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The Black and White Connection

Topics: Conversion of color images into grayscale.

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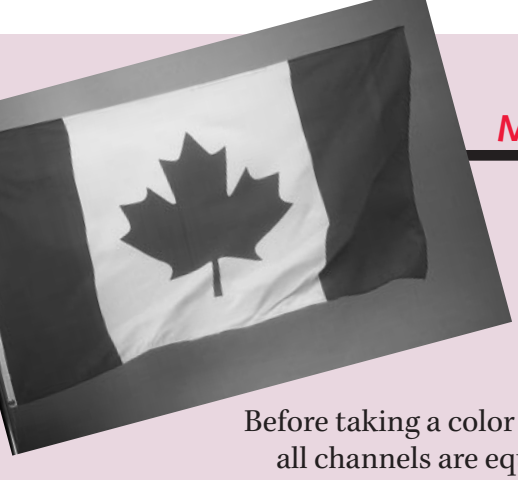


The black and white connection

Before taking a color picture into black and white, be Machiavellian. Realize that all channels are equal, but some are more equal than others. Find out which one is your enemy—and proceed to eliminate it.

In the good old days, color photos implied color printing. Jobs that were to appear in black and white—which were the majority, given the high cost of color—were generally shot in black and white as well.

Nowadays, however, nearly everything is shot in color—but quite a lot of it still needs to print in black and white. The good news is that Photoshop provides a number of ways to make a really sparkling conversion.

The bad news is, in the old days the client could only compare the printed result to a black and white original. Today, there's a *color* original floating around, ready to thumb us in the eye, laughing at how futile our conversion technique is.

Three types of contrast

The purpose of this column is not to show how to get killer B/Ws out of color originals, a topic that would take 50 pages or so to discuss in full. But I would like to suggest a method that will greatly improve the process. It's based on understanding what gets lost during the conversion—and then putting some of it back again.

Given the brilliant reds, blues, and yellows of the parrot at center below, the left-hand B/W version is fairly bogus. The right-hand version is more faithful to the original. Similarly, at the top of the page, the right-hand flag clearly stands out better against the sky than does the one at left.

I intentionally didn't print that color original, to avoid calling attention to what it has in common with the parrot. We'll get back to that; meanwhile, let's talk about contrast, and the lack thereof in black and white.

In B/W, there is contrast between the white and dark parts of the flags, and between both and the sky, which is somewhere in the middle.

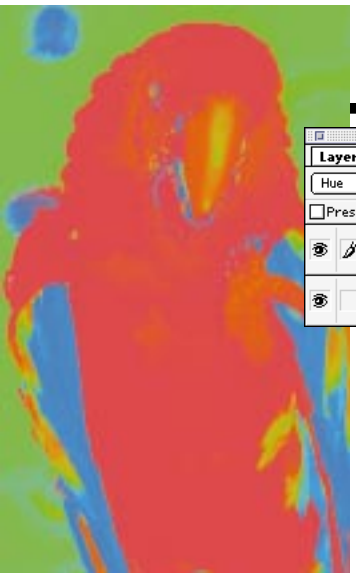
But there isn't *enough* contrast, because some got left by the wayside during the conversion. In the color original, we would perceive that the flag was dark and the sky light, but we would also perceive that the flag is red and the sky blue. That variation makes the flag stand out against the background much more sharply.

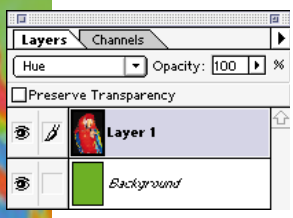
A lot of people use the term *color* to describe this kind of contrast. As Photoshop uses *color* to mean something else, we should use the term *hue*. Whatever we call it, it isn't worth much in black and white. But if it isn't there, we miss it.

And so, the left-hand version comes up a bit short. Not that there's no contrast between flag and sky—the flag is definitely darker—but there isn't as much as we're looking for.

We therefore must fight back by adding contrast. As darkness contrast is the only kind that counts in B/W,

If you understand what gets lost during the conversion from color to black and white, you'll know why the B/W version at left is so inferior to the one at right.





