The Great
Imaging Equalizer

Topics: The Auto Levels command (Auto Tone today) and why it works so well—sometimes. How a correct choice of white and black point is vital to the success of a correction.

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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 a hundred edited threads from Dan's Applied Color Theory e-mail list.

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With a single, three-second command, a novice can transform a lousy image into a professional-looking one—some of the time. Understand the principle that makes this crude method work and you're well on the way to good images *all* the time.

It happens to very good bridge players. It happens to very good chess players. It happens to very good office politicians, very good stock market analysts, and very good journalists.

In short, it happens in any competitive activity involving skill, and when it does happen, it is roughly the most frustrating thing in the world. I refer to the fact that on occasion a skillful player loses to some lout who has no clue what he's doing.

In our own profession, the equivalent occurs in an area that many of us take pride in: the appearance of our images, whether in print, on the Web, or elsewhere. Many of us are reasonably accomplished at bringing out the best color and detail. It's most annoying, then, to labor over an image and then have somebody who knows nothing whatsoever about Photoshop come along and do a better job in seconds than we did in half an hour.

There is only one way a novice can do so, and that is with a command scorned by the righteous and the knowledgeable, at whom this column is normally aimed.

Said knowledgeable have been bombarding my e-mailbox with requests for advice on resurrecting lousy images. This is not a great surprise, in view of the massive increase in the number of poor images that many of us are now forced to deal with.

I will oblige these people in my next column with some effective maneuvers that seem very sophisticated. *Anybody* can understand them, however, provided they grasp why the amateur move sometimes gives better results than would-be experts get.

Contrast, contrast, contrast

No doubt, the bottom image of the Grand Canyon has a lot more contrast, profundity, bite, snap, pop, and depth, And, since the color is within reason, the whole world will like this version better than the hideous original.

This correction was done in roughly three seconds by applying that amateur command to the file. (For the record, I am working entirely in RGB in this column, converting to CMYK only at the last minute, but the choice of colorspace really doesn't matter.)
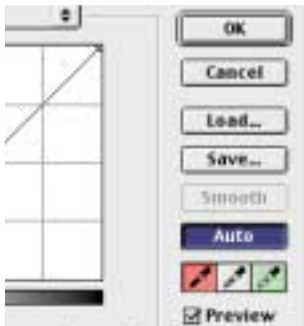
The command in question is Photoshop's Auto, which is found either in the Curves or Levels dialog box. It is also used, with somewhat less scintillating results, on the series of circles on the right. The top target represents the original image. The second, fourth, and fifth versions are all reasonable shots at improving contrast. The one that stands out like a ripe banana on a pile of coal was produced by the Auto command.

Such spectacular changes occur because the Auto command ignores color altogether. Its strategy is to maximize contrast in each channel. Translation, remembering we are talking about RGB: somewhere, it will force minimum red into the picture, and somewhere else maximum red. Ditto for green and blue.

This method works brilliantly in an image like that of the Grand Canyon, because as it
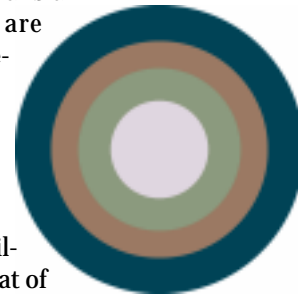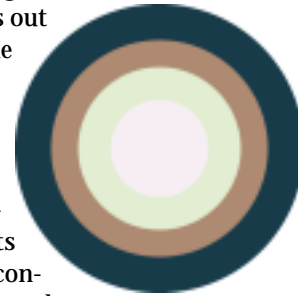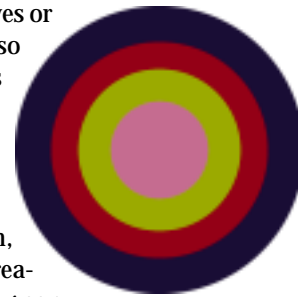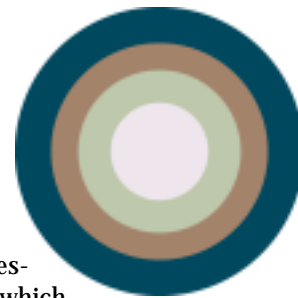
Left: Photoshop's Auto command makes a sizable improvement in seconds. Above, the flip side: Auto can produce substantial color changes. The top target is the original; of the four "corrected" versions, the Auto is the one with the weirded-out colors.

happens the brightest point for all three channels falls in the same place. The lightest clouds are the lightest part of the image. Being clouds, they should be white, meaning, equal (and maximum) amounts of red, green, and blue light.

