

Plate Blending as Poetry

Topics: Channel blending, CMYK vs. RGB, fleshtones, greenery, role of unwanted color.

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Author's comment: We call it "channel blending" today, and we realize that it works better as a rule in RGB than in CMYK. But the basics haven't changed all that much. Today channel blending is part of the arsenal of every serious retoucher. This column, reproduced here in the expanded form of a book chapter, was the first of a three-part series that explored the many uses of this technique in color correction.

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 hundreds of edited threads from Dan's Applied Color Theory e-mail list.

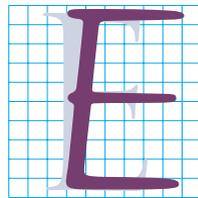
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CHAPTER 5

Plate Blending As Poetry



In strongly colored areas, detail in the weakest ink—the unwanted color—is critical. If you don't have that detail, there's only one thing to do: get it from somewhere else. Understanding the observations of an American poet will help.



Emily Dickinson, the 19th-century American poet, was a keen observer of matters of color. She should, in fact, be required reading for Photoshop theoreticians.

Although not a Photoshop user herself, she was able to put her finger on many an issue that still plagues us. The image at the upper right of this page is a romantic icon, exactly the sort of thing most professionals have to produce over and over again.

Most of the time, that reproduction winds up being—well, I'd better leave the description to Dickinson.

*It tried to be a Rose
And failed—and all the Summer laughed.*

* * *

Since our clients may not be so easily amused, it behooves us to do some technical analysis. I haven't seen the particular flower that Dickinson was referring to, of course. But I can tell you what its problem was. It had a lousy cyan plate, same as the one at the top of this page. Her retoucher should have blended channels to get a better one.

How do I know? Because that's how it is with red roses, and that's how it is with most brilliant objects. The weak ink is the key to detail.

And to understand why things work that way, one might start with the following:

*Nature rarer uses Yellow
Than another Hue.
Saves she all of that for Sunsets
Prodigal of Blue.
Spending Scarlet, like a Woman
Yellow she affords
Only scanty and selectly,
Like a Lover's Words.*

* * *

This isn't bad poetry, but as color theory it leaves a lot to be desired. The exigencies of rhyme outweighed the facts. Understandably reluctant to commence hostilities with

*Nature rarely ladles Yellow
Out of a Tureen,*

the poet found herself obliged to declare Nature prodigal of the wrong color. I can-

not continue the rewrite: the business about spending scarlet is far too politically incorrect for the publisher to permit me to leave it in. I have thought, instead, about likening the way nature is with red to how calibrationists expend time and money on color management solutions that don't work, but I've had some difficulty coming up with lines that scan. I would, however, end the poem thusly:

*Chorus'd Nature, chanting Yellow,
Sings with more élan
Than Progeny of Press atonal
Magenta and Cyan.*

* * *

Before you decide that poets should stick to poetry and Photoshop authors to Photoshop, let's cut Emily Dickinson a break. She didn't know her verse was incorrect, because

Figure 5.1 Two cyan plates, one with proper focus, and one that is decidedly second rate.



she thought in the color terms some of us learned in school under the acronymous name Roy G. Biv: Red, Orange, Yellow, Green, Blue, Indigo, Violet. I don't know that there has been a lot of research done on this point, but my impression is that, of these seven hues, Dickinson is correct: nature uses yellow the least.

Today, we have buried Mr. Biv and think in terms of CGYRMB, a perfect color circle. In this model, red falls midway between yellow and magenta, magenta is midway between red and blue, and so on.

One might think that there would be no reason that any one of these six colors would be used more than another, but a quick check of the works of God and man demonstrates how silly that view is. Red, green, and blue objects are far more com-

mon in nature than the other three. Bananas and other yellow objects exist, but they aren't that common. Bubble gum and cactus flowers are magenta, and certain Caribbean waters are cyan, but outside of these I am hard put to come up with *anything* else that is magenta or cyan. And yet you could name hundreds of things that are red, green, or blue.

An interesting exercise is to walk down the street and record the color of clothes that passersby wear. I've tried this and found ratios from four to ten to one in favor of RGB colors as opposed to CMY.

The point of all this poetry and palaver? Simply this. In the images you work with, you are far more likely to be working with red, green, and blue objects than cyan, magenta, and yellow ones.

Figure 5.2 When the two cyans are plugged into the same MYK image, the difference is impressive.



To translate this into prepress language: it is extremely likely that the objects we work with will have two strong inks and one weak one, as opposed to other way around. It is that weak one, and how to exploit it, which is the focus of this chapter.

The Cavalry of Woe

CMYK, in addition to being a cockeyed colorspace, is a backwards one. Instead of choosing inks based on their positive capabilities, they have been selected for what they do *not* do. Magenta does not reflect green light; yellow does not reflect blue; cyan does not reflect red.

From this, it is not too much of a stretch to realize that much of the color correction we do is topsy-turvy: that to be effective, we have to think in color terms that are the opposite of what one might expect. When we deal with reds, we should be thinking cyan; when doing greens, magenta; and when portraying blues, yellow.

This is the religion of the *unwanted color*—the color that is the odd man out.

Because the unwanted color is so proficient at poisoning what would otherwise be a bright, clean look, it has a special importance in making an image seem lifelike. The unwanted color, even in slight quantities, is what gives an image depth.

The most obvious example of the importance of the unwanted color is in flesh-tones. Regardless of a person's ethnicity, flesh is basically red. That is to say, it is a combination of magenta and yellow. Cyan is, therefore, the unwanted color.