Images have three kinds of contrast: hue, or basic color; saturation, or purity; and luminosity, or brightness. The first two kinds vanish in B/W. Photoshop layers can be set up for hue or saturation (left and below). If any objects are clearly defined—as the parrot and its wings are—that's contrast that will be lost during conversion. You should be thinking of how to get it back.

that's the kind we have to add. In the right-hand version, the flag gets darker, the sky gets lighter, and it looks more natural. A suggestion of the hue variation has been retained.

Discovering what gets lost

Success in this endeavor depends on three things: identifying what will be lost when color vanishes; deciding approximately what the final result *should* look like; and figuring out how to get there.

In the flag image, the contrast between red and blue is obvious, and it's also obvious that the red is currently the darker of the two. So, we know which to lighten and which to darken.

The parrot also has a red vs. blue issue, but the solution isn't so simple. If the picture were any more complicated, it might be really tough to figure out what needs to be done.

If you haven't done a lot of this before, a good way to begin is with a Photoshop layers trick. Set the image up as two identical layers, but replace the bottom one with bright green—if you're in RGB, $0^{R}255^{G}0^{B}$. The overall image won't look any different, because the top layer takes precedence.

Now, however, we can commence our investigation, by changing the layer method from Normal to something else. This page illustrates what happens when we select Hue, Saturation, and Luminosity. The first two, though blurry, show the contrast that will be lost in black and white.

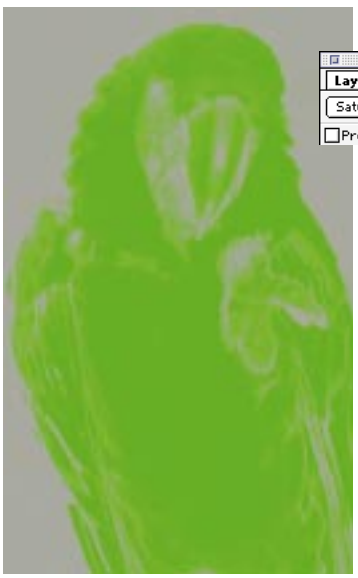
A certain amount of thinking is necessary here. Hue can show worthless variation, such as the blue blotch in the upper left corner of the image. You have to examine this and decide to ignore it. On the other hand, when objects are well defined—as the shape of the parrot is in both Hue and Saturation modes—you can bet that some compensation is going to be necessary.

Two other contrast problems suggest themselves. The blue feathers are well defined in Hue mode, and the parrot's claw is visible in Saturation.

At this point, we have a look at a picture that's black and white and green all over, by switching the layering method to Luminosity—which is another way of saying, black and white. This helps in two ways. First, we can decide that there is already so much contrast in certain areas—such as the parrot's claw against its body—that we don't have to worry about it. Second, it can guide us to the right method of augmenting contrast.

Our two images both present the problem of differentiating something blue from something red. The red flag is plainly darker than the blue sky. In the parrot, however, it's *not* obvious whether the red chest is darker than the blue wings. That's why we often need to look at the Luminosity layer (or the Info palette, set to read LAB values).

Here, we can see that the wings are very slightly darker than the chest. As in the flag image, we need to enhance the difference between the two. And, since we have no hue or saturation to play with in black and white, we'll have to suggest contrast by varying darkness. We'll have to lighten the reds and darken the blues—the opposite of the move required in the flag image.

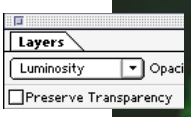


This is, incidentally, why I didn't want to show a color original. The red of a Canadian flag isn't precisely the same as the red of the parrot's chest, but it's very close. And, in the left-hand B/W versions of each on the first page, the two reds are indeed close, which is what one might expect.

