

Fate and the False Profile

Topic: The introduction of an important new technique made possible by advances in Photoshop 6: the generation and intentional assignment of a false profile to an RGB file with the idea of fooling Photoshop during subsequent colorspace conversions.

Column first appeared: August 2001, *Electronic Publishing* magazine.

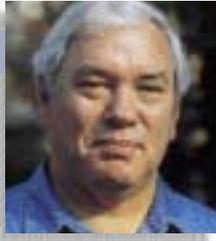
Source of this file: The author's draft as submitted to the magazine.

Author's comment: This technique immediately established itself as the method of choice for dealing with underexposed originals. (Four years later, Photoshop CS2's introduction of the Exposure command was the first credible alternative.) Also, it found its uses in RGB images that were too brilliant for CMYK: a false profile could often bring these colors back into gamut. Nowadays the false profile is an important part of the picture-postcard workflow, deliberately generating a lighter original for subsequent maneuvers. Also, some operations with extremely limited time and high volumes of work simply do *everything* by means of false profiles: they have hundreds of them, and their correction consists of assigning the closest one to each image, then converting to CMYK.

This archive, to be released over several years, collects the columns that Dan Margulis wrote under the *Makeready* title between 1993 and 2006. In some cases the columns appear as written; in others the archive contains revised versions that appeared in later books.

Makeready in principle could cover anything related to graphic arts production, but it is best known for its contributions to Photoshop technique, particularly in the field of color correction. In its final years, the column was appearing in six different magazines worldwide (two in the United States).

Dan Margulis teaches small-group master classes in color correction. Information is available at <http://www.ledet.com/margulis>, which also has a selection of other articles and chapters from Dan's books, and more than two hundred edited threads from Dan's Applied Color Theory e-mail list.



Fate and the False Profile

One of the best ways to improve a bad RGB image is also one of the most paradoxical. It's a change, but it's not a change, it's color management, but it isn't color management, and it's a misuse of technology, but it works.

Some scientists were recently conducting clinical trials on a pill they hoped would counteract high blood pressure. Medicines that can do that make a gang of money for drug companies.

As it turned out, the drug, minoxidil, was fairly good at it, but several patients refused to continue taking it because of an unfortunate side effect. Some men had to shave twice as often. Others reported more hair on their hands, not to mention full-blown Werewolf Syndrome.

After hastily reformulating the drug as a skin lotion instead of a pill, and a few more tests, the scientists had a bonanza dwarfing the one they'd been hoping for. Far more men are concerned about their receding hairlines than controlling their hypertension.

A similar thing has happened with Photoshop—a feature was introduced that failed at what it was supposed to do, but is very useful for something far different.

Pictures A–E illustrate. They're all the same image, left untouched from a digital camera, but they sure don't look alike.

Although these are CMYK images—we couldn't print them otherwise—they originated in RGB. And, for the last three years, Photoshop has permitted different definitions of what RGB means. So, if these opened while still in RGB files, a given user might see, roughly, any of these five variants, although the difference between A and D would be much greater on the screen than here on the printed page.

In previous Photoshops, few people's RGB was exactly the same, but the variation was less than the difference between B and E. Almost everyone found that acceptable, but Adobe did not. Hence, the change, where RGB could mean almost anything. Depending on what your own definition is, you can now get any of these five results when you convert into CMYK.

This sounds flaky, but there was supposed to be a method to it. We were supposed to embed a profile, or



The same RGB image converted into CMYK without any alteration, but with different assumptions as to what "RGB" means: A) Adobe RGB; B) Apple RGB; C) sRGB; D) Wide Gamut RGB; E) ColorMatch RGB.

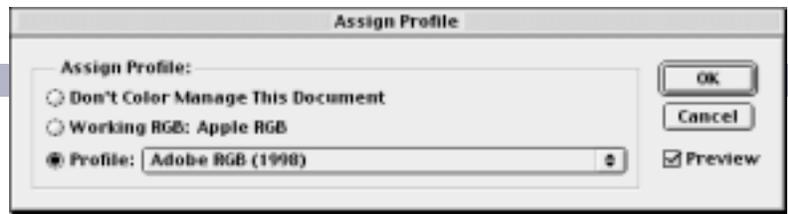
tag, into each file that would identify what sort of RGB was intended.