It may be a leap of faith for you to accept that cyan is the most important color in a face. So, without further theoretical ado, let's go straight to an example. The two cyans of Figure 5.1 represent the only dif-

ference between the two versions of Figure 5.2. The other three channels are identical.

Note that there is technically nothing wrong with the poor image. The fleshtone is within proper parameters. But the picture has gone dead. The other seems to leap into three dimensions by comparison.

When two inks are clearly dominating, the unwanted color is so potent in neutralizing them that adding it is almost like adding black. The unwanted color, however, is not quite as blunt an instrument. Also, a much bigger range, and thus a better shape, can be engineered into the unwanted color than into either the two dominants or the black. That is just a matter of numbers: in the better version, the cyan ranges from around 5^C to 20^C. There is thus four times as much cyan in the darkest area as in the lightest. Try getting *that* with either one of the dominants.

Best of all, the unwanted color is easy to adjust—or, if need be, to create. The two dominant inks must be kept carefully balanced; otherwise, areas of the face will start to get too yellow or too magenta. But it will take an enormous move in the cyan before the overall color of the woman goes to something other than a shade of red. Much can be hidden in the unwanted color, and part of the normal technique of working with faces should be calling up the cyan and seeing what improvements can be made. The picture as a whole cannot be sharpened, for example, but sharpening only the cyan is possible, and that will make a small but significant improvement.

To sum up, when trying to improve sky, the professional thinks of yellow first. To correct faces, we concentrate on cyan, and for plants and other greenery, we focus on magenta.

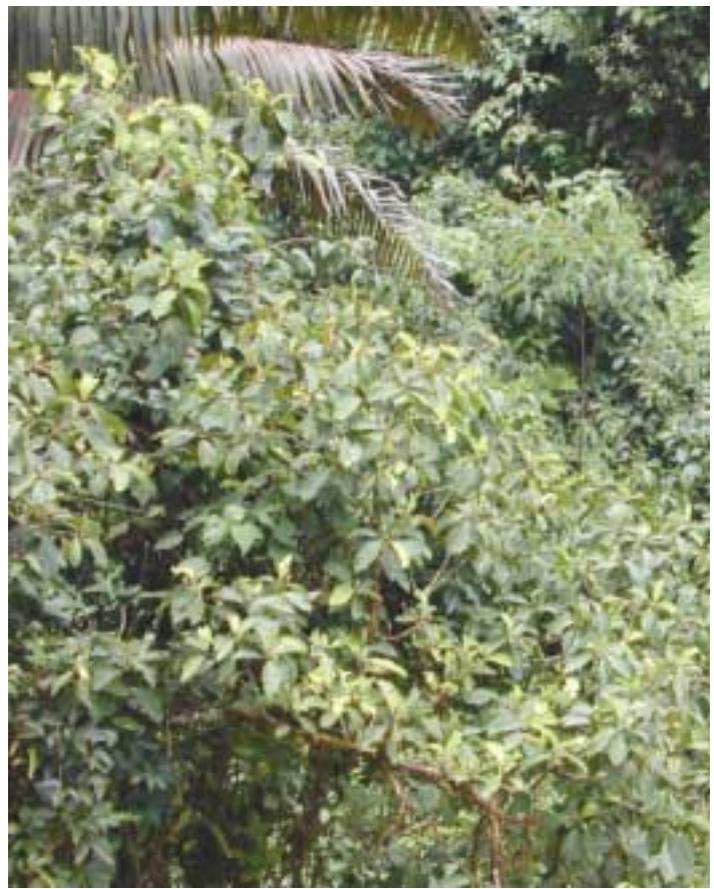
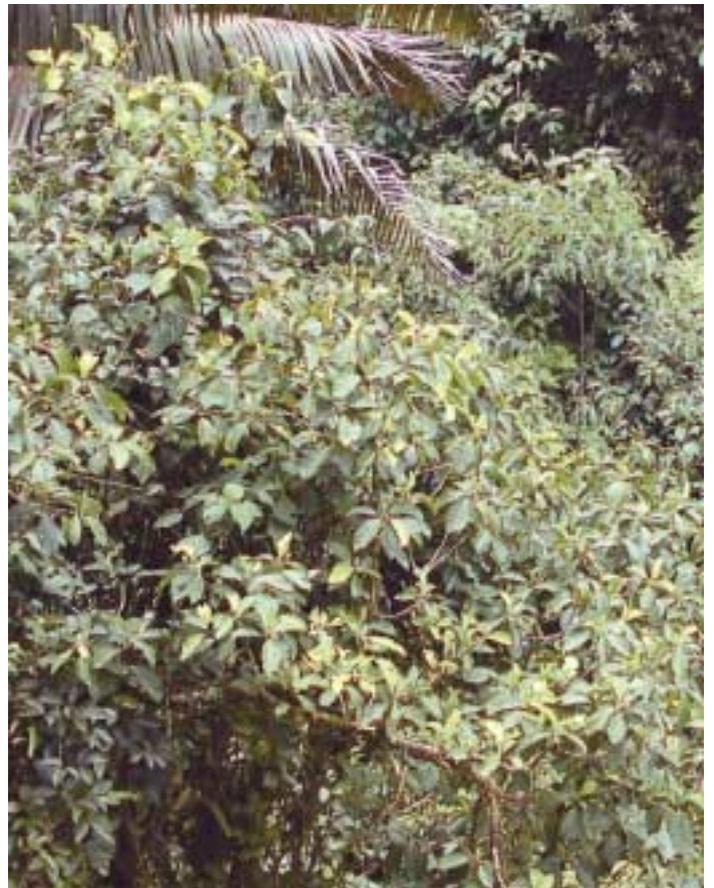


Figure 5.3 When the interest area is the green of a forest rather than the red of a face, the key color is magenta rather than cyan. Above, the original image and its magenta plate; at bottom, a version with a better magenta. The two color versions are identical in the CYK channels.