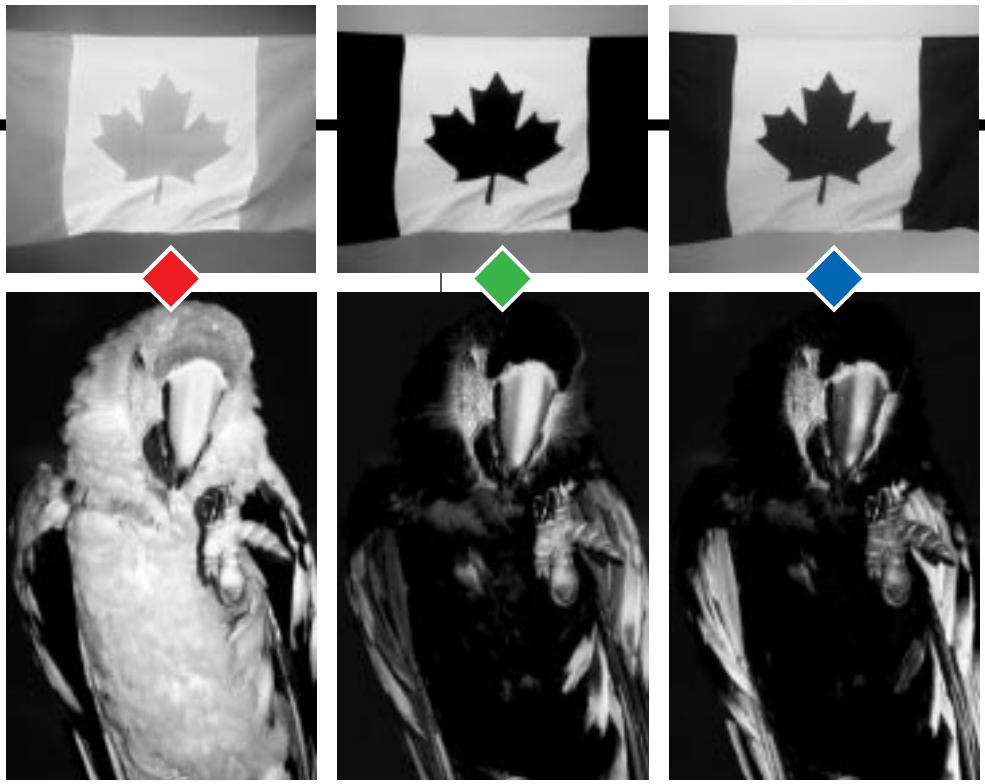
But they shouldn't be! What those reds *used to be* is history. Maybe they were identical once, in a colorspace far, far away. There is no earthly reason for them to be identical now.

Putting a hand on the scale

For black and whites, we need a file with only one channel. Unfortunately, files that are in color start it with at least three. To make the switchover, we could use one of the color channels and throw away the others, or take some kind of average of all the color channels.



The single-channel approach is usually advanced by aging scanner operators, who use the green channel of RGB, throwing away the red and the blue. (Some people suggest converting the file to LAB and trashing the A and B



The conversion to black and white averages the red, green, and blue channels, but they aren't given equal value. The green is twice as important as the red, and four times as important as the blue.

channels, but this is essentially the same as converting to grayscale directly.)

For several technical reasons, using the green is more likely to be correct than anything else. However, inmany cases this is not true, two of which are illustrated at the top of this page.

Suppose that we have to choose the best black and white in each case. In the flag, the green isn't bad, but the blue is better. In the parrot, all three channels are pretty terrible, but if someone points a gun at us and tells us we have to choose the best one, it's the red for sure.

In short, choosing a single channel to work with is occasionally worthwhile. Taking the blue channel only of the flag would work, but taking the red of the parrot would not. Normally an averaging method makes more sense.

That doesn't mean the averaging should always be by the Photoshop formula, in which the green channel is worth around twice as much as the red and four times as much as the blue. Instead, we should be feel free to stick a heavy hand on the scale.

Who's not with the program?

Machiavelli wrote: "A prince ought either to be a true friend or a true enemy, He should stand wholeheartedly behind his friends, and wholeheartedly against his enemies. This is always smarter than remaining neutral."

Although he was not a Photoshop user, Machiavelli would have done just fine with his B/W conversions. Success often depends on finding out who your enemies are, and arranging to have them liquidated, or at least eviscerated.