The cure proved worse than the disease. Setting up profile management properly was too difficult for most users. Consequently, it became dangerous to pass RGB files on to strangers, because one couldn't tell what their setups would be or whether the embedded tags would be honored.

Five profiles in search of a rationale

Photoshop 5 took a laissez-faire approach, inviting us to choose from many different RGB definitions. While one can still with a bit of effort use any of those, Photoshop 6 strongly steers us toward four favorites.

Those four, with a fifth that's a ringer, are shown above. Version B might be considered the default. It's



Photoshop 6, unlike past versions, allows two pictures to be open simultaneously with different RGB definitions. Above, the Assign Profile dialog. Below right, the asterisk in the image's title bar indicates it's using an RGB definition that differs from the one specified in Color Settings.

Apple RGB, which is similar to the traditional Photoshop RGB definition. The others, and how they differ, are:

- **Adobe RGB** defines all colors as significantly more intense than Apple RGB does. Also, values in the midrange of Adobe RGB are darker than the same values in Apple RGB. Version A is therefore not just more colorful, but fuller than version B is.
- **sRGB** is as dark as Adobe RGB, but much less colorful. In fact, it's slightly blander than Apple RGB.
- **Wide Gamut RGB** is a hungry shark waiting to pick off anyone foolish enough to dive into it as a default RGB definition. Its colors are drastically more intense even than Adobe RGB. Many are too brilliant to display correctly on a monitor, let alone print. In this image the stop sign, the blue paint on the barrel, the orange on the danger sign, and the greenery at right are all far out of the CMYK gamut. Version D is therefore attempting to match colors that it has no more chance of producing than Charles Barkley has of becoming the Rogaine poster child. The result here isn't terrible, but it often will be. Nevertheless, shark's liver oil has been discovered to have therapeutic value in certain cases, and Wide Gamut RGB has an interesting application also, which we'll get to in a few pages.
- **ColorMatch RGB** is as dark as Apple RGB, but slightly more colorful. This difference isn't important in this column, which is about using profiles to make big changes. So, we will ignore it henceforth. Here, any comment about Apple RGB applies also to ColorMatch RGB.

No harm, no foul

The question of which one of these one should generally use has gotten more attention than it deserves. Some are better for certain output conditions, but the bottom line is, if you're

knowledgeable about color you can develop effective workflows around any of them.

Sometimes, however, the decision makes itself. The digital camera that shot this Mississippi River image uses technology developed before these choices were possible. Its engineers were trying to get good results if people just opened its results in Photoshop. In other words, they were assuming a world of Apple RGB users.

And so, if this is your camera, you can save yourself a lot of grief by choosing Apple RGB as the default Photoshop's Edit: Color Settings. Open its images using one of the others, and

most of them will seem too dark or too lurid, if not both.

There's just one problem. *This* image doesn't. In my opinion, versions A or D are clearly the best two on the page.

Assuming we normally work in Apple RGB, there is a strong case for handling this picture differently. I'd advocate treating it as an Adobe RGB image, which is to say, I would prefer to start with version A than version B.

Doing this really requires Photoshop 6, which, unlike past versions, allows images with different RGB definitions to be open at the same time. The command is Image>Mode>Assign Profile, which gives us scores of options, of which the four majors are at the top. Pick Adobe RGB, and, presto! The file doesn't change—except it does change! All the numbers stay the same, nothing gets thrown away, yet the file is now darker and more colorful on screen. And it'll stay that way when converted to CMYK. There's even a convenient asterisk in the image's title bar to remind us that something's up.