Yet I Know How the Heather Looks

Figure 5.2 wasn't a red picture, but the most important object, the face, was red. In Figure 5.3, on the other hand, green dominates. That means strong yellow and cyan, and it means that magenta is the unwanted color.

The bottom halves of Figure 5.3 make clear how critical that unwanted color is. There isn't any difference at all in the cyan, yellow, and black, but the enhanced magenta seems to bring the image to life. No other channel could have such a pronounced effect in this picture, just as in por-

traits no other channel can have the impact as the cyan.

Here, we simply use the contrast-enhancing technique of Chapter 3, steepening the curve in the magenta where the greenery is, roughly 10^M to 20^M . Also, I've sharpened the magenta channel. Notice how harsh the result is. That's one of the happy things about using the unwanted color: it's covered up by so much ink from the two dominants that we can get away with really ugly-looking channels.

Of course, in real life we would do other things to this image besides tweaking

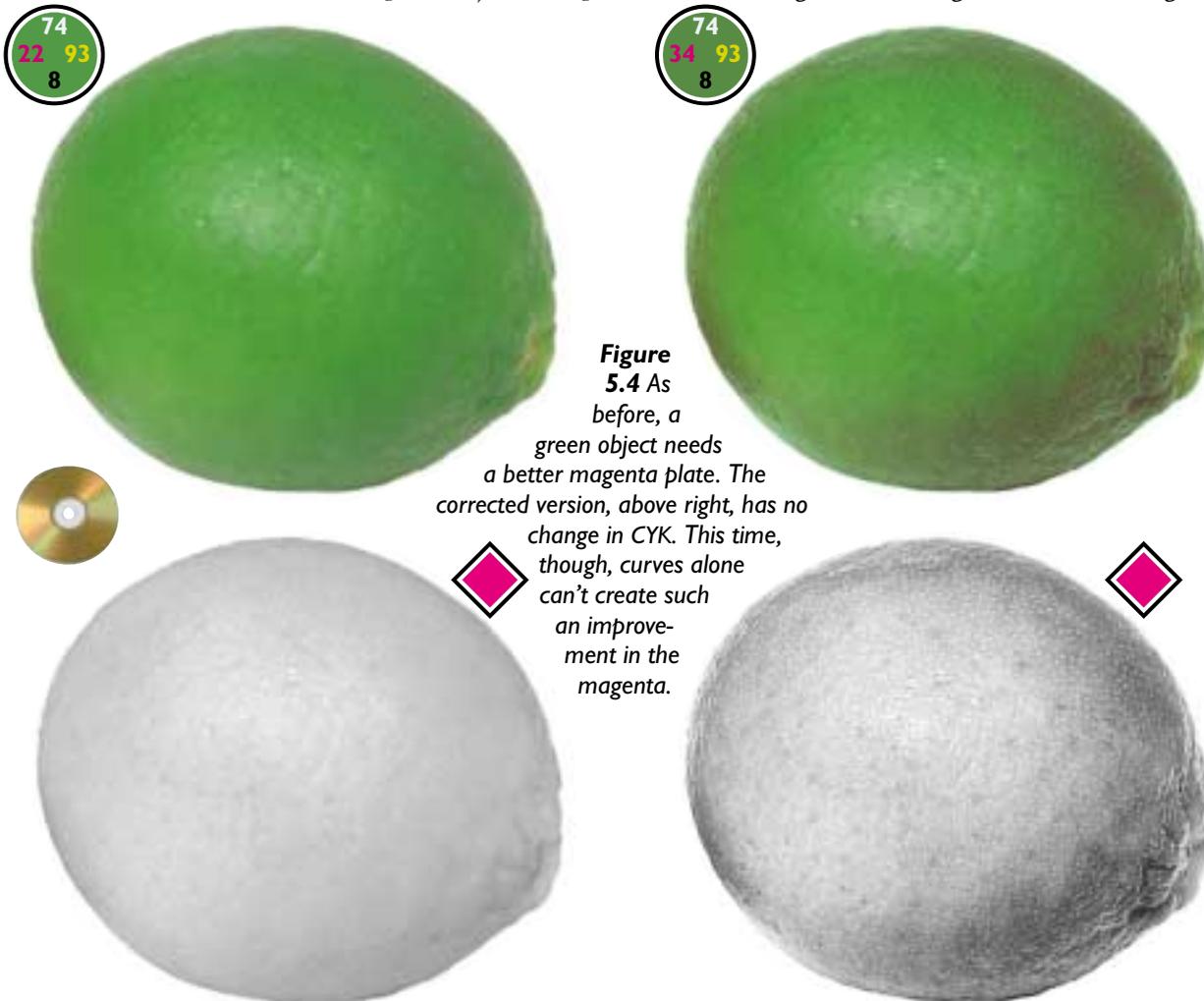


Figure 5.4 As before, a green object needs a better magenta plate. The corrected version, above right, has no change in CYK. This time, though, curves alone can't create such an improvement in the magenta.

the unwanted color, but that isn't the point. The message is, when confronted by such a predominance of one color, you'll get a lousy image if you *don't* take special care with the unwanted color.