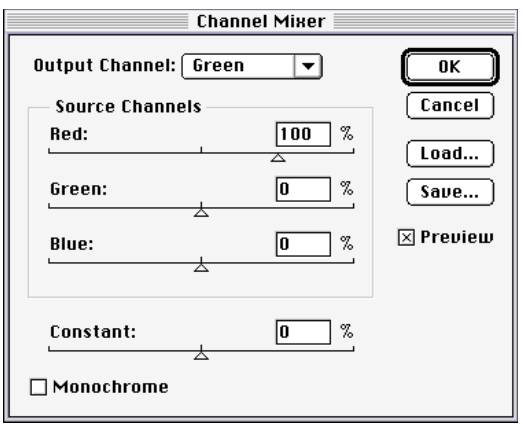
In the flag image, we've concluded that we need to darken the flag and lighten the sky. Unfortunately, the red channel has a different agenda. It is the enemy.

In the parrot, we know that the wings must be darker than the chest. The green and blue channels are on a different wavelength. They need to find out who's boss.

There are many different ways to teach them this lesson. Mostly, it's just a matter of remembering the recipe: four parts green, two parts red, one part blue.

One of the simplest, albeit not the most intuitive, solutions is to switch the position of the channels. Red is twice as important as blue, so switching the good blue with the bad red in the flag will improve matters. Green is twice as important as red, so switching the good red with the bad green in the parrot will give the contrast between wings and chest that we're looking for.

It's easiest to do this with a copy of Photoshop 5.x, which introduced a new command, Image: Adjust>Channel Mixer. As shown below, just define the green as being based 100% on the red, and vice versa.



Photoshop 5's Channel Mixer can add contrast before the B/W conversion. Here, the green channel is replaced altogether by the red.

This method can yield funky-looking results, such as the green parrot on the next page. Plus, my Canadian friends are still sore over an incident in a recent World Series where U.S. forces undertook to display their flag upside down. What will they think when they find out I've made it blue?

To pacify them, the original is alongside it. Even if you don't follow the averaging process, do you see what will happen when these two go to B/W? The blue flag seems to us darker than the red one; the blue sky darker than the orange one.

Variations on a theme

The Channel Mixer isn't the only way to get this result. One could also, for example, save a copy of the RGB original, convert the copy to B/W, and then blend the best original channel into it. For that, one can't use the Channel Mixer, which only works within a single document. Instead, one could 1) paste one channel on top of the other and change the opacity in the Layers palette; 2) use the Image: Calculations com-

Since the red channel is twice as important as the blue in the conversion to B/W, one solution to the flag problem is to interchange them. The right version is strangely colored, to say the least, since it uses the blue channel in the red position and vice versa, but it will also convert to B/W better than the one at left.

mand; 3) (my favorite, because it's simpler) use Image: Apply Image.

This command can also be used to blend channels of color files. To do so, the one we plan to blend into must be displayed on the screen, rather than a composite color image.

The channel to use for the blend can come from any open document with the same number of pixels as the original (such as, obviously, a copy of the file). This differentiates Apply Image from Channel Mixer, which can only blend within a single document.

There is no colorspace limitation on Apply Image blends; we can combine an RGB with a CMYK channel. This capability becomes important as the images get more complex. The flag and the parrot are fairly straightforward; the pinkish parrot alongside the green one below will produce a similar B/W. It was produced by a single Apply Image, 60% of the red into the green.

Complications can arise when a channel we wish to weaken also has critical detail, where the overall range of the image is incorrect, or where there is a sharpening issue. Then, we may need to cross colorspaces. Let's finish with something tougher.

Only you can prevent flatness

The range of the original color photo on the opposite page is OK. The shirts are almost white enough and the ranger's pants are black enough. Nevertheless, the picture overall is too dark, something we'll have to keep in mind when converting to B/W.

Also, here it's not nearly as apparent in the original how much contrast depends on color as it was in the other two images. This is therefore a good time to set up a Hue layer, as on the facing page.

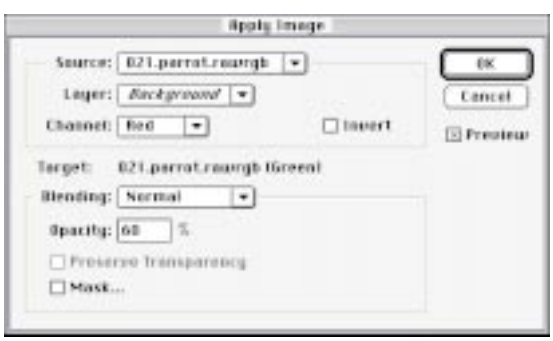
Not much is happening in the foreground, but there's a big color break between the foreground rocks and the background canyon, and an even bigger one between the ranger's head and the sky. We start out with the head being lighter than the sky and the foreground rocks lighter than the canyon. These differences need to be greater.

