Beautiful Inkjet Photos with Color Management

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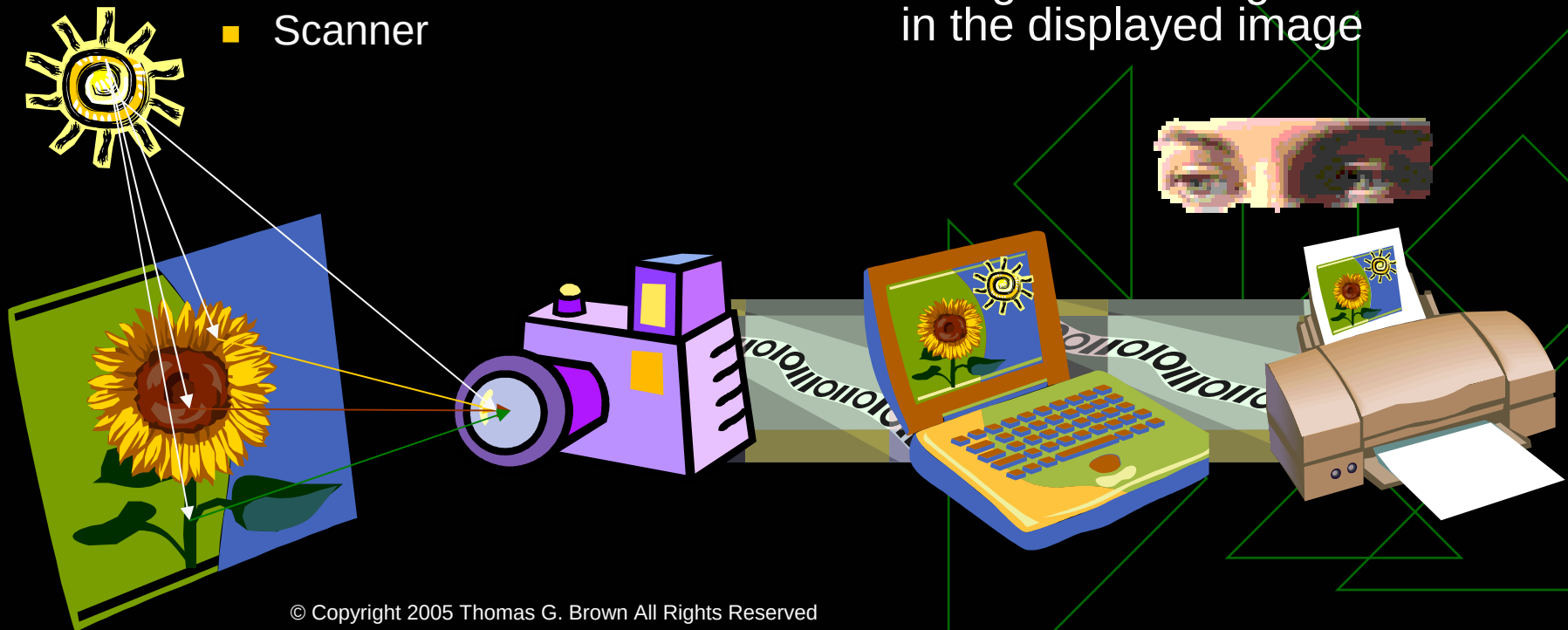
What to Expect

- A 50 minute world wind tour of:
  - Color theory for digital photography
  - How monitor settings impact the color we see
  - How paper, ink, printer settings impact printing
  - How color management can help you print better photosgraphs
  - Acquiring ICC Profile for you printer & monitor
  - An approach to configure Photoshop CS to use color management

What is Color?
What is Digital Color?

- Our interpretation of light
  - produced by a light source
  - or reflects off object
- Light captured by Digital Device
  - Camera
  - Scanner

- Data stored as an array of numbers
- Computer displays numbers on Monitor or Printer
- Such that humans can recognize the original scene in the displayed image