In many cases, the need for strong contrast in the unwanted color is so compelling that we have to take desperation measures. The normal desperation measure is to find a higher-contrast channel and blend it into the unwanted color, hoping not to throw overall color off too much in the process.

This is actually a watershed moment in this book, at least if you've been reading the

chapters in order. Up until this point, the concepts have been universal. We *always* need to create appropriate highlight and shadow values. If we have a choice of the shape of curves, we *always* choose to have them emphasize the important areas of the image.

From here on, however, the strategies are specialized. Plate blending, unsharp masking tricks, unorthodox GCR decisions, the use of other colorspace: these are all great responses to specific situations. Unfortunately, one has to learn what those situations are.

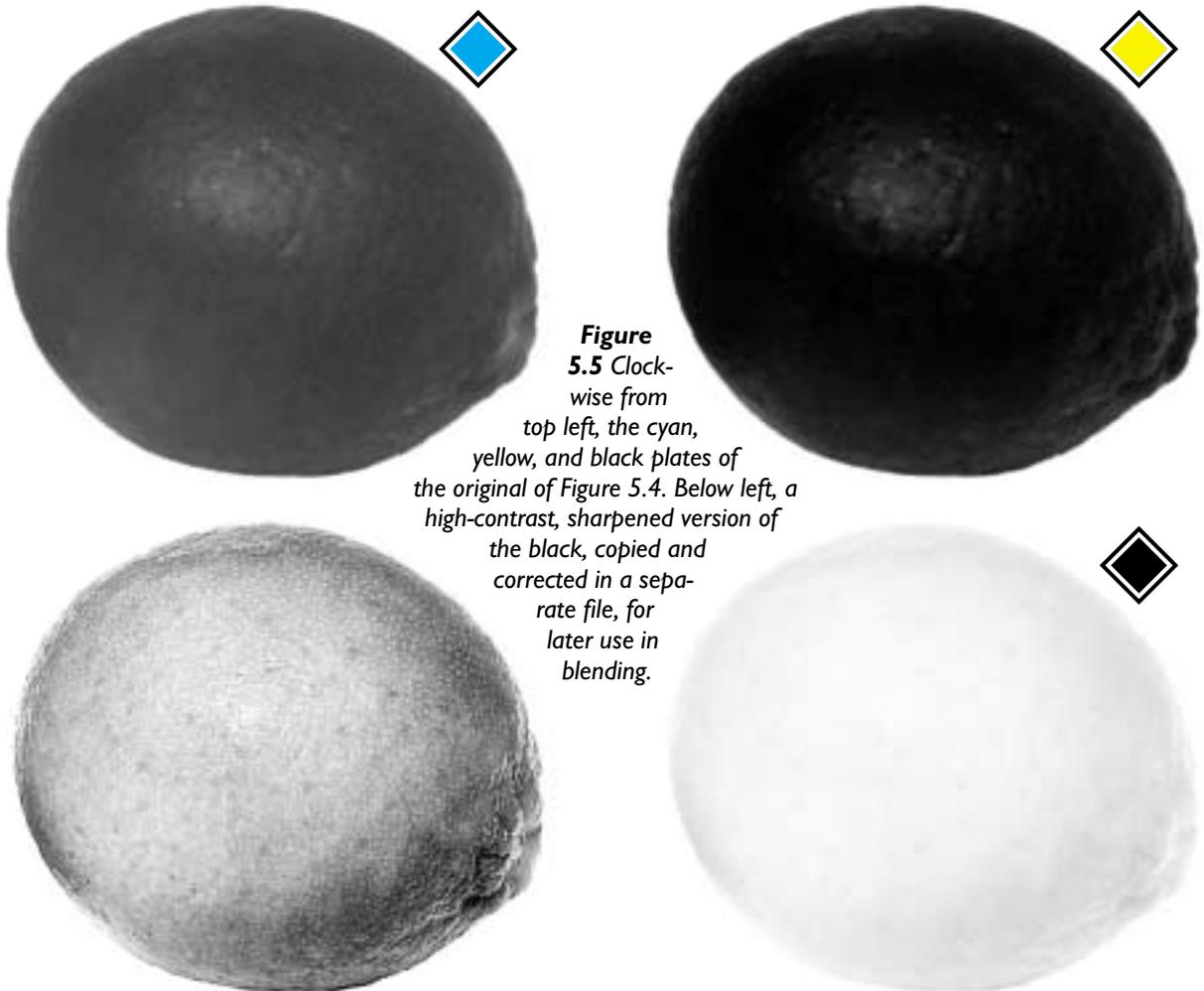


Figure 5.5 Clockwise from top left, the cyan, yellow, and black plates of the original of Figure 5.4. Below left, a high-contrast, sharpened version of the black, copied and corrected in a separate file, for later use in blending.

The Berry's Cheek Is Plumper

When everything is brilliant, nothing is brilliant. Plate blending to enhance contrast in the unwanted color is often needed when there are large areas of intense color. Fruits, vegetables, and, of course, flowers are excellent examples.

There are two main reasons this maneuver is so important. First, the human observer always tries to break apart similar colors, whereas a camera does not; therefore, humans perceive more variation in the color of fruit than is ever captured on film. Since our job is to remind the eventual viewer of the original subject, not what the photographer captured, we have to try to restore some of this color variation, and applying curves and sharpening alone may not do it.