As usual, one of the RGB channels is not with the program. This time it's the blue, which has the sky lighter than the ranger's hat. As this blue appears to have no redeeming social value, I replaced it completely with a copy of the red, which plainly does better in the critical areas than the green.

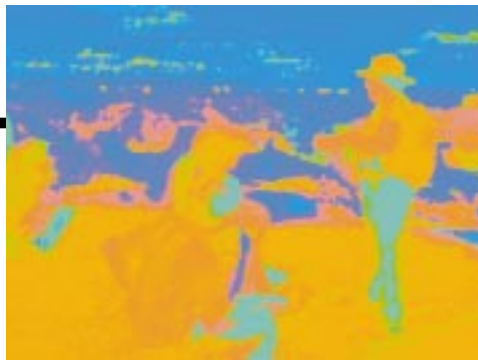
The green has certain detailing in the people that the red lacks, so I was reluctant to kill it altogether, preferring to blend 60% red into it.

Now, to address the lightness issue, I made a copy of the image and converted it to CMYK, using Light GCR, 100% maximum black. You see the resulting black channel here, overly harsh because I sharpened it to death. Sharpening a black channel is often a good idea and sharpening it to death is often a *very* good idea if it is to be used in a blend with another channel, which will soften it considerably.

I then returned to the original RGB, which I wished to lighten considerably. The fastest way to do that, as we know,



Two ways of accentuating contrast between the blue wings and the red chest. Left, swapping the red and green channels. Right, replacing the green channel with a new one that is a 60–40 blend of the old red and the old green. This can be done either with Channel Mixer, Calculations, or (above) Photoshop's Apply Image command.



Converting the image at left to a good B/W depends on finding areas of color contrast. Right, a Hue-layer representation.

is to lighten the green. I did so by blending in 50% of the oversharpened black. I then gave the CMYK file the burial it deserved and converted the RGB to grayscale. You see the result here, next to a default conversion that I daresay you don't like as much.

Advice in black and white

Notice that throughout this column, we haven't mentioned curves or any other standard form of correction. That isn't because those methods aren't effective; indeed, had I used curves here in addition to the blending, the results would have been better.

These methods work in CMYK as well as in RGB. Furthermore, this is not a jigsaw puzzle that has only one solution. You may not agree with the blending percentages I used, or you may use other methods that accomplish the suppression of the poor channels in favor of the contrasty ones.

If you don't do *something* along these lines, however, you are fated to have dull B/Ws. If that isn't in your travel plans, you need to keep only a few things in mind:

·Know what you're losing in the conversion. Examine the original for places where the contrast you perceive is one of color and not of brightness.

·Get away from thinking that this is some kind of literal, formulaic conversion. It's perfectly all right for the same red to be of different darknesses in different B/Ws, It's perfectly all right for your idea of how dark each red should be to vary from mine.

·Similarly, forget a one-size-fits-all averaging method. The three images we've seen here have featured one bad red channel, one green, and one blue.

·And, as in the management of graphic arts firms, you sometimes need to be ruthless. When you encounter an individual—or a channel—with an attitude problem, if persuasion doesn't work, elimination is the next step. Your employees, and your B/Ws, will thank you for it.

The Hue layer shows we need to lighten the ranger's hat and darken the sky. As the blue channel above does the opposite, it, and to a lesser extent the green, need to be suppressed in favor of the better red. Afterwards, moving a copy of the image to CMYK yields a black channel that can be used to lighten the image in further blends. Below, a default B/W and one done the way described above.

Contributing editor **Dan Margulis** *is author of* Professional Photoshop 5. *He can be reached at 76270.1033@compuserve.com. For information on his color-correction tutorials, or to join his on-line color discussion group, visit www.ledet.com/margulis.*