SPECIAL SECTION

The Color Evolution

COLOR MANAGEMENT HAS COME A LONG WAY IN THE LAST DECADE

by Dan Reid

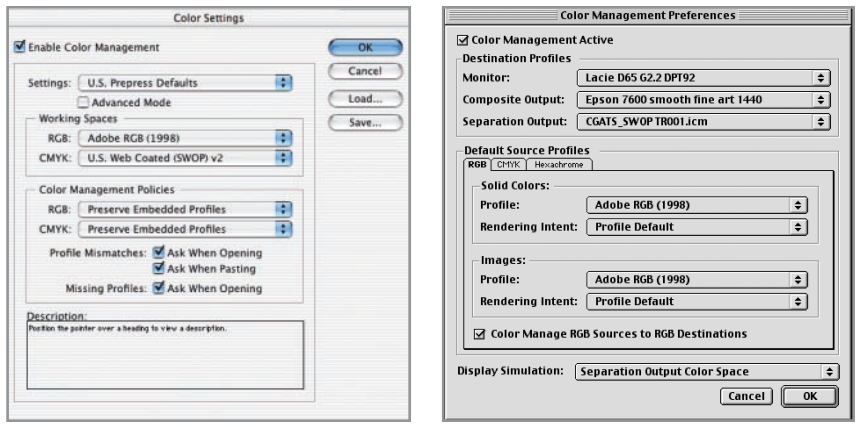
Color management has changed quite a bit. Not until the mid-1990s was there a common format for exchanging color characteristics between programs. The ICC/ICM file format is a standard way of exchanging color information in both Macintosh and Windows operating systems.

There are fundamentally different approaches between Mac and PC color architectures. Windows ICM 2 relies upon each device to have a profile loaded at the respective control panel, while the Macintosh platform uses a single control panel to designate ICC profiles to all devices. Although there has been great progress in each platform, neither has garnered the support and adoption originally hoped for. Software giants, like Adobe or Quark, use portions of each, but do not rely upon Colorsync or ICM for conversions. Alas, it's definitely an evolving technology.

Color Communication Improving

It's not as bad as it may sound however. Adobe Photoshop 7, InDesign 2 and Illustrator 10 all use a common format for color configuration, which is a great step forward since previous versions have had differing support color management and recognition of ICC profiles. Adobe provides a suite of applications that harmoniously communicate color information easily.

QuarkXPress' color management window (Edit>Preferences>color management) offers a different approach to the process. You can tell Quark to convert only RGB objects and images but not CMYK, and you must tell it which monitor's ICC profile to use; Adobe products recognize this automatically. Prior to version 5, Quark had some color management quirks that were not always apparent. If you decided to import a PICT or JPG file instead of TIFF, each file type would separate differently. It also relied on a CMYK output device as the final destination. Thankfully, the droves of designers with desktop Epson inkjets can print out of Quark 5 without a RIP because of the ability to print to RGB composite printers. InDesign 2 also supports RGB composite printers and uses a similar motif of assigning ICC profiles for each object individually.



Adobe's color setting are the same in Photoshop 7, inDesign 2 and Illustrator 10 while Quark 5 takes a different approach. Sadly, Adobe PageMaker v7 does not use the common color settings. If you are confused on how to get both Adobe and Quark applications to separate and preview the same you are not alone. This is one of the reasons why many struggle with using color management – each vendor has a different approach.

RIPin!

A RIP usually offers more options in optimizing color output. Early versions did not provide robust support for color calibration and conversion, but today many manufacturers offer support for most color management devices, such as X-rite or GretagMacbeth. Options such as channel ink restriction, linearization and total ink limit provide the tools needed to optimize the ink distribution. In addition, RIPs now offer conversion of both RGB and CMYK objects. More advanced RIPs offer designation of ICC profiles for image and vector objects independently for each color model, proofing using reference profiles and a selection of rendering intents for each object. Even with this list of accomplishments, some RIPs still don't' recognize embedded ICC profiles or provide options for CMM.

Scanners/Cameras

The software that comes with most scanners supports ICC profiles, but not all.

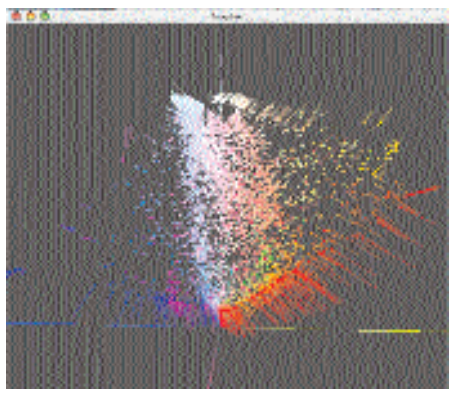
Scan back cameras, generally speaking, have good support for ICC profiles, while field cameras are often more difficult. Camera profiling used to be the most difficult and confusing task of color management. Today there are several options to choose from for targets and software programs to create camera profiles. The biggest challenge in both scanner and camera profiling is proper calibration of the device before profiling. Surprisingly this is the most perplexing task.

The goal here is to create an ICC profile that can be used in a variety of lighting and exposure variations. Integrated Color Corp.'s ColorEyes camera profiling software provides an incredibly detailed approach to creating useful camera profiles.