Second, we want our bright objects to

look three-dimensional, not like flat blobs. The right-hand lime in Figure 5.4 is *rounder* than the one on the left. That's because the purer the color, the closer it seems to us. The more it tends toward gray, the further away it goes.

At the brightest spot in the center, these two limes are almost identical in color. The difference is at the edges. There, the right-hand version is grayer, less green. Those grayer edges recede, fooling us into thinking we are seeing rounder fruit.

And, not to beat a dead horse, when we have a dominant red, green, or blue object, the way to turn parts of it gray is with its enemy, with its opponent, with the ink that is specifically designed to contaminate, poison, depurify, confound, distress, and distract it, to wit, the unwanted color.

Once having concluded that this lime needs a magenta plate like the one at bottom right of Figure 5.4, the question is how to get there from the version at bottom left. The answer is, we don't. The original is simply too flat. Curving it won't help—at least it won't help enough.

Accordingly, we need to seek assistance elsewhere. We need to find a channel with more detail and blend it into this pathetic magenta. Figure 5.5 shows the choices.

The maxed-out yellow is plainly unsuitable. The cyan is pretty flat as well, although it does have a well-pronounced hot spot in the middle. And the black? Well, at first blush, it seems as flat as the magenta, but it isn't. Curving this one can bring out detail, as we will see.

The first order of business is to get a copy of the aforesaid black

Stumbling Blocks: Poetry and Peril

- **The deceptive default.** Contrast-enhancing blends need to be done in Normal, or occasionally Lighten or Darken modes. Photoshop's default is Multiply. Leaving it at that will mess everything up.
- **The Misapply Image command.** Apply Image only works when the channel being changed—the target—is the only channel displayed on the screen, or the only channel active in the Channels palette.
- **Failing to correct after the blend.** Blends can sometimes make the unwanted color channel too heavy, subduing colors. In such cases, don't forget to apply a subsequent curve that lightens, but remains steep in, the highlight area. This will retain the added contrast.
- **The CMYK shadow imbalance.** When blending another channel into the cyan, be careful not to lighten its shadow, which normally is 10 points higher than in the other three. Sometimes, the blend channel needs to be copied, darkened, and then applied to the cyan.

channel to play with. This is done by displaying the channel; Select All (Command-A); Copy (Command-C); New document (Command-N, which automatically opens a document to the same size as what we have just copied); Paste (Command-V); drop down one layer (Command-E.)

The result of all this alphabet soup is a grayscale document that is divorced from the original, meaning we can smash it all to pieces if we like.

But there is no need for such violence. Instead, what we want to do is increase contrast in the fruit, and having gone through Chapter 3, we know exactly how to do so. We create a curve that is as steep as possible in the area occupied by the lime. And for good measure, we apply heavy unsharp masking afterwards. The result is at the bottom left of Figure 5.5.

This hot rod of a channel is almost good enough to replace the original magenta, because the two are practically the same color. The key is understanding that contrast needs somehow to be added to the magenta. After that, how far to go is a judgment call.

With both the original file and the separate blending channel open on screen, we display the magenta channel of the original and choose Image: Apply Image. Up comes the dialog box shown in Figure 5.6. We now specify that the source is the other image and pick an opacity, using Normal mode. Understanding that this is an arbitrary decision and that you are perfectly free to think I should have gone further or not even this far, I used 75%.

Ordinarily, after a blend like this, a further correction is necessary. Blending into the unwanted color always adds detail, but it frequently changes color as well. We want a rounder lime, not a browner one. Most of our perception of color comes from the brightest area of the fruit. So we have to make sure that, after the blend, that point hasn't changed color too much. If it has, we need to apply curves to the blend plate to restore color while holding contrast.

Here, we lucked out; the color is close enough as is, another reason to favor blending with the black plate as a source rather than the darker cyan.

If this blend seems too simple, more complicated options are readily available. We could have made two separate blending channels, one based on the cyan and one on the black, and then blended those together before blending the result in the magenta. Or we could have made a copy of the image, converted it to LAB, and used the L channel for blending. Or to RGB, and used



Figure 5.6 The blending process, using Photoshop's Apply Image command.



Figure 5.7 Left, the original. Center, removing all cyan sharply reduces grain. Right, increasing contrast in the cyan makes all patterns more pronounced.

the green. Or we could have done one of these things using Multiply as the blend mode, rather than Normal.

Any of the above is a reasonable choice for dealing with this image. Giving up and leaving the magenta plate alone is not.

In Just the Dress His Century Wore

The interesting marbled-paper image of Figures 5.7–5.10 symbolizes a species particularly suited to unwanted-color moves. If an object has a pronounced grain, as this

paper does, the unwanted color governs its intensity. When we want to make the grain more or less prominent, the unwanted color is the principal tool.

Although wood might be a more typical example of where we might want to control grain, the paper image has more possibilities. Images like these are sold to be used as backgrounds, for which they are very useful. Frequently we will want to make some custom variation of them. Here are a few such ideas.

Figure 5.8 When the image is shifted from magenta-red to pure red, the unwanted color becomes even more prominent. Center and right, adjustments in the cyan drastically change the strength of the grain.



