A Crash Course in Printing

PACC Program

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Goal

- Intro to printing focused on the essentials
- Take an image from camera to physical display
- Pretty good display of a pretty good print that matches digital image pretty well
- Can't expect perfection: Compromises, tradeoffs ($), approximations
- Use the right tool for the job

Key Points

- Turn on color management
- Tag each digital image with a color profile
- Calibrate and characterize your monitor
- Convert from image color space to printer color space when printing
- Don't let printer manage color

Outline
Part 1. Making a Print

- Concepts
- Calibrating and characterizing a monitor
- Calibrating and characterizing a printer
- Color-managed workflow
- Printing options
- Workflow for using a personal printer
- Printing at a print shop
- Why doesn't my print look like the image on my monitor?

Outline
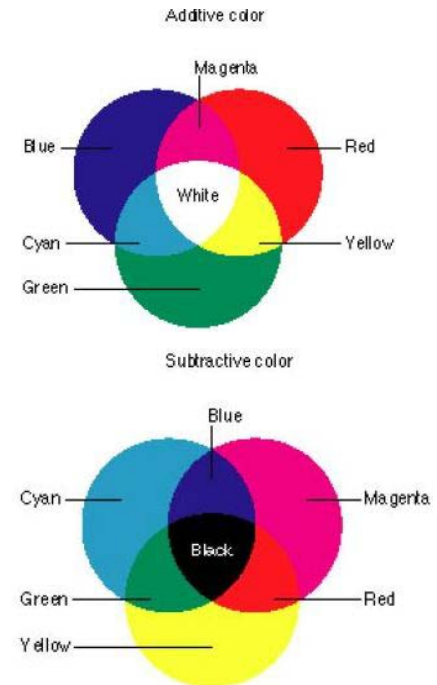## Part 2. Displaying a Print: Mat & Mount

- Matting options
- Demo: Cutting a mat
- Demo: Matting a print
- Mounting options
- Demo: Mounting a print
- Demo: Calibrating & characterizing a monitor
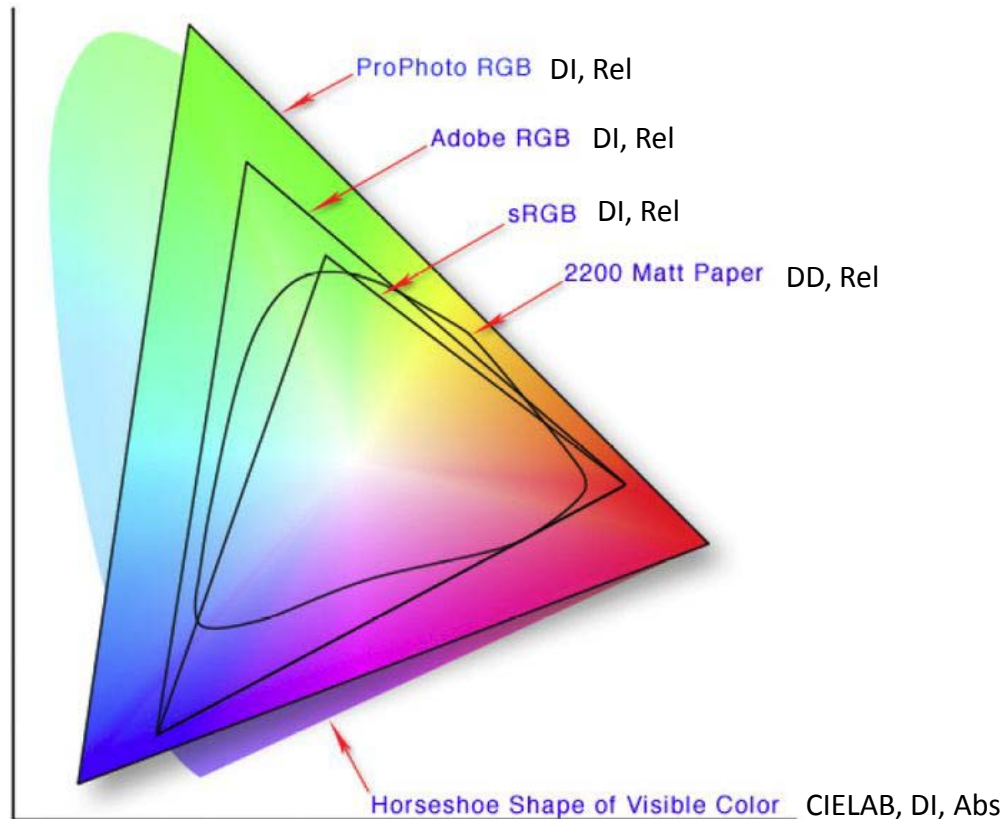
PART 1. MAKING A PRINT