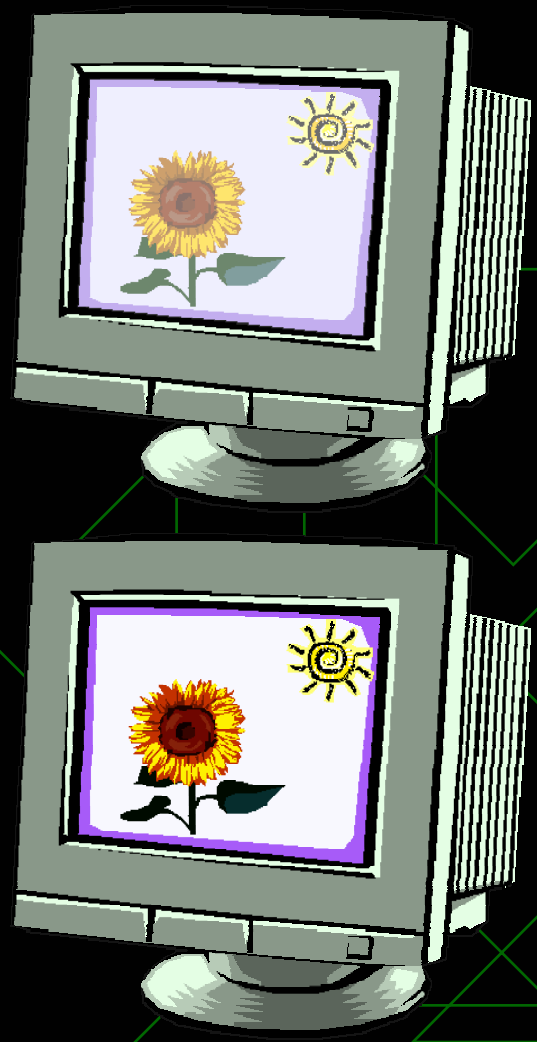


Bad News on Digital Color

1. Nothing is perfect
2. Everything changes

Monitor Variability

- Color Temperature
  - 6500K* (reddish)
  - vs.
  - 9300K (bluish)
- Brightness and Contrast change
  - White Point
  - Black Point
- CRTs Change Quickly
- LCDs Change Less Quickly



Printing Variability

- The paper
  - Whiteness
- Printer Driver Settings
  - Paper Type
- Match Ink and Paper
  - Pigment vs. Dye
  - Printing on Treated side
- Printer change fairly slowly

Why Color Devices Change

- Device setting
- Consumables
  - Different papers, Inks
  - Can change from on shipment to the next
- Maintenance
  - Head Cleaning, Head Alignment
- Ambient lighting
- Age of the device or printout

Color Device have different capabilities

- Gamut
  - Range of colors a device can produce
- White Point
  - Color and brightness of the whitest white produced
- Black Point
  - Darkness of blackest black that can be produced
- Linearity
  - Gamma – How brightness changes from Dark to Light
  - When you change the number that represent color does the amount of change appear the same across the range of possible colors

Is there any hope?

Is there any hope for getting predictable color from our digital devices?

Yes!

Color Management

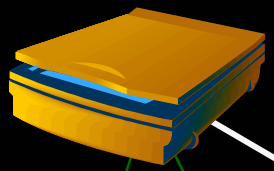
Color Management System

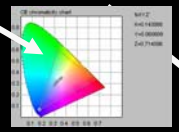
1. Converts color signals produced by a device e.g. Scanner, Digital Camera
2. Into “Universal” representation of color
3. Converts color back to signals needed by another device e.g. Monitor, Printer
4. Keep the conversion consistent from one device to the next

ICC Device Profile

- Given a known set of device conditions
  - Eg. Same printer, paper, ink, settings
- Can measure a device's capabilities
  - Gamut, White Point, Black Point, Linearity, Gamma…
- ICC Profile
  - Small data file that contains the results of our test
  - Used during color conversions

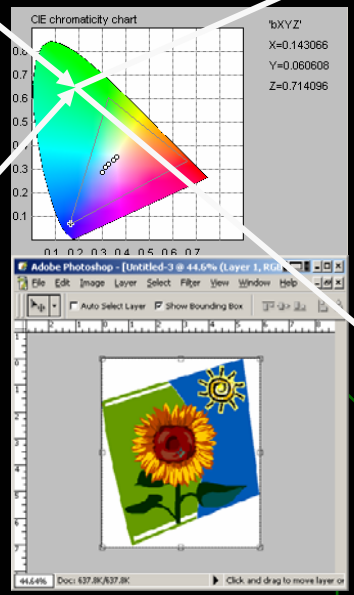
Color Management



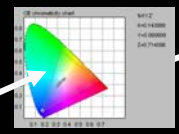


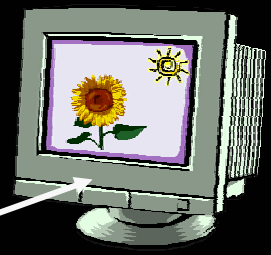
Scanner Profile

Color Working Space

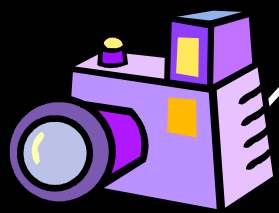


Monitor Profile

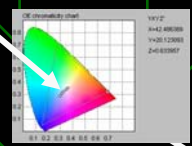


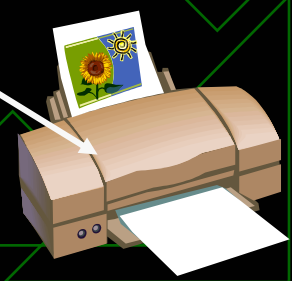


No Profile
(in most cases)



Printer Profile
(given paper and settings)