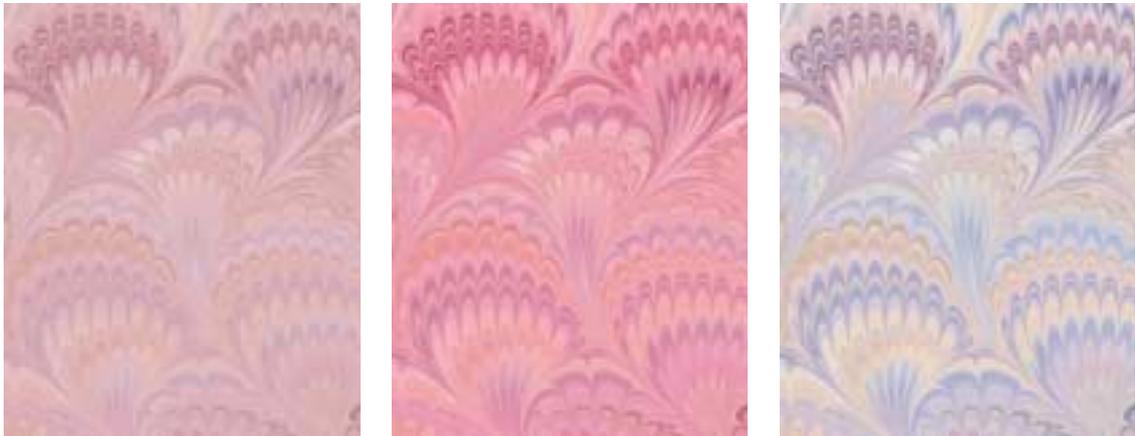


Figure 5.9 Neutralization techniques. Left, a single overall reduction in saturation. Right, curves that aim for more neutral colors. Center, swapping the cyan and black plates gives less color variation.

Curve-based contrast boosting of the unwanted color is the best way to bring out the grain. In Figure 5.7, compare the original to a version with no cyan at all, and one with a steep contrast curve that increases cyan quartertones without adding cyan where there was none.

Unwanted colors do their work best against purer incarnations of red, green, and blue. The overall feeling of this art is less red than magenta, although the yellow plate is much heavier than the cyan. In

Figure 5.8, we make the image pure red by duplicating the magenta plate into the yellow channel.

Under these circumstances, the impact of moves in the cyan is intensified. Note that one effect has gone away: a danger in working with grains is that the grain may take on the look and feel of the unwanted color. This is what is happening in the right third of Figure 5.8. Where the cyan is heavy, the pattern is becoming distinctly blue. That color shift is not necessarily a

Figure 5.10 Special effects. Left, increasing cyan sharply overall by blending 50 percent of magenta into it. Center, an inversion curve on the cyan. Right, using the entire available colorspace through drastic curves.



problem with this art. If we were working on a reddish wood, however, a bluish grain would be just as easily achievable, but far less desirable.

The center image of Figure 5.9 suggests a way of avoiding this. Earlier, I asserted that adding the unwanted color is roughly as powerful as adding black. To test this proposition, I actually transposed the black and cyan in the center image. If we would like a strong grain, but don't want any of it to have a blue tinge, this is the way to go.

This version is flanked by the right and the wrong way to get a less pink and more neutral effect. On the left, Image: Adjustments>Hue/Saturation reduces saturation everywhere. This floods everything with unwanted colors, and although it does make the image more neutral, it also neutralizes a lot of its appeal.

The blunt instrument of Hue/Saturation adjustment should only be used for its ability to isolate a certain color. When acting on the image as a whole, curves will always be more effective, as in the version at the right of Figure 5.9. This was treated just as we would any other image with a cast. I found areas that I wanted to neutralize and forced a gray in them. This retained plenty of interesting color variation throughout the image, since places with relatively heavy magenta, yellow, or cyan continued to display it. The only issue was where to set the highlight and shadow. This is one of the rare images that, in the interest of softness, should probably not make use of all available color space. So, I set my highlight at $10^C 10^M 8^Y$, intentionally retaining a slight magenta cast, and the shadow at about 50% in all colors.

Figure 5.10 shows three fanciful variants. At left, a new cyan plate that is a 50–50

split with magenta makes for a lavender image with a much less pronounced grain. Quick! How would we add more grain?

Yes, of course, this change has given us a different unwanted color. The way to add detailing would be to alter the yellow.

The center version has a flipped cyan. That is, the start of the curve is higher than the end, meaning that places that were relatively heavy in cyan are now relatively light. This is not a straight negative version of the cyan, which would overwhelm the image, but a softer variation on the negative theme.

Finally, the right-hand version is a reminder of just how much vitality we can add to any image through curves. I simply set the lightest area of each color to zero and the heaviest to around 90%.

This series of maneuvers illustrates some of the potential offered by manipulating abstract patterns. They have interest just by themselves, but they are particularly useful as backgrounds, especially if they are not too assertive.

Give the One in Red Cravat

Our last demonstration of the contrarian school of color correction is Figure 5.11. At first glance, it isn't much like the other images in this chapter, which tend toward blazing exhibitions of a single color. Here, 90 percent of the image—the door and the woman's flesh and hair—is fairly subdued. The dress, however, is brilliant red, and when we see brilliant reds, we must instinctively look to the cyan plate.

The extra bite in the door comes from moves in the L channel of LAB. We'll see how to do this sort of thing in Chapters 8 and 9. But LAB techniques won't put folds in the dress. And without those folds, the dress looks like it's painted on.

This seems like just another version of the lime, or of the woman's face. After the overall correction is made, we need to think about blending into the weak channel. But this one is not as easy. The lime was entirely green. While the face wasn't the only thing red, there wasn't any other important color in the picture. But in Figure 5.11, if we start blending into the cyan plate, the door is apt to turn a very weird color.

