What is color management?

Part 5: Rendering Intents and ICC profiles

Before we actually can start using ICC profiles, we need to understand some of the options available for using these profiles on our images.

Four rendering intents re-map out-of-gamut colors by means of clipping or compression.

This month I'll use the most color geek terminology thus far to explain something called Rendering Intents.
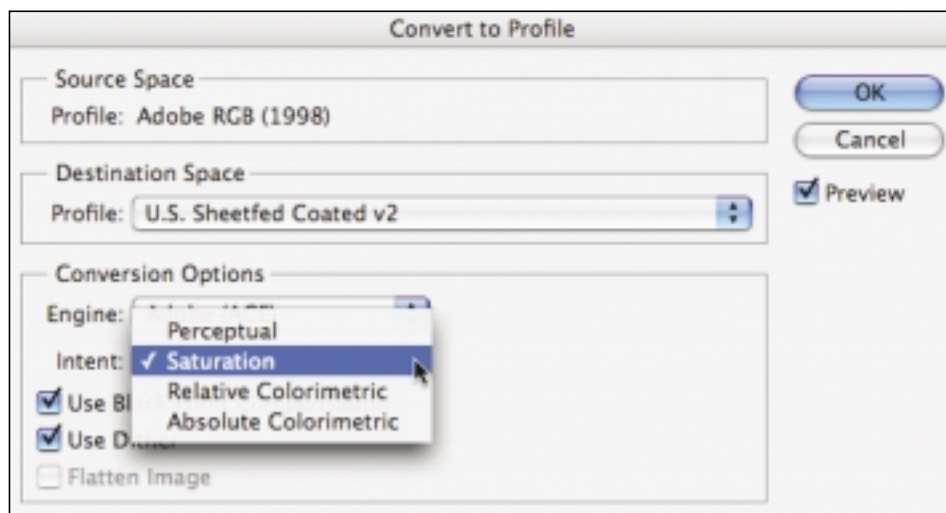
Each device in our workflow has a range of colors and tones that it can and cannot reproduce. Colors that are available in one color space but cannot be converted into the intended subsequent color space are called **out-of-gamut colors**. Somehow we need to re-map the colors of the original into colors that can exist in a converted file that can be reproduced on the next device. Fortunately, ICC profiles have something called **Rendering Intents**. You need to be familiar with the names of the various intents and how they work in every application that deals with ICC profiles.

Ideally, we want the source file to have a gamut at least as large as the gamut of the output device. If the gamut of the source file is smaller, the printer might be able to create colors that we never had to begin with. Rendering Intents are found in **tags** built directly into ICC profiles for use in color conversions. (There are four Rendering Intents, but only three tags are necessary, as you'll see.)

The ICC specifies four methods of mapping out-of-gamut colors from the **source color space** (of the original document) into the gamut of the **destination color space** (of the next device). Each is designed for different types of situations, depending on the source, the out-of-gamut colors and the nature of the imagery. At least that's the idea.

The four rendering intents re-map these out-of-gamut colors through two basic techniques. One technique is to re-map the colors to the closest colors within the destination color gamut. That is, to compress the out-of-gamut colors, and only these colors, into the new gamut, so they resemble as closely as possibly the most saturated colors of the original. This process is called **gamut clipping**. It's used in the **Relative Colorimetric** and **Absolute Colorimetric** rendering intents.

The second technique is **gamut compression**, which affects *all* the colors in the source image. The net result is that all the colors undergo some numeric alteration upon conversion and gamut re-mapping. The **Perceptual** and **Saturation** rendering intents use this gamut compression technique.

While there are just two basic re-mapping approaches—clipping and compression—used in these four rendering intents, each intent includes further refinements and differences.

The **Perceptual** intent (gamut compression) affects all the colors in the source space. This intent attempts to maintain the *perceptual relationship* of the colors in the source image, but within the color gamut of the destination space. The source colors are not altered equally in this conversion. The conversion is weighted to deal more with each hue than its saturation/lightness, because our eyes notice differences in hue far more acutely than they notice differences in saturation or lightness. Early on in color management, the Perceptual intent was sometimes referred to as "Photographic" in applications that didn't label the intent as it should be. Some users (and even some geeks) recommended always using the Perceptual intent with photographic images. But this isn't always the best one, so don't make this blanket assumption. The Perceptual intent often *is* a good option if there are a lot of out-of-gamut colors in the original image.

At one time, the **Saturation** intent (gamut

compression) was recommended for solid graphics such as logos. Its gamut conversion is weighted to produce the most vivid saturated colors (hence the name), which can produce less than desirable results with images. In most cases, this intent really is best used for files that don't contain images and for business graphics and similar types of files. Still, depending on the profile and how it was built, the Saturation intent might be fine for some images, so don't dismiss it outright.

The conversion of the **Relative** **Colorimetric** intent (gamut clipping) takes into account the *white* of both the source and destination. The ICC profile "knows" all about the device it is fingerprinting, including the paper white of the printer, which is quite useful in color space conversion. Unlike the Perceptual intent, the colors that fall within the destination gamut are not affected during the conversion. I find that the Relative Colorimetric intent can work quite well with images, and I usually prefer using it over Perceptual. But picking an intent is image- and profile-dependent, and in any case the right intent is the one you, the user, prefers.

The **Absolute Colorimetric** intent (gamut clipping) handles out-of-gamut mapping just like Relative Colorimetric, with one big difference—how it deals with white. This for-proofing conversion maintains the paper white of the source onto the paper white of the destination. Hence the name "Absolute." If you want your Epson printer to simulate a MatchPrint, for example, the two would have different paper whites—the Matchprint would likely appear much more yellow. In the source file, every area that should not have tone would be left untouched paper white. Absolute Colorimetric conversion would ensure that the right amount of ink would be laid down to make the white paper of the Epson print (destination) appear as yellow as the paper white of the Matchprint (source). That's why this intent is used for proofing only. Nevertheless, it is a powerful and useful method for making the output of one device mimic another. The white of any paper greatly affects our perception of all the other colors in a file.

We do have options for how gamut mapping is conducted with ICC profiles, but there are still issues to keep in mind. First, the gamut of any device is fixed, and often we just have to live with this limitation.

Next month, we'll conduct some actual conversions using profiles in Photoshop and see how these intents, along with other options, can make a profound effect on the final output of your images. ❏