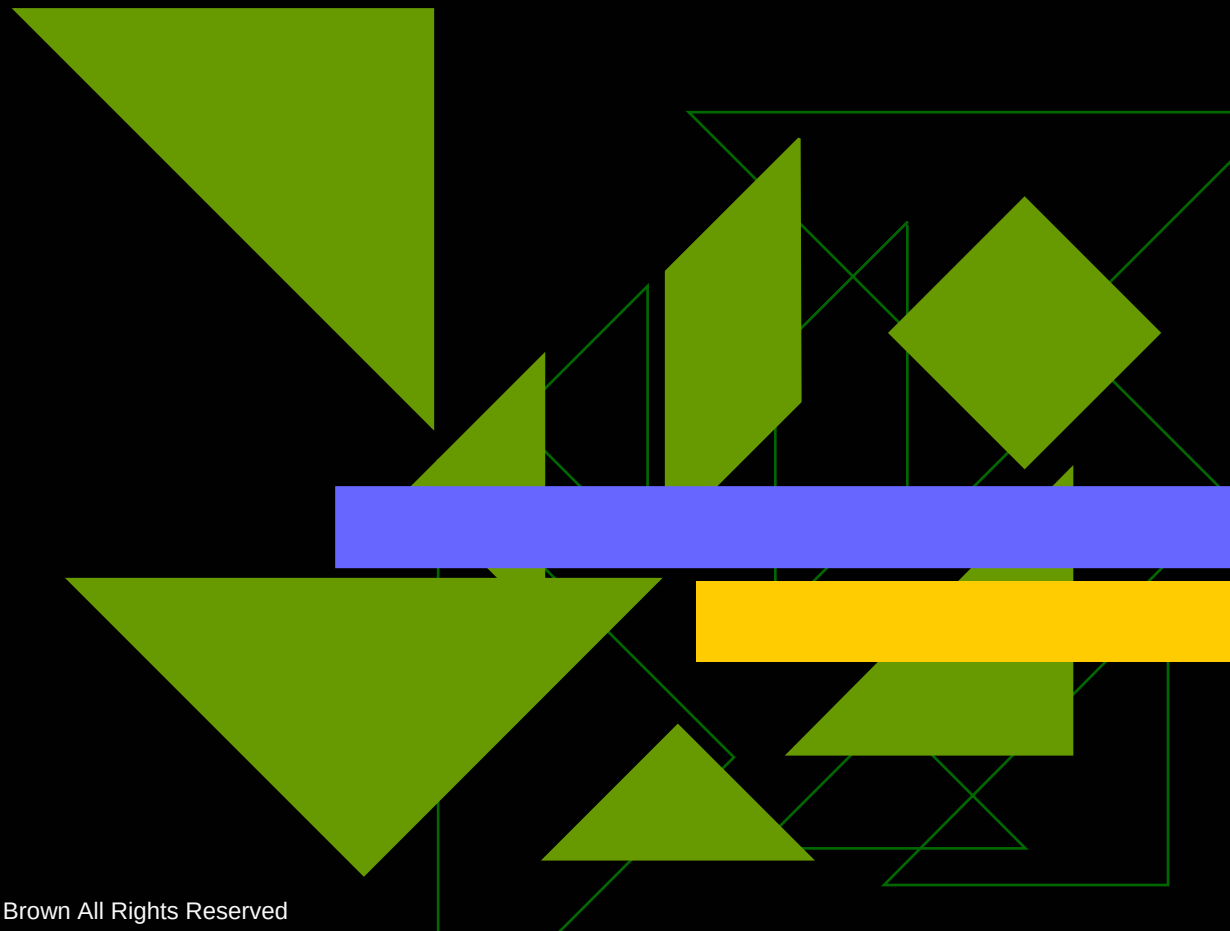




When colors will not match Conversion Options

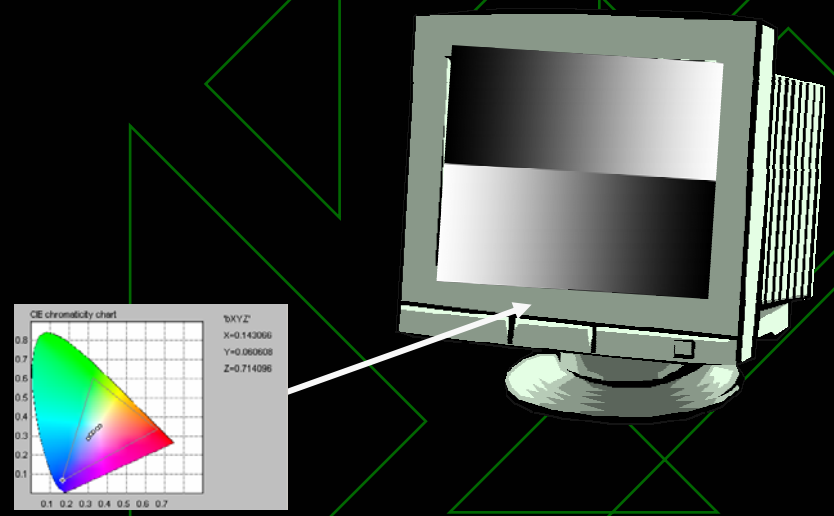
- Rendering Intent:
  - Perceptual
    - The full gamut of the image is compressed or expanded to preserve the visual relationship of all the colors on destination device. Deals with lots of out of Gamut Colors
  - Relative Colorimetric
    - Compresses just the out of gamut colors to fit into the gamut of the output device
  - Not Often used with digital photography
    - Saturation, Absolute Colorimetric
- Black Point Compensation
  - If the blackest black is blacker than output device can produce adjust the blacks so that they can all be printed
  - Often used with Relative Colorimetric