Because the image data itself is never altered, there's no downside to doing this. Whether you intend to correct the image further, as I would, or whether you think it's good enough already, it has to be better to start out by assigning this false profile. This decision will not affect the next image you open. It's all plus, no minus.

Therefore, if you open an Apple RGB image and conclude that it's both too light and not colorful enough, change it to Adobe RGB. If you think it's too light, but that the colors are OK, try sRGB. After applying the false profile, try a Command-Z to make sure it does look better. If it does, what do you have to lose?

This doesn't sound like a topic worth devoting a column to, because the opportunity to do what's been described so far

More vivid colors sound like a good idea, but not when the image already features big areas of brightness. These uncorrected images were opened in Adobe RGB (top row) and Apple RGB (bottom). Below, magnification shows how the brighter Adobe RGB definition can lose detail in the dark parts of colorful areas.

isn't common. Besides, an expert could make version B look like version A in other, albeit more time-consuming, ways.

Experts also dislike excessively colorful RGB definitions, particularly if the file is eventually headed for CMYK. Adobe RGB features many colors too brilliant to reproduce with CMYK inks. That's happening, for example, in the stop sign in version A. The red being called for is more intense than can be printed. So, Photoshop is taking a guess about what kind of bright red is needed.

A stop sign, being essentially a flat color, is ideal for such guesswork. More detailed objects may become colorful blobs.

The images on this page, like the previous one, are raw captures from a digital camera. This time, however, brighter colors aren't better. The bricks behind the photographer are too red, but more to the point, the sweater has lost shape in version H. Its darkest areas were still out of the CMYK gamut, so they converted to something unnaturally pink. In the more subdued version J, they were valid colors, which is why the darker areas seem to have held more detail.

For the same reason, in version G the shadow to the left of the woman's feet is almost gone. All these oranges are out of CMYK gamut in Adobe RGB, but not in Apple RGB.

If one wanted both the colors of versions G and H but better detailing in the bright areas, it would be a lot easier to

achieve this starting with versions J and K. This is the case against using Adobe RGB as one's default definition for pre-press. It's fashionable in the color management

community to favor it, but I think that's only right if you're not comfortable with adjusting images. For competent retouchers who need to wind up in CMYK, even sRGB is a better choice than Adobe RGB, in my view.

It's easy to imagine other pictures, though, where its brighter colors might be a plus. And notice that this set of comparisons is missing a significant minus. The color variation is the same as version A vs. version B, but this time the more colorful version isn't darker. What gives?

Eye of newt, and toe of frog

In calibrationist heaven, the original is perfect, thus one wants the perfect profile to represent it. In the real world, especially now that we have a lot of losers snapping away with cheap



digital cameras, the originals often leave a lot to be desired.

An injection of the wrong profile sounds like a desperation measure, but it's so easy, and so effective, that it's tempting to look for other illnesses that it may cure. For real basket cases, it can be a lifesaver, but Photoshop, sadly, doesn't supply anything horrible enough for the task. Fortunately, we can make our own horrible profile.

Manufacturing custom profiles is thought to be fiendishly difficult. It's no such thing; the medicine is clearly labeled. And, to be prepared for all contingencies, I'd suggest mixing up a few potions that will cure the most grievous image ills.

An RGB profile has a color component, defined by its *primaries*, and a darkness component, defined by its *gamma*. These buzzwords sound a lot more terrifying than they are.



L

Unlike Peter Pan, Rebecca is growing up. She is now ten. By popular demand (i.e., mine) here is a more recent picture.

The orientation of this image is correct. Rebecca is horizontal because she is lying across my favorite easy chair, to prevent me from sitting there instead of doing something more useful, namely, giving niece a piggyback ride.

Second, children and other wild animals are not like professional models. If you have a shot with a perfect expression, you get no second chance. If it isn't technically what it should be you still

Forget trying to invent false primary numbers; you'd need to be comfortable with the xyY colorspace. Instead, borrow what Photoshop has supplied: the Apple RGB numbers for a duller look, Adobe RGB values for something more colorful, and Wide Gamut RGB ones for something psychedelic.