Concepts
Color Model

- How color is described
- **RGB** - <r, g, b>
  - Red, Green, Blue
  - Projected light
  - Used for Camera, Monitor, and Editing
- **CMY(K)** - <c, m, y> or <c, m, y, k>
  - Cyan, Magenta, Yellow (blacK)
  - Reflected light
  - Used for prints
- **LAB** - <l, a, b>
  - Lightness, A color dimension, B color dimension

Concepts
Color Space

- Coherent group of colors

ProPhoto RGB DI, Rel
Adobe RGB DI, Rel
sRGB DI, Rel
2200 Matt Paper DD, Rel
Horseshoe Shape of Visible Color CIELAB, DI, Abs

DD – Device Dependent
DI – Device Independent

Abs – Absolute Color
Rel – Relative Color

Concepts
Gamut

- Group of colors
- Often synonymous with color space
- Wide-gamut color space: a color space with a wide-range of colors (relative to some other color space)

Concepts
Profile

- Specifies the real color indicated by a relative color

- (That is, it maps from a relative color space to an absolute color space)

- <0, 255, 0> - Most green color in color space
  - Adobe RGB profile maps it to a vibrant green
  - sRGB profile maps it to a less saturated green

Concepts
Color Image File

- Collection of numbers that describe an image

- Collection of color tuples from a color space

- Profile for that color space

- E.g., PSD, TIFF, JPEG

- Raw Image File

 – Proprietary absolute color info and format

  – DNG

Concepts
Tagging an Image File with a Profile

- All (non-raw) image files should have a profile
- **Assign** a profile if one doesn't exist
  - Doesn't change the image info in the file
- **Convert** to a profile if you want to change the color space associated with an image
  - Changes the image info in the file
- What happens to out-of-gamut (OOG) colors?

Concepts
Rendering Intent

- Specifies what happens to OOG colors during a color space conversion

- **Perceptual**
  - Squeezes OOG colors
  - Shifts in-gamut colors

- **Relative Colorimetric**
  - Clips OOG colors

Gamut mapping

Perceptual | Colorimetric

Large gamut

color spaces

Small gamut
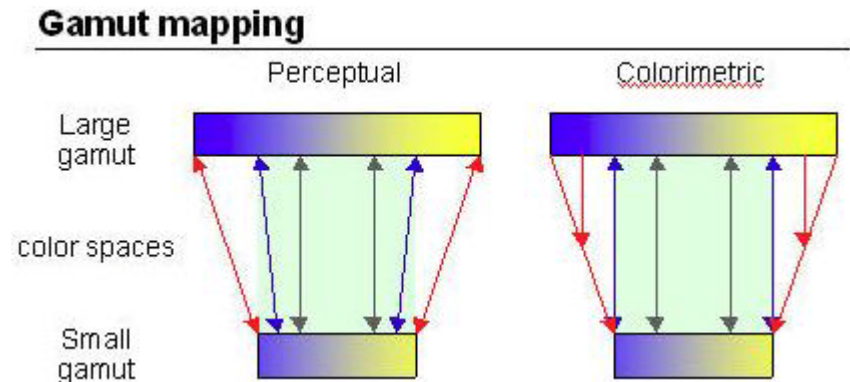
Calibrating & Characterizing a Monitor