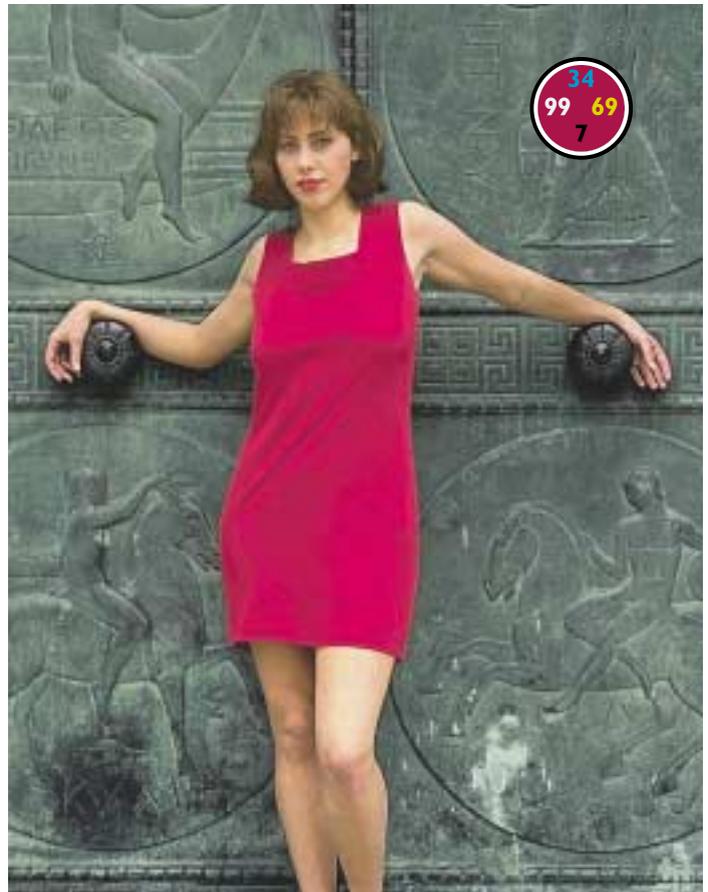
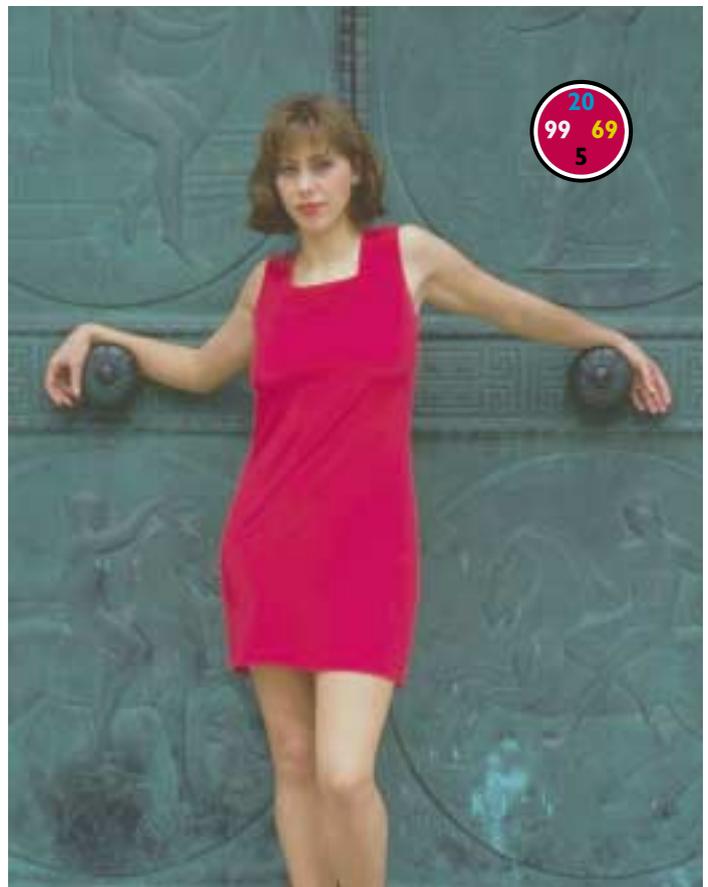
We've avoided the practice for nearly five chapters, but here there's nothing for it but to make a selection and blend into that. First, an examination of the channels verifies the problem. The cyan is terrible. The magenta is totally solid. The yellow is serviceable and is the obvious blending choice.

I've used this image in classes and have been astounded to see professional retouchers who are insightful enough to realize that such an unorthodox maneuver is necessary, yet so set in their ways that they take half an hour to create the necessary selection mask.

Granted, the ability to make accurate masks is one of the hallmarks of the professional. If you don't have a lot of practice at this sort of thing, imagine how difficult it would be to select, for example, the hair of the woman in Figure 5.1. In such a case, we'd be looking at individual channels to try to find the best edge and doing all sorts of other tricky things.

Here, however, there is no need to spend any time at all. Just look at the magenta plate in Figure 5.12. One can hardly ask for a more decisive distinction between dress

Figure 5.11 *The unwanted color at work in a selected object. An overall plate blend won't work here because it would change color too drastically in the background. By selecting the dress and blending into that, however, more detail can be built into the folds.*



and background. All one has to do is hit the dress with the magic wand tool, and presto, a perfect selection. I feathered it from force of habit, but this is not really necessary.

Now, with the dress still selected, flip to the cyan channel, and apply the yellow channel to it. This will leave the background unaffected. I used 50% opacity.