Tuning Up
Getting Profiles



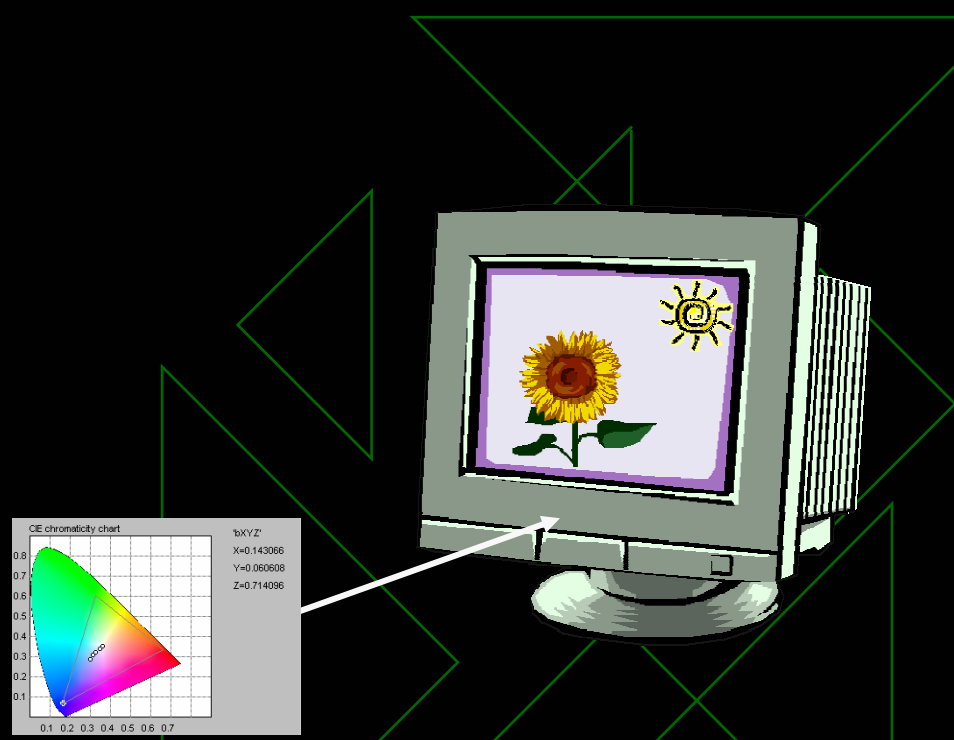
Monitor Profiles

- Process
  - Warm Up Monitor
  - Tunes Monitor
  - Produce ICC Profile
  - Test
- Tools
  - Spectrophotometer or Colorimeter
  - Monitor Profiling Software



Monitor Profile

- Products
  - Monaco OPTIX*
  - GretagMacbeth Eye-One Display 2
  - Color Vision Spider2

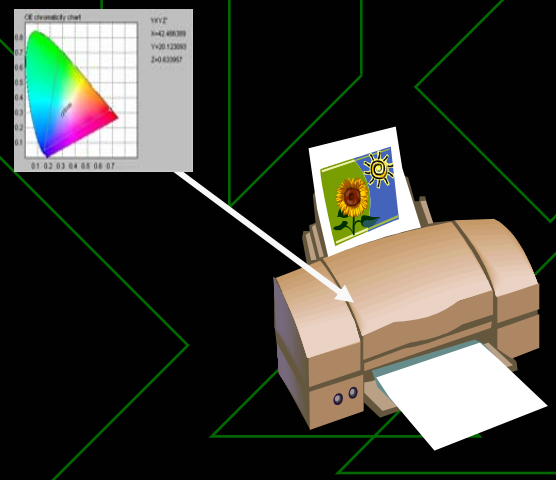


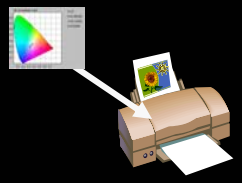
Printer Profiles

- Process
  - Maintain Printer
  - Start Documentation
  - Select settings for paper
  - Print Test Target (No Color Management!)
  - Read Target
  - Generate Profile
  - Backup Load the Profile
  - Test using profile
- Tools
  - Printer Profiling Software
  - Spectrophotometer