- Monitors are a critical part of the <u>digital</u> workflow
- Must be adjusted to a well-known standard for consistent, predictable results
- **Calibrate**: adjust the physical state (color temp, luminance, gamma)
  - Once a month is probably often enough, and before important work
- **Characterize**: create a profile that relates the monitor's colors to absolute colors (test and response)
  - That is, define the monitor-dependent color space
- Use a colorimeter (X-Rite i1Display 2, $110)
- Monitors aren't properly adjusted from the factory and their properties drift over time
- Make your monitor profile the operating system default
- Default location, PC: C:\Windows\System32\spool\drivers\color

Calibrating & Characterizing a Printer

- Should do but usually don't
- **Calibrate**: clean nozzles, align heads, keep clean
  - Consider doing a nozzle check before printing
- **Characterize**: download pre-defined profiles for printer, paper, ink combos
- Default profile location, PC: C:\Windows\System32\spool\drivers\color

Color-Managed Workflow General

- Maintain and use as much color as possible
- Images are tagged with color profiles (color spaces)
- Devices and software recognize and use the color profiles
- Explicit conversions are made when necessary
- Implicit conversions sometimes occur
- sRGB is usually the default color space
- Bad things happen if a step is missed

Color-Managed Workflow
Before Photoshop

- Camera makes a raw image file or JPEG image file
- Must convert a raw image to a standard color space
  - like Adobe RGB or sRGB
  - for editing, display, printing
- Raw image converters
  - Your camera!
  - Adobe Camera Raw (some editing, Photoshop front end)
  - Lightroom (more editing, can export to Photoshop)
  - Aperture

Color-Managed Workflow Photoshop

- Import image file into Photoshop (PSD, TIFF, JPEG)
  - An image file should have an embedded profile
  - Try to attach a profile if there isn't one
  - Determine image file profile by examining "Document Profile" in the Photoshop status bar
- Match image color space to Photoshop working color space
- Edit image file in the selected color space
- Convert image file to display on monitor
- Convert image file to print

Color-Managed Workflow Photoshop color settings

- **Working Spaces**
  - RGB: Adobe RGB (or sRGB IEC61966-2.1)
  - CMYK: U.S. Web Coated (SWOP) v2
- **Color Management Policies**
  - RGB: Preserve Embedded Profiles
  - CMYK: Preserve Embedded Profiles
  - Profile Mismatches: ✓Ask When Opening
    ✓Ask When Pasting
  - Missing Profiles: ✓Ask When Opening
- **Conversion Options**
  - Engine: Adobe (ACE)
  - Intent: Relative Colorimetric or Perceptual
    ✓Use Black Point Compensation
    ✓Use Dither (8-bit/channel image)

Printing Options
Personal Printer

Pros
- Instant feedback
- Really get to know how the prints will look
- Can use specialty papers and inks
- Can make custom profiles
- Can get the technology you want
- Can maintain the printer
- Good for making many prints

Cons
- Initial cost ($500 +)
- Costly to upgrade
- Depreciation
- Need to maintain the printer
- Compromises (limited print size, can't print to edge, etc.)

Printer Options
Local Print Shop

Pros
- One-hour turnaround
- High quality printers
- Printer maintained by the print shop
- No initial outlay
- Cost per print can be reasonable (Costco)
- Can talk to the personnel

Cons
- Limited papers and ink
- Cost per print can be higher
- Not fully in control

Printing Options
Internet Print Shop

Pros
- High quality printers
- Printer maintained by the print shop service
- No initial outlay
- Cost per print reasonable
- Personnel may be extremely knowledgeable

Cons
- Several day turnaround
- Harder to interact with the personnel
- Limited papers and ink
- Not fully in control

Workflow for Using a Personal Printer Preparing Master Edited File

- Duplicate, flatten and close the master image – work on temporary copy
- Make sure there are no sensor dust spots visible. If so, remove.
- Color space? Adobe RGB for personal printer; sRGB for some print services; ProPhoto?
- Decide on image size (adjust to fit pre-cut window mat by unchecking Constrain Proportions?)
- Resize – resolution (360 ppi for Epson; 300 ppi for other?);
- Sharpen (Smart Sharpen) after enlarging image view to 100% (double-click on Zoom tool)
- Inspect closely for unwanted spots that may become visible after sharpening, and remove
- (If sending to commercial printer use their guidelines for color space, resolution, file format (JPG, Tiff or PSD) & paper size. May need to add 'white canvas' to image to match paper size.)