As it did with the lime, this blend left the unwanted color too dark. Therefore, with the dress still selected, I brought its minimum cyan value down to what it was before the blend. I swept the left endpoint of the curve to the right rather than reducing the quartertone, to maintain steepness and retain the shape of the folds.

Figure 5.12 *Creating a replacement for the original cyan channel, left. Below, left to right: the original magenta; the original yellow; a 50–50 blend of the yellow into the dress area only of the cyan; and a final cyan version in which curves have been applied to the dress to lighten it and enhance shape.*



But Graphicker for Grace

When one color dominates the image, we should not be dazzled into believing that that is the one we must attack. Instead, we should be more subtle, devoting our energies to courting the color that is prominent by its absence—unwanted, perhaps, but not unnecessary, not unloved.

Admittedly, this channel blending is tricky stuff, more so than the curving of Chapters 2 and 3. The decision-making is much less automatic. It's fairly easy, I think, to know when a channel blend might be appropriate; the hard part is deciding how to execute it.

The language of color is indeed the language of poetry. The idea that there should be fewer yellow objects in nature than red, green, or blue ones is counterintuitive, but it is nevertheless correct. Many scientifically fashionable ideas about how color should be handled have failed because their authors did not grasp facts about color that were obvious to, say, Leonardo da Vinci.

Or Emily Dickinson, for that matter. I've often been attacked, over the years, for saying what I did in Chapter 1, that photos taken in dark conditions generally need to



Quick & Dirty

MANIPULATING THE UNWANTED COLOR

- ✓ Areas that are predominantly red, green, or blue are peculiarly susceptible to moves involving the opponent process plate, otherwise known, somewhat inaccurately, as the *unwanted color*. In red areas, including fleshtones, the unwanted color is cyan; in greens, the unwanted color is magenta; and in blues, it is yellow.
- ✓ Focus-enhancing moves in the unwanted color are very powerful, roughly as effective as moving both dominant inks at once. In adding detail, it's the most significant channel. Steepening the weak color's curve will yield dramatic results.
- ✓ Many bright areas appear too flat because they lack an unwanted color altogether. In such cases, applying curves will be of little help. It is often necessary to generate a shapelier unwanted color plate by means of blending detail in from another channel.
- ✓ After a channel blend, restore original color by lowering the minimum value of the new channel in the affected area to whatever it was before.
- ✓ When trying to use bright, happy colors, consider reductions in the unwanted color rather than trying to beef up the dominants.
- ✓ In objects with a pronounced grain, such as woods, steepening the unwanted color will greatly intensify the graininess, but at the risk of creating an unwelcome hue. In such cases, consider means of transferring some of the role of the unwanted color into the black plate. Normally this is done by blending some of the unwanted color into the black.
- ✓ Zeroing out the unwanted color in the absolutely brightest area is a good way to add even more contrast to a primary color, even though letting one of the CMY colors drop to zero is normally considered unacceptable.
- ✓ Our perception of colors is influenced by what we see near them. To emphasize a bright color even more, increase the unwanted color in nearby areas.
- ✓ Be alive to the possibility that an image may offer more than one opportunity for an unwanted-color maneuver. If an ink is unwanted in one area of the image and dominant elsewhere, generally it will pay to steepen the curve in the unwanted area even if it penalizes the dominant range.



be lightened even when the photographer has already tried to compensate. Match the art! say the scoffers.

What gives you the right to think that an observer would see it differently than the camera?

A voice from 1862 answers them:

*We grow accustomed to the Dark
When Light is put away.
As when the Neighbor holds the Lamp
To witness her Goodbye.
A moment — we uncertain step
For newness of the Night,
Then fit our Vision to the Dark
And meet the Road erect.*

* * *

For all the glorious instincts of the true poet, certain things come only with experience. Appreciation of the importance of the unwanted color is one of them. For now, we should just resolve that all strongly colored red, green, and blue objects: flowers, fruits, faces, whatever—will always have high-contrast and poetically shapely unwanted-color channels in our work. In arranging this, we avoid the following Dickinsonian error of inexperience:

*The good Will of a Flower
The Man who would possess
Must first present
Certificate
Of minted Holiness.*

* * *

Phooey. The above is a crock. You want good flowers, you don't need any certificate.

You need a good unwanted color. The certificate, plus the other three channels, plus a dollar and a half, gets you on the subway.

Long before the age of Photoshop, John Wiley & Sons, the publishers of this book, brought out a scholarly work on color, which offered the following wisdom:

Confusion about the elementary principles of color is very widespread, the chief reason being that words dealing with color are used very loosely in ordinary language. But the difficulty goes deeper than that. Color was an art long before it was a science, and consequently the language of color is poetic rather than factual. The words are not as a rule intended to be taken literally but rather to convey a feeling or an impression. . . . Scientists are often infuriated by their inability to pin down an artist, or even a layman, to factual statements on subjects that might lie within the sacred realm of physics. Or, not recognizing that the artist's statements are poetic, they point out the departures from literal truth and expect the artist to retract them.

If you read about "caverns measureless to man," nobody supposes that a dedicated spelunker with modern surveying instruments would be unable to map them, if they existed. And if a lady with spike heels says "My feet are killing me" this is easily recognized as a poetic statement, on a somewhat lower plane. But if someone says "This color has some red in it," how are we to take it? This sentence sounds factual and objective, but probably it merely expresses that the speaker associates a feeling of redness with the color, and it might better be regarded as a poetic statement.

Indeed.