MUSICAL GENIUS, LEONARD BERNSTEIN...
"TO ACHIEVE GREAT THINGS, TWO THINGS ARE NEEDED: A PLAN, AND NOT QUITE ENOUGH TIME."

PHOTO CREDIT: George Talbot/ANL/REX/Shutterstock
WORLD HEAVYWEIGHT CHAMPION, MIKE TYSON...
"EVERYONE HAS A PLAN, UNTIL YOU GET PUNCHED IN THE FACE."

PHOTO CREDIT: The Ring Magazine/Getty Images
WHAT'S THE PROBLEM?
COLOR TROUBLESHOOTING INVOLVES…

• The search for hidden structures
  • Digital file DNA

• Defining tests that answer the question “What controls what?”
  • Test files that include the relevant data; send them through the system
  • Isolate variables in multivariate processes; turn processing options on/off

• Tools
  • Adobe Creative Suite
  • Enfocus PitStop
  • Raster Image Processor (RIP) driving a digital press
  • Chromix ColorThink Pro
SCIENCE GENIUS, JAMES CLERK MAXWELL...

"IT IS A MATTER OF BALANCING ECONOMY AGAINST QUALITY." ... IN REGARD TO THE NUMBER OF PRIMARY COLORS DESIRABLE

~FROM ART AND VISUAL PERCEPTION, BY RUDOLF ARNHEIM

\[ \mathbf{\nabla} \cdot \mathbf{D} = \rho \]
\[ \mathbf{\nabla} \cdot \mathbf{B} = 0 \]
\[ \mathbf{\nabla} \times \mathbf{H} = \mathbf{j} + \frac{\partial \mathbf{D}}{\partial t} \]
\[ \mathbf{\nabla} \times \mathbf{E} = -\frac{\partial \mathbf{B}}{\partial t} \]
CONSTRUCTING A PRINTED SURFACE: THE PRESS

- Requires consumables maintenance
  - Factors of heating/cooling, dryness/moisture, pressure/friction
  - Moving parts

- Sheet Uniformity
- Maximum densities
- Press linearity | process control using a standard paper type
  - Half-toning
PRE-PRESS DEPARTMENT IN A BOX: THE RIP

• Repeat-able
  • Job stock calibration (process control for families of like-media)
    • G7™ calibration

• Colors match other colors
  • Device characterization (media family profile creation)
    • Often needed to achieve color space conformance
    • Improves spot color simulation accuracy

• Color editing (late-stage, in the pressroom)
  • Curves, tables, color sliders
• Working and device colorspace: RGB | CMYK
  • Synchronize

• Lab:
  • Color appearance predictor | profile connection space

• ICC profiles:
  • Device values mapped to appearance predictions (Lab)

• Color matching systems: PANTONE (spot colors):
  • Swatch name | lab value | simulation-device recipe

• Overprint

• Transparent layers processing: Adobe Flattener:
  • Atomic regions creation | conversions of colorspace and data-type

• Element data-types:
  • Pixels | vector fill (smooth screen) | vector font/text (fine screen)

• Grey & Black specification
  • Pure | colorful

• PDF for printing:
  • Embed color profiles | PDF/X output intent
IN-RIP COLOR MANAGEMENT:

- Normalized color spaces:
  - RGB working space profile | CMYK reference print condition profile | rendering intents
- Honor embedded profiles: yes | no
- RGB simulation/output:
  - Source RGB to output device colorspace
  - Source RGB to CMYK reference print condition profile | to output device colorspace
- Spot color mapping tables:
  - PMS Name-Lab to local simulation-device recipe
  - PMS Name-Lab tint value to new value
    - with interpolation for curve-like smooth change
  - PMS Name to other PMS Name
  - CMYK to PMS Name
  - RGB to PMS Name
IN-RIP COLOR MANAGEMENT:

- Use PDF overprint simulation: yes | no
- APPE or CPSI: print file downloader | PDF print driver | PS print driver
- Dither pattern setup (half-tone): smooth screen | fine screen
- Preserve Pure black (RGB): yes | no
- Use PDF/X output intent: yes | no
MORE IN-RIP MANAGEMENT:

• Moiré reduction | smoothing
• Sharpening | edge enhancement
• Large font conversion to object | fine screen to smooth screen
“The key to making this process feasible for nonexperts (and... faster and more accurate for experts as well), is to separate... corrections into those that really require the operators... judgement and those that simply depend on detailed knowledge of the characteristics of the system components, such as... inks, paper, ...and the printer.”
FAILURE CATEGORIES:

- **Surface** construction: ink on paper | press consumables maintenance
- **Repeatability** failure: process control | press and/or RIP
- Press conformance: **colorspace** matching failure
- **Spot color simulation** matching failure
- **Transparent layer** processing failure
- **Appearance** matching failure
  - Page or Document-level
  - Element-level
APPEARANCE FAILURE-TYPES:

• Light/Dark : too much | too little
• Dull/Vivid : too much | too little
• Hue Family : warm / cool (in reds & greens) | blue/purple (C+M)

• Balancing of these contrasts helps to enhance detail, and leads to a sense of color, clean and bright.
PERCEPTUAL PSYCHOLOGY GENIUS, RUDOLF ARNHEIM

"IN NO RELIABLE SENSE CAN WE SPEAK OF COLOR ‘AS IT REALLY IS’; IT IS ALWAYS DETERMINED BY ITS CONTEXT."

PHOTO CREDIT: http://www.davidbordwell.net
TOOLS FOR APPEARANCE CORRECTION

- Tone reproduction curves (TRC)
- Rendering intents and color profiles
- Color sliders
  - Pixel adjustments at the element-level
EXPLORATIONS IN COLORSPACE
TROUBLESHOOTING PROCEDURES:

• Get your press into conformance with your reference print condition
• Examine the data | check the color specifications
• Make a proof print
• Search for transparent layer processing failures: atomic regions | conversions of color space or data-type | color mismatches
• Identify spot color simulation matching failures, correctable with a table
• Identify appearance matching failures:
  • Correctable with a curve (global tone reproduction transformation)
  • Correctable with a source profile or rendering intent (global warping of colorspace)
    • Wrestle control back from PDF/X output intent?
  • Correctable with a color slider (element-level, global pixel-editing)
• Or… send it back upstream