Plate Blending by the Numbers

If you're having a problem with faces that seem to lack snap on the printed page, the solution is probably a blend into the cyan plate. That sounds like an expert is needed—but here's an easy recipe.

By Dan Margulis

Find yourself a fashion magazine, or any other print publication that shows a lot of faces. Pick out five or six individuals with light complexions—natural blondes, children, people with relatively light hair. Also, locate a similar number of dark-complexioned faces: brunettes, non-Caucasians, people with a pronounced suntan.

Would you not agree with me that the depth of the faces is much better in the darker-skinned people? By and large, that they have more pronounced chins and noses, that their cheeks seem rounder, their eyes more prominently placed?

If you don't have such a magazine handy, take my word for it: it is, they do, they are, for sure.

Before you cast the first stone at the magazine, have a look at your own work. Have you had more than the average number of problems with images of lighter-skinned people?

What accounts for this? Look at light-complexioned people on the street and you won't see this effect. How come it gets screwed up on the printed page?

This is a hard question, but if you read the last installment ("Plate Blending as Poetry," *Electronic Publishing,* August) you can at least state the proximate cause of the problem and its likely solution. The cause is an inadequate cyan plate; the likely solution is a blend that gives it more contrast.

Tricky stuff, granted. Understanding where to get the blending tools from, how to use them, and why they work requires an experienced color technician. If you aren't that, but still want your faces to look crisp, there's good news. I have a nearly foolproof recipe that anybody can follow.

Thus, contrary to the usual practice of this column, we'll do the how first and the why afterward. If you already know how to do this, and are looking for something more challenging, try this quiz:

1. Why do the darker-skinned people generally look so much more three-dimensional?

2. In determining whether the cyan plate of a face shot does the job, why is the dot gain setting so relevant?

3. How does this relate to the relative prominence of the green circle to the right of the graphic at the bottom of this page?

4. The two parrots at upper right were generated from the same RGB file. Can you guess what was done to them? Which do you think looks better? What about if the only criterion is the detailing in the bird's chest?

The face of the unwanted color

Before getting started with the recipe, a brief review. When an object has a pronounced and relatively pure color, the depth we seek depends far more on the weak CMY ink than the dominant ones. So important is this weak plate, or *unwanted color,* that if a good one doesn't exist we should make one. In a red object, that means the cyan

Above: There's something odd about the way the bottom version of this image was separated. Can you identify it? Which of the two images would you prefer? Below: When the background is bright, small variations in color—like the circle at right—stand out, or at least they should stand out. This explains why in a strongly colored area like the parrot's chest (or a human face) the cyan plate, which produces such variation, is so important.

plate; in a green one, the magenta; and in a blue one, the yellow.

Last time, we discussed a silhouetted red rose and a silhouetted lime. Obviously, these qualify as strongly colored objects. The red part of the parrot does too. A human face isn't quite as spectacularly colored, but it is red nevertheless, not magenta, not yellow. And given how important the lifelike reproduction of faces is too most Photoshop practitioners, we want to be very picky about just what kind of cyan plate we will accept.

How the recipe works...

Ingredients: One image of a face, more or less correct for color but lacking in sparkle.

Preparation: If you are using Photoshop 5 *and* you have it set to convert RGB colors upon opening *and* your RGB Setup reads Gamma 2.2, change it to 1.8. If you are using Photoshop 4, or if your Photoshop 5 settings are more sensible (sorry, it just slipped out, I couldn't help it, honest) forget this entire paragraph.

1. If you are starting out with an RGB file, make a copy of it, convert it to CMYK, and make a copy of that. If you

are starting with a CMYK file, make two copies of it and convert one to RGB. Either way, you now have one RGB and two CMYK copies of the file.

2. Activate the RGB file, and apply the curve shown to it. This will make the image uglier, but don't worry. Note that in this curve, the dark side is to the right, which is not the Photoshop default for RGB files. If, on your system, the gradient bar on the bottom of the curve moves in the opposite direction from the example, either reverse this curve or, perhaps simpler, click on the gradient, which will reverse its orientation.

3. *(optional)* If it seems appropriate, apply unsharp masking to the RGB file.

4. Without closing the RGB file, turn your attention to the first CMYK file.

Display its cyan channel (keyboard shortcut: Command-1). With Image: Apply Image, apply the red channel of the RGB file to the cyan of this one, 100% opacity, Normal mode. Now redisplay the composite CMYK image (Command-~). *Note:* if you are trying to improve a green object, rather than a red one like a face, in this step you should be applying the green channel of the RGB to the magenta of the CMYK.

