFTING

➢ Frequency
  - Session-to-Session ?
  - At transitions
  - Equipment changes
  - Before/After Sessions
  - Treat it like Colour Hygiene
➢ Well behaved Input
  - No clipping
➢ Sufficient number of colour patches
➢ Improves tonescale, white balance and total color

TARGETS - COLOUR MEASUREMENT
ANTICIPATE VIEWING CONDITIONS ?
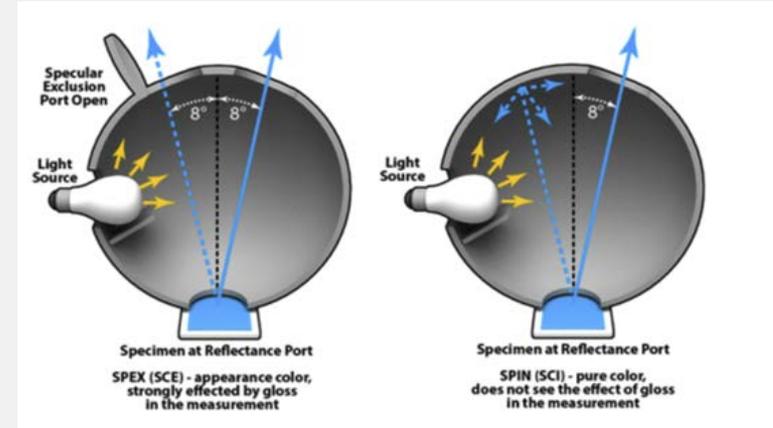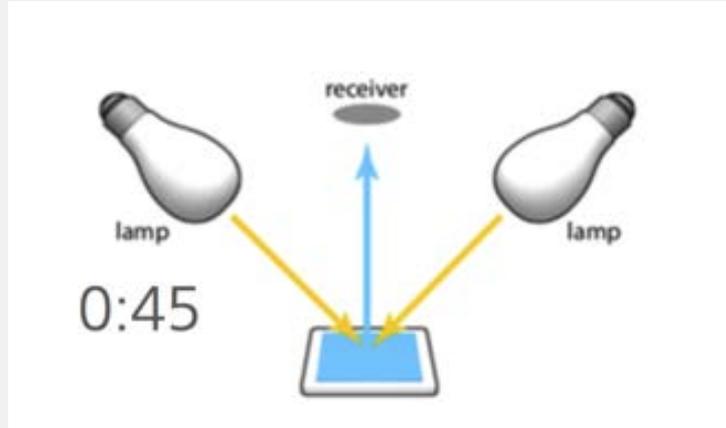

In the Box, 0:45
- Affordable equipment
- Not suitable for textured content
- Largely driven by graphics art imaging
- Inconsistent with most viewing environments

Outside the Box, Sphere
- Specular excluded -
  - Appearance color - affected by gloss
- Specular included -
  - Pure color - unaffected by gloss
- Textured surfaces
- Probably more consistent with everyday viewing

https://www.xrite.com/blog/difference-between-0-45-and-sphere-measurement

- PROFILE SMOOTHNESS -
COLOR GRADIENTS FOR DETECTING COLOUR POTHOLES
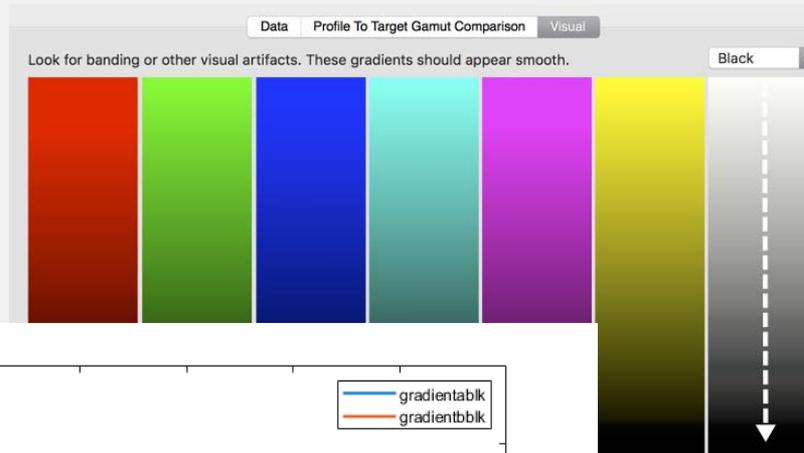

From SpectaCore
by ColorBurst®.
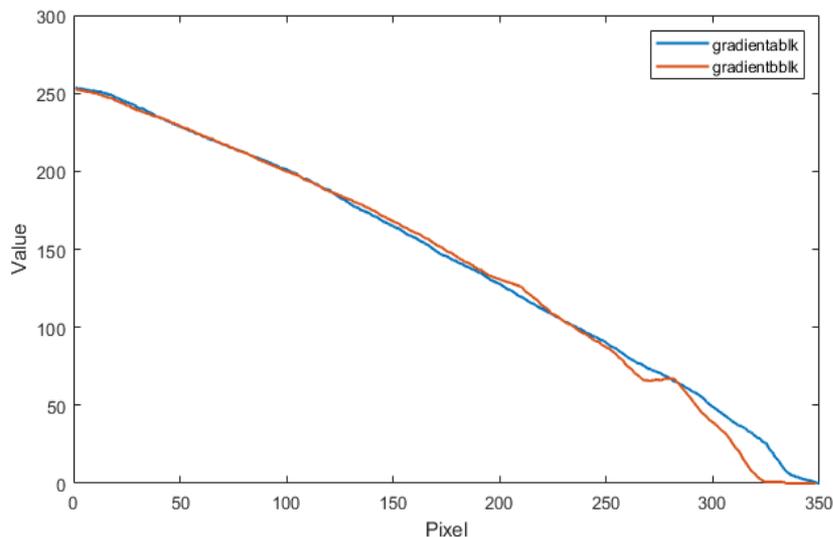
- Identifies ill behaved colour transitions from aggressive colour profiling. Overfitting ?
- Synthetically generated inputs
- Teaching to the test component