And forget the technicalities of gamma; all you need know is that a higher number makes a for darker RGB. Apple and ColorMatch have gammas of 1.8; those of the three darker RGBs are all 2.2.

The box on Page •• explains how to make your very own false profiles. How many you are likely to need depends largely on how many poor originals you have to cope with. Remember, this is a medicine for sick pictures. If you're a professional photographer, getting Version B when you'd prefer A should be rare. If you're a service provider, you may regularly get worse originals—much worse.

Eat your heart out, Richard Avedon

Long-time followers of this column will be acquainted with my lovely niece Rebecca. A certain picture of her, taken when she was two, had several instructive features, chiefly critical detail over its entire luminosity range. I've used it several times in books, articles, and lectures.

have to run with it. Unfortunately, in the age of cheap digital cameras, "isn't technically what it should be" can mean something very discouraging indeed, such as the Princess of Darkness in version M.

Image L could use a little local retouching, but I restricted myself to global corrections for the purpose of discussion. It seems to me that it is eminently suitable for any kind of professional reproduction. How can that wretched mess at the bottom of the page have possibly produced it?

Starting in RGB, I found that the white parts of Rebecca's collar were too blue. I reduced that cast with curves to the red channel, but found I couldn't eliminate it without making the face too red.

I therefore converted to LAB, something that was necessary anyway. Super-dark images are always noisy once their tonal range is opened. Blurring the A and B channels eliminates the color component of this noise. I also lightened the image slightly in the L channel.

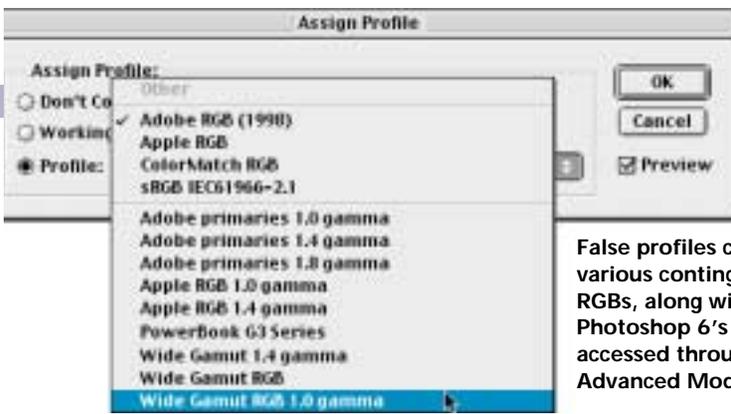
Then, back to RGB for a luminosity blend to add snap to the face, using the green channel, which is almost always the best in a face shot.

Finally, I moved into CMYK. Because of all the lightening that had been going on, the shadow was less than 40% black.

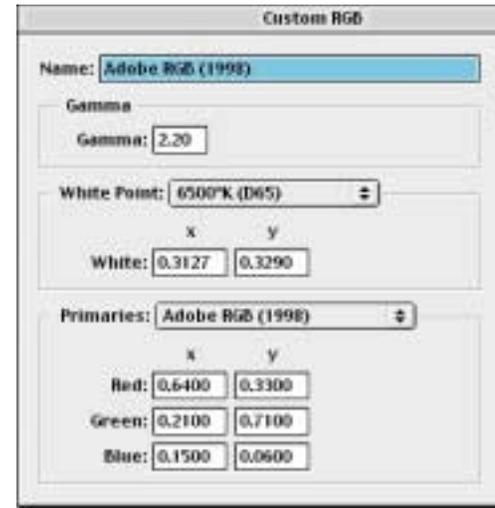


It's hard to believe that the image at the top of the page was generated from the dark mess at left. In this correction, the key move was the first one. Instead of opening it in Apple RGB, it was opened with a false profile, right, one using Wide Gamut RGB primaries and a 1.0 gamma.