Workflow for Using a Personal Printer Printer & Paper Setup (using PS CS5)

- Brush paper lightly with clean fine-haired paintbrush to remove loose particles, and then insert into desired printer slot
- Open printer program from within photo editing application (e.g., Cmd/Ctrl-P in Photoshop)
- On opening screen, choose:
  - **Document profile** (same as chosen color space – usually Adobe RGB 1998)
  - **Color Handling**: 'Photoshop Manages Colors' (make sure color management is turned off in print settings dialog)
  - **Printer Profile**: select profile for printer/paper combination from the dropdown list of profiles (discuss how to save downloaded printer profiles)
  - **Rendering Intent**: Relative colorimetric (or Perceptual?)
  - Check **Black Point** Compensation
  - **Printer**: same as the one that you are using
  - **Print Settings**: click to select paper size and position. When done, 'Scaled Print Size' should reflect image size. Make sure image and paper orientation coincide (i.e., Landscape versus Portrait)
  - Click on '**Print**'

Workflow for Using a Personal Printer After Print Emerges from Printer

- Lay flat. Best to wait at least 10-15 minutes for ink to dry before deciding if it looks right. Best to inspect under overcast daylight (near window) or under a small fluorescent lamp (e.g., OttLite)

- If print is Ok, **do not save** sharpened image file (copy) unless you later expect to make more prints of same size. If you do plan this, rename file to include image size – e.g., 'oceanbeachFS8x10.psd' (FS = flattened & sharpened)

- Place uncovered print face-up in a protected area (e.g., shelf, drawer) for about 24 hours. Then insert in drawer, box or clear envelope while waiting to decide what to do with it.

Printing at a Print Shop

- Tell them not to manage color!
- Can they print to the edge?
- Do you need to fill the target photo sheet?
- Can you download their printer profile?
- Do you need to convert to their printer profile?
- Submit file on-line (read everything)
- Local: Walk in with a thumb drive
- Costco

Why Doesn't my Print look like the Image on My Monitor?

- Can't get a perfect match: projective versus reflective
  - View prints in a controlled sunlight-temperature light (5000k) (OttLite)
- Follow color management procedures
  - Calibrate and characterize monitor
  - Make sure monitor isn't too bright (e.g., iMac)
  - Turn off printer color management
- Edit in a "good" environment
  - Use sunlight-temperature light (5000k)
  - Don't allow glare on screen
  - Work in a light-controlled room or use a monitor shade
- Use a white editing background

Key Points

- Turn on color management
- Tag each digital image with a color profile
- Calibrate and characterize your monitor
- Convert from image color space to printer color space
- Don't let printer manage color

BREAK

PART 2. DISPLAYING A PRINT
MATTING AND MOUNTING

Matting Options
General

- Use acid-free, archival paper, tape, glue, etc.
- Approach 1: image fills mat opening
  - Allow for mat overlap (1/4 inch per edge)
  - An 11x14 mat has a 10.5x13.5 opening!
- Approach 2: print floats in mat opening
- Approach 3: print floats with photo paper border
- Use jigs to mark opening and align print

Matting Options
Use Pre-Cut Mats (E.g., REDIMAT)

Pros

• Ready to go (no equipment or skills)

Cons

• Standard aspect ratios

• A bit more costly

• Need to plan ahead

Matting Options
Have Store Cut Mats (E.g., Michaels)

Pros

- Don't need equipment or skills
- Can get custom aspect ratios

Cons

- A bit more costly
- Need to plan ahead

Matting Options
Cut Your Own Mats (E.g., Logan 450)

Pros

- Can get custom aspect ratios
- Least expensive per mat
- Can make at any time

Cons

- Must buy equipment
- Need a work space
- Must learn how to measure and cut

Demo
Cutting a Mat

Demo
Matting a Print, Floating

Demo
Matting a Print, Filling

Mounting Options

- Use acid-free, archival paper, tape, glue, etc.
- Approach 1: edge to edge
- Approach 2: center
- Use jigs to align print

Demo
Mounting a Print, Centered

Demo
Calibrating & Characterizing a Monitor

Next PACC Print Competition
February 8, 2012!