T.Olson, Smooth Ramps: Walking the Straight and Narrow Path through Color Space, IS&T's Color Imaging Conference, 1999

- INSIGHTFUL STATISTICS AND REPORTING -
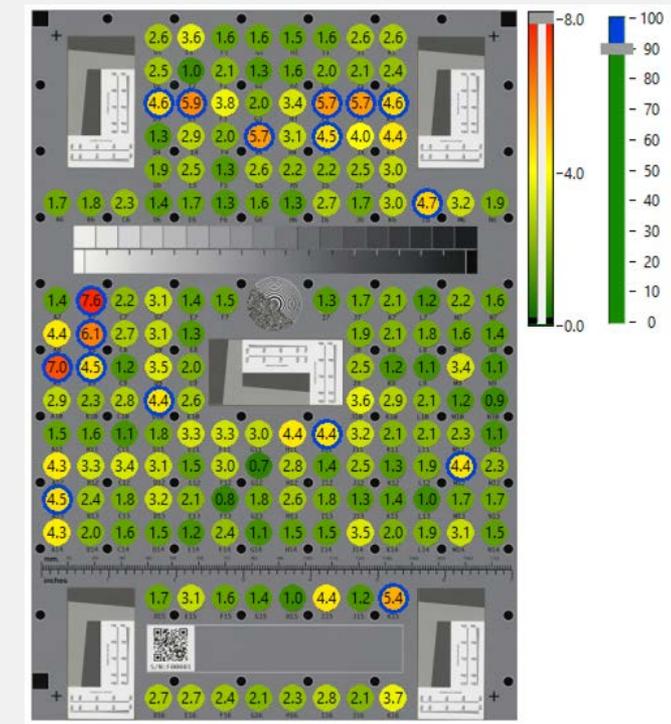## MORE THAN JUST AVG. AND MAX ΔE
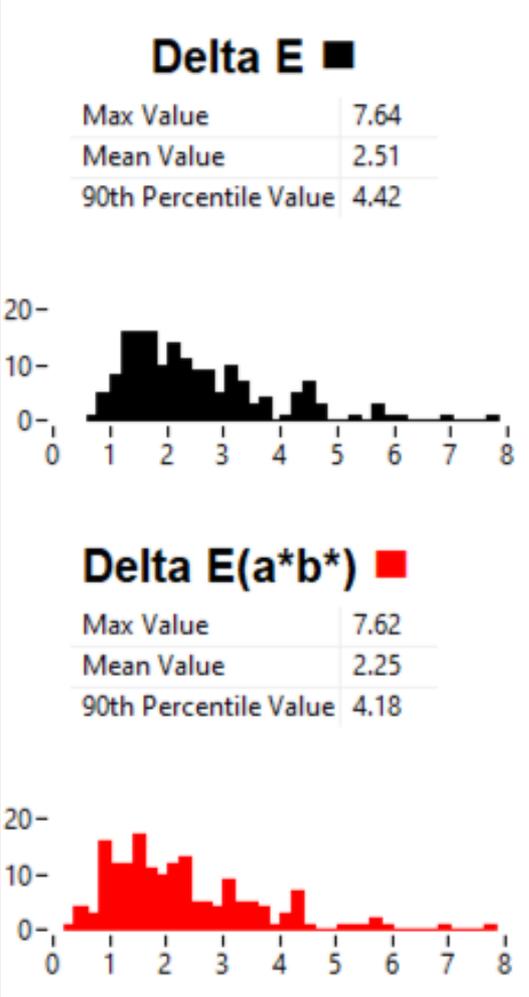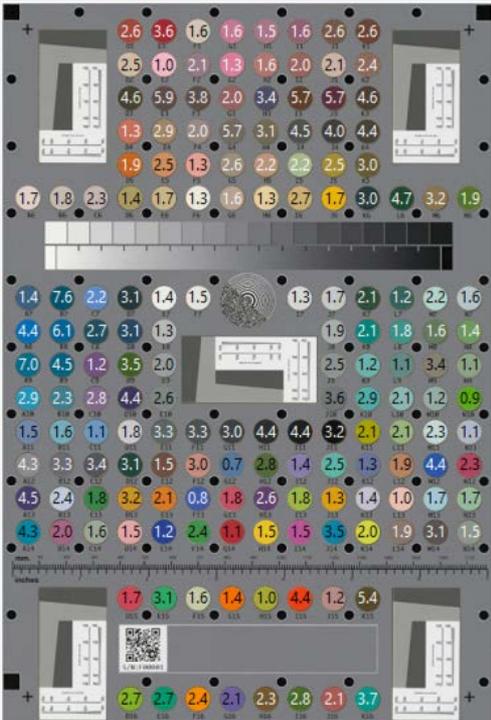
SUMMARY

- MEASURE YOUR TARGETS (OR HAVE THEM MEASURED)
- RE-PROFILE FREQUENTLY
- THINK ENVIRONMENT
- ANYTHING/EVERYTHING CAN GO WRONG.
- IT'S MORE THAN AVG. AND MAX ΔE
- SMOOTHNESS TOOLS ARE HERE AND COMING
- OTHER COLOUR MEASUREMENT APPROACHES

- THANK YOU-

- LARRY SPEVAK, COLORBURST -

- DAVE WYBLE, AVIAN TECHNOLOGIES -

- KEN FLEISHER, NGA-