5. The image probably looks too gray now. If it doesn't, you're all set. If it does, copy the image to the clipboard (Command-A, Command C), and, turning your attention to the *second* CMYK file (the first one, plus the RGB file, may now be discarded), paste the saved image on top of it (Command-V).

6. This procedure has established a two-layer document. If the Layers palette isn't visible on your screen, bring it up with View: Show Layers. At the top left of this box, change mode from Normal to Luminosity.

**7**. Choose Layer: Flatten Image. Save, cool and serve.

...and why

That an Photohop gourmet chef might get better results than this in certain cases, by exploiting different black generations, use of the L channel of LAB, and other advanced stuff, doesn't alter the fact that the recipe worked well in this image, and will also work well in any case where we are trying to bring out detail in a strongly colored object. To go farther, we need to discuss *why* it works. For that, lets return to the quiz on the first page.

1. Why are the faces of blondes a bigger problem than that of brunettes?

Because in both, shape will depend on the quality of the cyan plate. A brunette's skin is not just darker, but browner, less red. It has a higher percentage of cyan right from the get-go, and is likely to show more detail in that plate.

2. Why on earth does dot gain play a role in this?
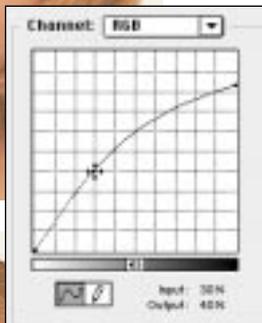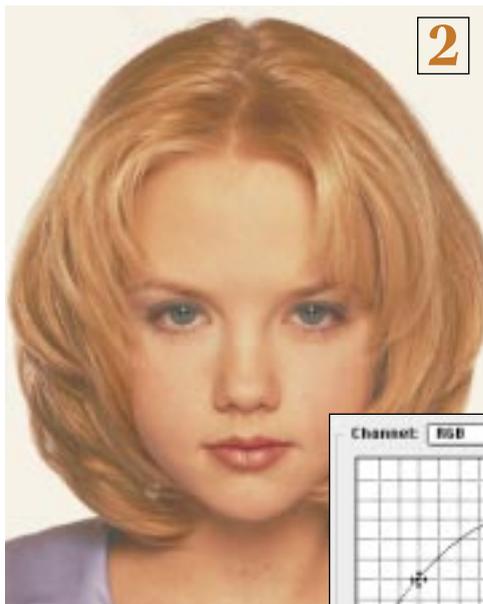
The recipe in action. This page, top to bottom: the raw image; a curve applied to an RGB version; unsharp masking is added. Opposite, top to bottom: a comparison of the corrected red channel (left) to the original cyan; the CMYK image after the cyan has been replaced; the final image. The numbers correspond to those of the recipe.

All printing processes have some dot gain. This misunderstood phenomenon causes images to seem to darken up when they are printed. The worse the printing conditions, the darker the appearance, and some compensation for it has to take place during the RGB to CMYK conversion.

This means if we are preparing the same image to appear in both a magazine and a newspaper, we need two separate files. Somehow we have to make the newspaper version lighter, because we expect it to get darker on press.

In RGB, the lighter a channel is, the more of that color is supposed to hit the viewer's eye. In a picture of a rose, for example, the red channel will be very light.

In CMYK, the lighter a channel is, the less of that ink will appear. The function of the ink is to prevent reflection of a certain color. Cyan prevents reflection of red. In a picture of a rose, for example, the cyan channel will be very light.

Similarly, where the red is dark, the cyan will be dark. Where the magenta is light, so will the green. Where the blue is dark, so will be the yellow. RGB is CMY, and they even make it easy for us by putting the letters in the proper order. R=C, G=M, B=Y.

There's just one catch. RGB doesn't have dot gain. So, while the red channel looks a lot like the cyan, the cyan will be lighter. The lightening process damages detail in the lighter half of the channel. Naturally, in the cyan channel, a person's face falls in that lighter half.

So, if you don't get it yet, here's what's coming down. We have an RGB picture of a face. We are anxious to hold detail. Therefore, as we convert to CMYK, we proceed to obliterate such detail in the most critical plate.

How clever does that sound?

This is why replacing the cyan with a modified version of the red is so effective. The red *has* to be higher contrast in the face, because of the dot gain compensation.

3. Where does the green circle fit in?

The circle is in fact the same color as the left side of the graphic,It sure doesn't look it. This explains why strongly colored objects need plate blending.