Printer Profile Products

- $pectrophotomiter
  - X-rite DTP-418*
  - Spectrolino / SpectroScan
  - Eye One
- Lesser Devices
  - Your Scanner
- $oftware:
  - Monaco Proof*
  - Profile Maker 5 Photostudio
- Consider Bundles





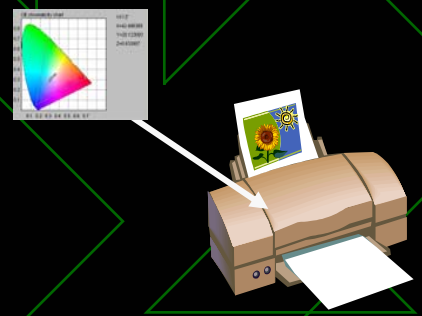
Cheaper Options Printer Profiles

- Service Bureau
  - Custom for You
  - Generally Accurate
  - Get some support
  - Charge Each Profile
  - If something changes you buy a new one
- Vendor Generic
  - Not Custom
  - Better than nothing
  - Generally no charge
  - Generally little support
  - Vendors usually updated on their website

Printer Profile From Service Bureau

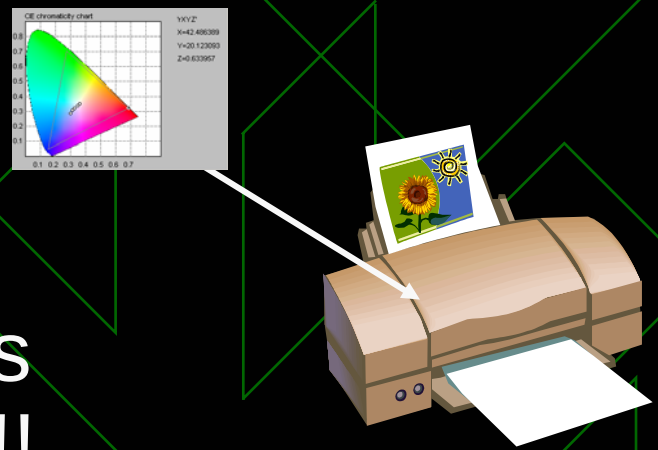
- Bureau will send you test targets, printing instructions
- Follow the instructions meticulously for printing, shipping targets
- Document your work
- Bureau will provide you with the ICC Profile, make backup
- Test the profile using Black & White Gradient, other images
- Always duplicate test conditions when printing

- Book Smart Studio, Eric Kunsman* eric@infraredman.com
- ColorValet www.chromix.com
- Digital Dog, Andrew Rodney http://www.digitaldog.net



Printer Profiles
Vendor Generic Profiles

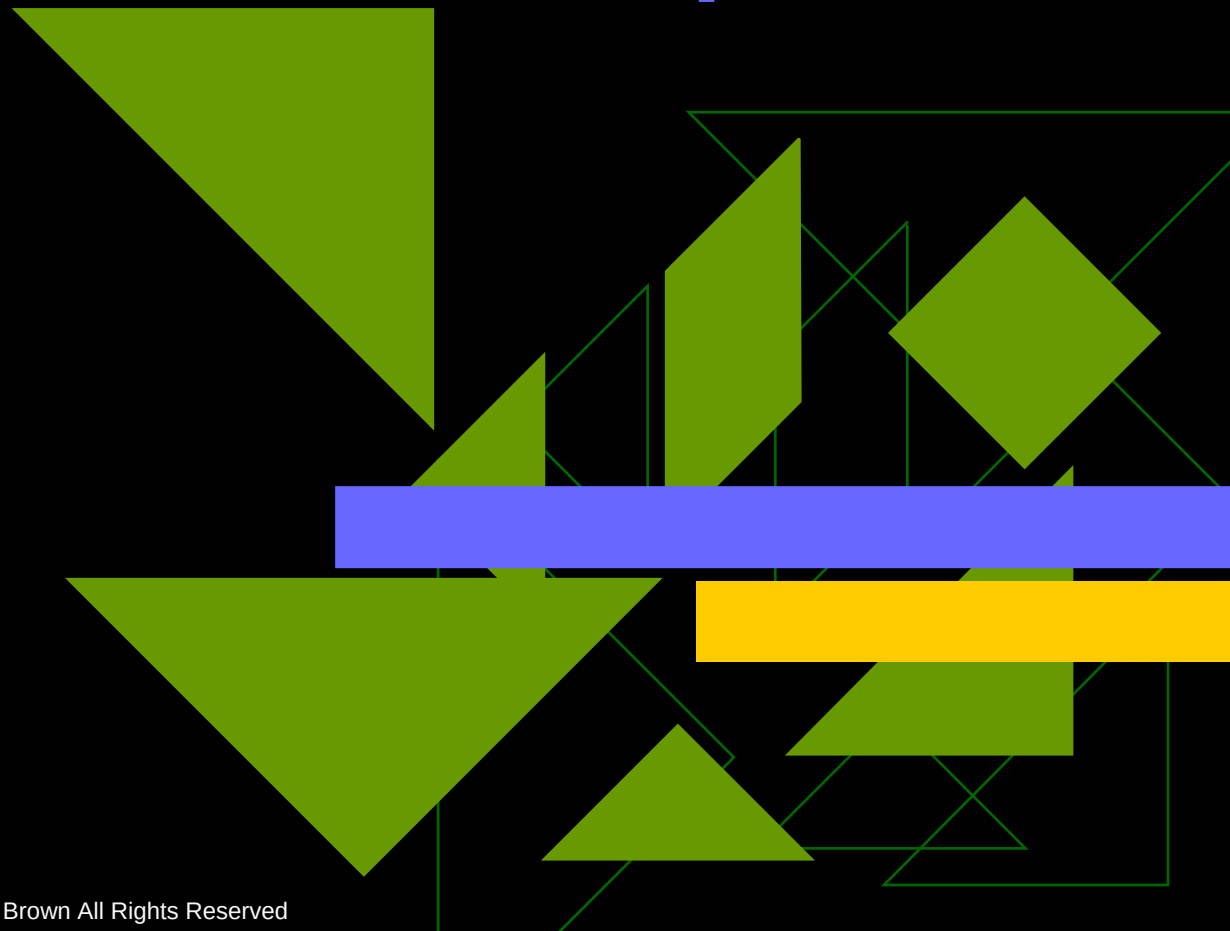
- Go to the Paper Vendors website:
  - Download your printers generic icc profiles
  - Identify Assumed Conditions
    - Paper
    - Printer Make and Model
    - Inks
    - Printer Driver settings
- Match Assumed conditions when you printing!!