False profiles can be prepared in advance for various contingencies. Left, the four basic RGBs, along with several fakers. Right: Photoshop 6's Custom RGB dialog, which is accessed through Edit: Color Settings (the Advanced Mode must be enabled to do this.)



This was just fine, as increasing the contrast of the black channel adds bite. I was even able to sharpen the black—sharpening anything else in this picture, including the L, wouldn't work because of the strong background noise.

The arsenal of the bogus

The last four paragraphs may not make much sense if you're not a color correction expert. However, you can probably appreciate that the key move was the one that I didn't mention: the false profile.

Image M is opened in the normal Apple RGB. Obviously, it's grossly too dark. That can be fixed with an RGB definition with a lower gamma. And, like nearly all images this dark, it's also too gray: all the colors are suppressed.

Having frequently dealt with this type of image, I already had a remedial profile available. It has a gamma setting of 1.0, rather than the 1.8 of Apple RGB, and it uses the wildly colorful primaries of Wide Gamut RGB. Version N is what the image looked like immediately after this profile was applied.

There's still a ways to go from that to version L, but the fundamental problems are now solved. The lightening caused by the lower gamma is much smoother than doing the same thing with Photoshop curves, which exaggerate changes at the highlight and shadows ends too much. That's not a problem with an image that starts only slightly too dark, but with one as bad as version M the image can get choppy-looking.

The Wide Gamut primaries also have an important role. Note the added redness in Rebecca's lips and, especially, her cheeks, almost as if she were wearing blusher. Similarly, I was able to hold the subtle yellows in her hair, and the dark brown of her sweater didn't go black.

You can see the beginnings of these things in version Q. Had I used even the Adobe RGB primaries, let alone the flatter Apple ones, a lot of intensity would have vanished.

Most pictures this dark will, in fact, open better using the Wide Gamut primaries, but if Rebecca had been wearing anything bright it wouldn't have worked. Remember, with the Wide Gamut definition, many, many colors are more brilliant than your monitor can show, and so far out of the CMYK gamut that the results of a conversion will be unpredictable.

Therefore, although the Wide Gamut 1.0 profile is usually the best for this kind of image, I also have made 1.0 profiles using the Adobe and Apple RGB primaries. And I have 1.4 gamma versions for all three.

"Normal" Apple RGB has a 1.8 gamma. There's no point to a 2.2 version because that effectively is what sRGB is already. A 1.8-gamma Adobe RGB, though, is valuable. I've never seen an image where 1.8-gamma Wide Gamut RGB made sense, so I've never made that profile.

Assigning a bogus profile sounds like a rather hairy thing to do, particularly if it involves those dangerous Wide Gamut primaries. But in drugs and color, it's hard to argue with clinical success. One can get from version A to version B in several ways, but doing it with a false profile is easiest. Getting from version M to version L without the aid of this particular scam is, as far as I know, not doable.

There's a bit of irony in using a tool designed to promote accuracy to create a deliberately inaccurate result. Then again, it's no sillier than rubbing blood pressure medication into one's scalp. Sometimes fate decides to intervene, opens our eyes to something deeper than what we thought we were looking at, leaves us blinking in wonder at how we could have been blind to the obvious.

The Birth of a False Profile

To create a new, reusable false profile:

- Open Photoshop 6's Edit: Color Settings and make sure that "Advanced Mode" is checked.
- Under Working Spaces: RGB, change the definition to the one whose primary colors you wish to use, normally Adobe RGB or Wide Gamut RGB.
- Now change it again, to "Custom RGB". This brings up the Custom RGB dialog shown at top right of this page.
- Change the gamma setting. Lower values will produce lighter files. Change the name of the RGB to something logical, like "1.0 gamma Adobe RGB", and click OK.
- Back in Working Spaces: RGB, choose "Save RGB". Save the file into your System Folder/ColorSync Profiles folder.
- In Edit: Color Settings, click on "Cancel" to restore whatever your original settings were. The new profile, however, will appear as an option from now on whenever you choose Image: Mode>Assign Profile. —DM

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