That perhaps needs more than a tad of clarification. Here goes. The circle is so prominent because of an interesting feature of human vision known as *simultaneous contrast.*

This is a highfalutin way of saying, when our eyes are hit with similar colors from neighboring objects, our vision adjusts to break them apart. Cameras don't have this capability; therefore, if you were to take a picture of the first page, the circle might vanish altogether. It certainly wouldn't have the prominence that our eyes are giving it in real life.

Just as we break the green circle out of a green background, we break apart the colors of any strongly colored object. We see more variation in a rose, a lime, or a light-skinned face than a camera does. This is why pictures of such objects always seem too flat. It isn't the photographer's fault. Our visual system wants to see more than the camera is capable of giving us.

4. How is the parrot constructed?

The top CMYK version is a normal Photoshop separation of an RGB file. The bottom version looks peculiar because it has no black plate at all. This separation was created by making a blank CMYK document, then pasting the red channel from the RGB into the cyan, the green into the magenta, and the blue into the yellow.

Primitive as it is, one could seriously argue that the bottom version is better than the top one. The overall color isn't bad. The background is a little cheesy. But the parrot's red chest is better than in the conventional sep. In fact, we could use the recipe to add yet a better cyan plate to the bottom version.

This is rather a harsh blow to calibrationists and other seekers after the perfect color separation algorithm. Do you mean to say that we can just steal the RGB channels, forget the black altogether, and still have a better sep than if we did things the scientific way?
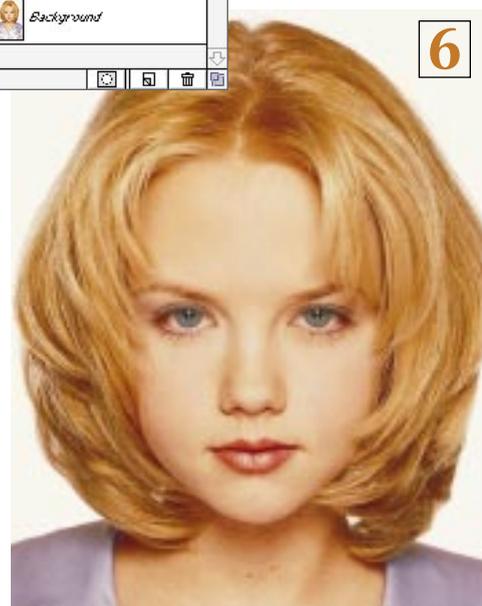
Well, no. This is an exceptional case. But once we understand why it's exceptional, we'll know how to modify the recipe to deal with things other than parrots and faces.

Back to dot gain: why CMY channels are lighter

The big difference between an RGB channel and its CMY counterpart is the dot gain compensation. The CMY channels must be made lighter during the separation process. Photoshop and other programs normally do this by lightening the midtone of each channel. The effect of the lightening will be strongest there, and lessen as we move toward the highlights and shadows.

This explains why the RGB and CMY of the parrot are so similar—*there aren't any midtones.* The parrot's chest is a highlight in red and cyan, and a shadow in green, magenta, blue, and yellow. So the dot gain compensation has little impact.

It also explains why the recipe works for a light-skinned person: the cyan and the red channels are both highlights. So, even though after recipe step 4 the image may look too gray, it won't be so far out of whack that step 5 can't bring it back.

But what if this doesn't apply? Try applying the recipe to two of the strongly-colored images we worked on last time, and you get mud. The unwanted color (cyan in the rose, magenta in the lime) is still critical, but in each case it's much heavier than it is in the parrot or the face. This means that the dot gain compensation is more of a problem. Re-

In a lime, the key plate is the magenta, which derives from the green of RGB. Top center: the magenta plates before and after. Below: the green and the curve that lightened it.

Above, a modified version of the recipe creates the stronger cyan plate that a rose needs. Top center: the original and corrected cyan. Bottom left: the original red channel, and the curve that lightened it before it replaced the cyan.

place the CMY unwanted color with its RGB counterpart and, as you can see, the image will get too dark.

In such cases, one can still take advantage of the superior contrast found in the RGB channels. The curve of Step 2 has to be different. Other than that, the recipe is unchanged.

The new curve has to make the RGB channel lighter, but also it should add snap. This is done by making the area occupied by the object fall in a relatively steep part of the curve. In this page's examples, note how that's happening.

Before leaving the topic, let's remember that it is a limited one. The images we've been working on feature one dominant object with one dominant color. If that doesn't fit the description of the image you're working on, forget the recipe and go back to less adventurous methods.

More than that, if you're a colorspace chauvinist, this is a time to think of toleration. CMYK and RGB are very similar. If you obdurately insist on working in only one, you'll be missing some great opportunities.