Printer Profile Testing

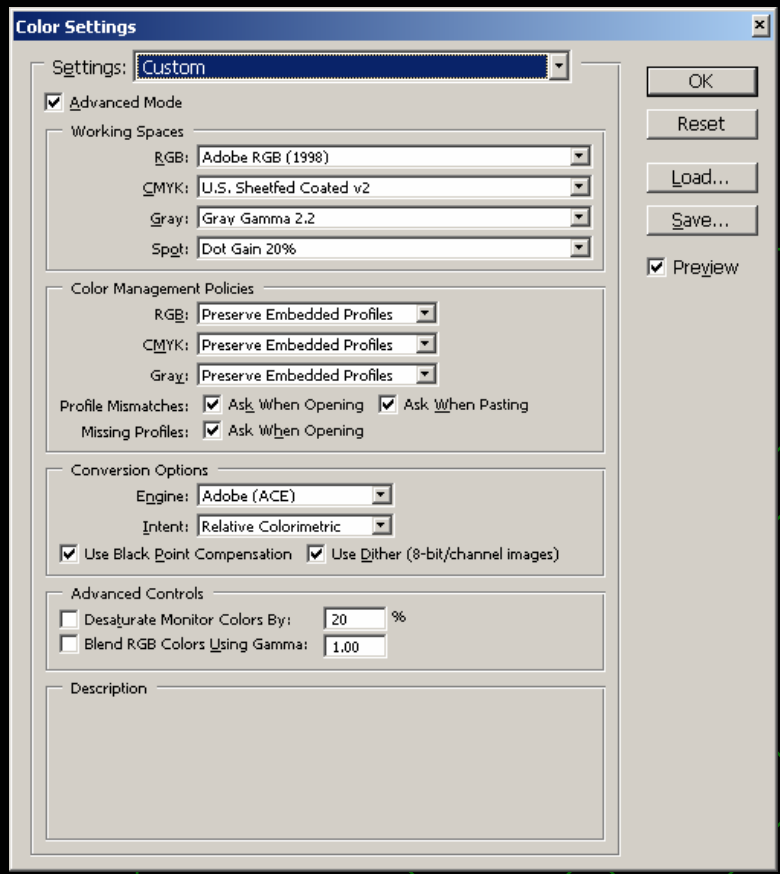
- Black to White Gradient to test
  - Profile
    - Look for color shifts
    - Look for Gaps
  - Identify White and Black Points
- How does it work on your favorite photos