Displaying Color

In the monitor arena, Sony released a self-calibrating "smart monitor" that includes its own colorimeter. What is really exciting about this monitor is its ability to not only adjust RGB gains to a target white point, but it also does a bias calibration for the shadows. No other monitor package I know of provides this option. The initial calibration cycle takes about 10 minutes because the sequence measures ambient light reflected on the screen. The software will give an error message if too much ambient light is hitting the screen.

Equally exciting is ICS BasICColor Display 2, which supports DDC/2 communication with compliant displays. Basically any display manufactured in the last three years has this ability. The DDC/2 allows the BasICColor to control a regular computer monitor; using this option, you can have BasICColor automatically set contrast, brightness and RGB gains in addition to video card look-up-tables for gamma correction. Essentially you are turning a "dumb" monitor into a "smart" one and preserving your investment at the same time.



This screen capture from ColorThink 2 illustrates how actual image data is converted to the destination color space. Notice the small color dots the comet trails. The comet trails show how the color is moved to a printable color. Selecting a different rendering intent will change how color is translated from source to destination.

Education on the Rise!

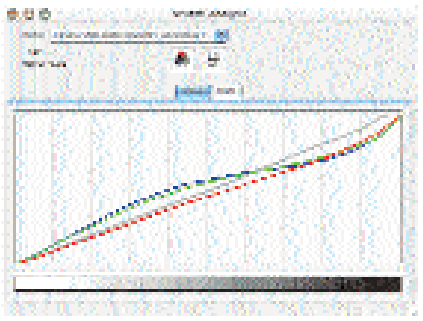
The New Year brought one book to market focused on color management: Real World Color Management by Bruce Frasier, co-authored with Chris Murphy and Fred Bunting. The Real World series from Peach Pit press promises to provide a wealth of infor-

mation and answers. GATF offers the GATF Practical Guide to Color Management by Rich Adams II - a look at the science behind color management and a synopsis of current profiling packages.

Software applications like ColorThink from Chromix and ICCtools' IccToolBox can graph an ICC profile to compare gamuts. ColorThink has the ability to plot an image's color data in 3D L*A*B*, and visually show how the color is transformed into the printer color space. You can see how and which colors are skewed based on the rendering intent selected.

Not to be out done, ICCtoolBox allows calibration curves to be plotted on 2D graph using just the color information. This helps in determining if you have problems of over-inking the paper, causing a hue shift in the dark colors and/or the color samples.

GretagMacbeth's ProfileMaker Professional 4 offers an option to adjust the calculations for a specific light source. This screen shot shows a GTI light booth. There is a measurable difference between D50 and a GTI light booth. The GTI selection is ideal if you are comparing a print under that light source, typically in comparison to computer display.



This capture from ICCTools.com's ICCtoolBox for Mac OS X shows the gray balance of an Epson 2200 RGB ICC profile. The gray line indicates tonal balance. This profile has fairly linear tonal response except for the deep shadows which max out before 100 percent. The swooping color curves indicate the curves created by the profiling package to achieve gray balance. Ideally you would not have curves that cross each other like the red channel in this profile.

Looking Ahead

Certainly the ICC specification is not perfect. Continued research and development in color science has prompted several revisions. The current version resolves some outstanding issues and clarifies ISO compliant formatting.

One of the more challenging aspects of predicting color response is how the observer perceives color under a light source. Some have found that certain ink and paper combinations change under different light types. The viewer notices a distinct color shift as the print is shifted into different light sources, such as tungsten or fluorescent. GretagMacbeth ProfileMaker 4 and BasICColor Print both provide an option to capture spectral data and repurpose it for a target illuminant, which is great because prints are rarely viewed under D50 lighting. More importantly, most graphic arts light booths can't and don't simulate a D50 spectral energy but rather 5000K white point.

So we have come a long way since the 1990s. We now enjoy wide spread support and adoption of ICC profiles in virtually all of the major print applications. Not all the applications have the same set of features or support for ICC profiles, though, which still causes confusion. There is still much work to be done but we are definitely taking steps in the right direction.

Book Review

Real World Color Management
By Bruce Fraser, Chris Murphy and Fred Bunting

The goal of maintaining color fidelity throughout a project can be an elusive one. What is on the screen might look like the proof, but what about the final product? From swatch to screen, from proof to final output, the way to make sure the results match the expectations – and those of the clients – is through color management. This book includes tips and tricks to help build and fine-tune ICC profiles, develop a color-managed workflow, understand the craft of converting from one color space to another, manage color using popular graphics applications and more.

Excerpt

One of the keys to successful color management – one that the manuals largely ignore – is paying close attention to the myriad factors that influence both the behavior of the various hunks of machinery we use to reproduce color, and the way we perceive that color. Our scanners, digital cameras, monitors, printers and presses are all physical devices and hence there're subject to physical influences – heat, humidity and friction to name but a few – that change the color they produce, and our perception of that color is strongly influenced by the environment in which we view it.

So sweating the details – keeping track of the way your various devices behave, correcting that behavior when necessary and controlling the environment in which we judge that behavior – is an essential but largely undocumented part of the color-management process. Color management succeeds or fails according to the accuracy with which we can describe the way our color-reproduction devices behave, but if that behavior isn't stable and repeatable, attempting to describe it is like measuring a moving target with a rubber ruler – you probably won't get the same answer twice in a row.