Configuring Photoshop CS



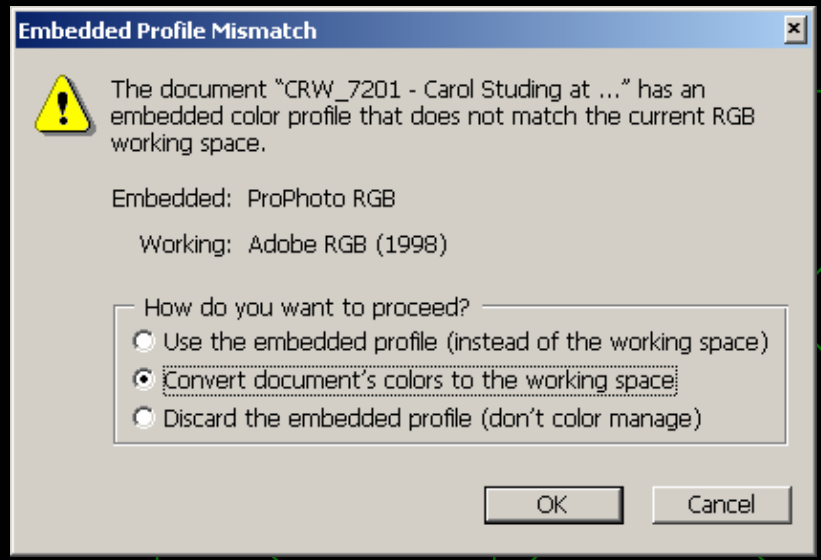
Configuring Photoshop Color Settings

- Check Advances Mode
- Working Space:
  - RGB
    - Adobe RGB (1998)*
- Color Management Policies
  - RGB
    - Preserve Embedded Profiles
  - Profile Mismatch
    - Ask when Opening
    - Ask when Pasting
- Conversion Options
  - Engine: Adobe (ACE)
  - Relative Colorimetric* or Perceptual
  - Use Black Point Compensation
  - Use Dither



Workflow: Opening a Photograph

- If your camera does not applies Adobe RGB (1998)
- The document has a profile that does not match the current working space
  - Convert document's color to the working space

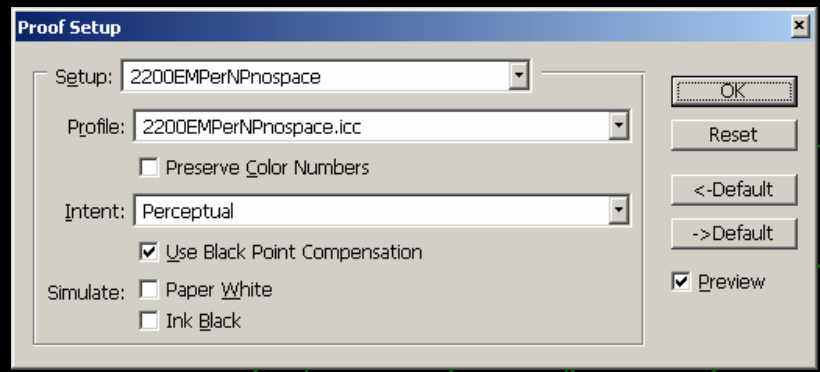


Workflow: Editing

- General:
  - Alignment
  - Cropping
  - Color Correction
  - Dodging and Burning
  - Compositing
  - Save you master Image
- Printer / Paper Specific:
  - Set White & Black Points
  - Size and Resolution
  - Sharpen

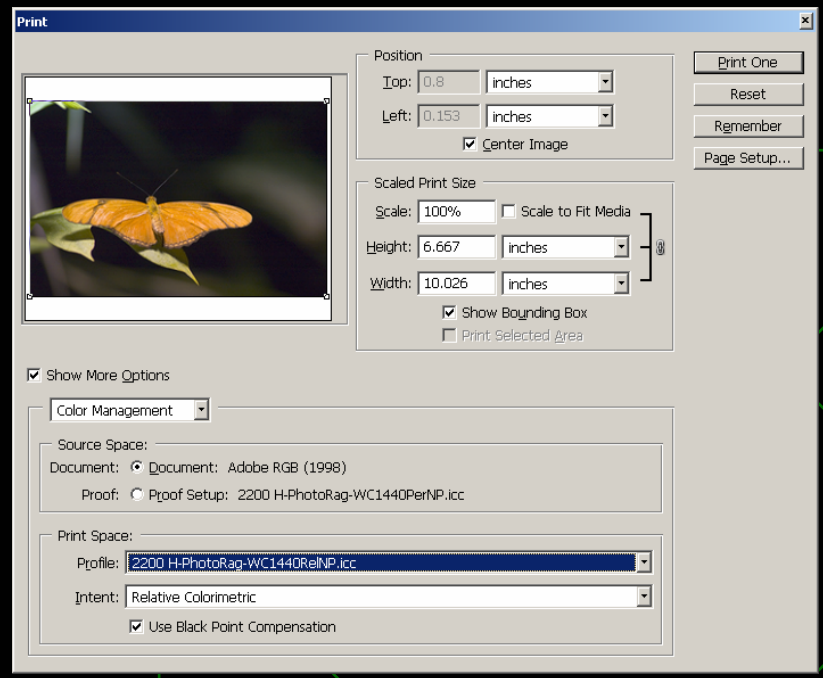
Workflow: Monitor Proof Setup

- View -> Proof Setup -> Custom
- Profile
  - Choose Printer Profile
- Preserve Color Number
  - Not Checked
- Rendering Intent
  - Perceptual or Relative Colorimetric
  - Use Black Point Compensation (Or Not)
- Now you know your settings



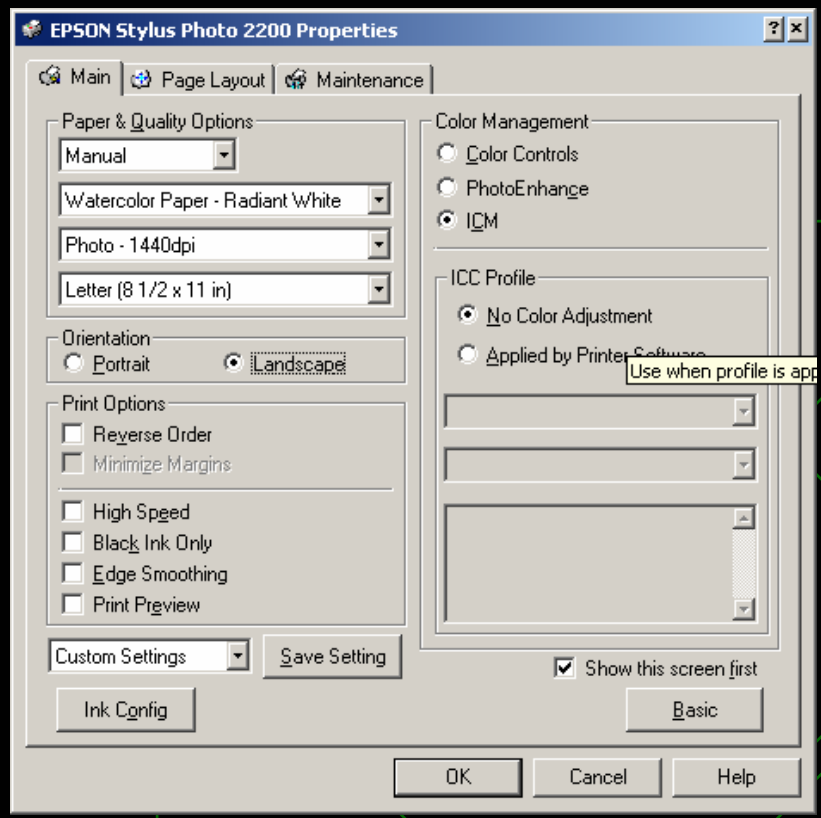
Workflow: Print with Preview

- File -> Print with Preview
- Source Space
  - Document: Adobe RGB (1998)
- Based on Screen Proofing set:
  - Print Space
    - Profile: The Profile for your printer paper combination
  - Intent
    - Perceptual or Relative Colorimetric
    - Use Black Point Compensation (or Not)



Workflow: Printer Driver Settings

- [Page Setup] -> [Printer] -> [Properties]
- Based on setting used to create your chosen ICC profile set
  - Paper Type
  - Resolution
- Use the NO ICC Profile set in Printer Driver
  - We are using Photoshop to manage this color



Workflow: Printing

- Insert your Paper
- Print
- Document your results
- Enjoy you work!

Summary

- Calibrate and Profile your Monitor
- Match Printer, Ink, Paper, Settings
- Get the best profile you can for your output devices
- Be meticulous about using the same procedures each time you print.
- Have fun adding beauty to the world!

Bibliography

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  ISBN 0321267222
- Johnson, Harald, “Mastering Digital Printing, Second Edition” Muska & Lipman Publishing, Cincinnati, OH, 2004.
  ISBN 1592004318

Color Webibliography

- Andrew Rodney The Digital Dog
  http://digitaldog.net
- List of Color Management Vendors
  http://www.photoshopfocus.com/cal_vend.htm
- Computer-Darkroom, Ian Lyons
  http://www.computer-darkroom.com/home.htm
- Wilhelm Imaging Research, Henry Wilhelm
  http://www.wilhelm-research.com

Color Management Resellers

- Chromix
  9594 1st Ave. NE #390
  Seattle Washington
  98115
  206-985-6837
  http://www.chromix.com

- Colormall.com
  1210 N. Jefferson Street
  Bldg L
  Anaheim, CA 92807
  (714) 224-0460
  http://www.colormall.com

Color Management Manufactures

- **Monaco Systems Inc.**
  100 Burrt Road,
  Suite 115
  Andover, MA01810
  978-749-9944
  978-749-9977 fax
  http://www.monacosys.com
  http://www.xritephoto.com

- **GretagMacbeth LLC**
  617 Little Britain Road
  New Windsor, NY
  12553-6148
  800 622 2384
  845-565-0390 fax
  http://www.gretagmacbeth.com/

Color Management Manufactures

- ColorVision
  Lawrenceville , NJ
  1-800-554-8688
  http://colorvision.com

Q & A