In the original, although they *should* be white, they aren't; they're yellow. The blue channel is not maxed out. Nevertheless, this is the lightest part of the blue channel anywhere in the image, so the Auto command jacks it all the way up. In doing so, it color-corrects the image, making what was a yellow cloud a white one.

The dark point works almost as well. The red and green channels are darkest in the signpost; the blue in the sign itself. Close enough. Zeroing out each channel at its darkest point works well—in this particular image.

This accidental correction of color, however, isn't the big gain. A popular fallacy in our industry is that the idea is to "match the art." In reality, the idea is much more to match the contrast and detailing of the original than it is to match its color. That's the big ad-

vantage of Auto—provided it doesn't actually make the color worse.

In the target series, it does. Here (since the white background is actually part of the image) all three channels max out in the same place, outside the target. Unfortunately, having found its white point, Auto now requires each channel to have a dark one as well. That means zero red in the outer, blue ring, no green in the next, red ring, and no blue in the green ring.

Pumping up the colors in this way makes everything darker and more vivid. The other three "corrections" are all more in the spirit of the original.

The point where all converge

This kind of color catastrophe will also occur in images that start out with a serious color cast, such as the theater picture at top left of this page. The center version is what happens when we trot out the Auto command.

This purplish mess came about because none of the three channels have the same endpoints. This is a particular problem in the background. One would think it would be close to the darkest point in all three channels. It is—in the green. The red is close, but is actually darker in the woman's hair.

The blue, however, is darkest not in the background, but in those wildly yellow belt buckles, which are about as anti-blue as could be imagined. Therefore, there's plenty of blue left over to contaminate the background and make the result look even more ridiculous than the original, if possible.

There's also no agreement on the light side. The green is brightest in the belt buckles, but the red is brightest in the man's left hand. The blue is brightest in the path in front of the background church, which therefore becomes a lovely cyan, rather than the white it probably should be.

Last time, this column discussed how to retain the sensation of color in a black and white image. Now, a lesson in reverse: a color image normally needs a little black and white if it is to be successful. The dark point almost always needs to be a *black,* neutral point; the light point is more various. Often it needs to be a *white* point, and almost as often it doesn't.

A slight variant of the Auto command can evade these difficulties. The right and left eyedroppers at the bottom of the dialog box allow us to make intelligent decisions about the the neutrality of our light and dark points.

These eyedroppers allow us to click on the exact points of the image that we wish to establish as white and black. (What we mean by *white* can be redefined by double-clicking on the eyedropper; by default, it's a pure white and a pure black, which is OK for the Web but bad for printing.)

For the right-hand version, I clicked in the woman's hair for the black point, and in the church beneath the man's red jacket for the white point. This doesn't make the image a work of art, but it's clearly better than the original, which the center version is not.

Establishing neutral white and

black points, as opposed to light and dark ones, is so effective that you might wonder why the Auto command doesn't do it. Actually, doing so with the dark point would work well in the large majority of images. It would have saved the middle image here.

But the darkest point in an image almost always *should* be neutral. The lightest point is another story. Often it should be white, as in the canyon image. But the lightest point of the theater image happens to be the belt buckles. Imagine what would happen if Photoshop forced *them* to be white! When I tried it with the eyedropper tool my monitor blacked out and the synthetic voice in my G4 began to beg for mercy.

Give me your tired images

Making a better stab at a white point distinguishes a more sophisticated correction algorithm, such as that used by Extensis Corp.'s Intellihance, from something as primitive as Auto. But even the best software can't be as certain as we are about what is supposed to be white. Human intervention does better. The big reason has little to do with whiteness or blackness.

Color experts know how important

a full range is. They therefore are punctilious about setting white and black points, although, for greater cachet, they tend to use the terms *highlight* and *shadow.* If pressed, they will come up with technical definitions, such as, the highlight is the lightest significant white point of the image, except for reflections and objects that are light sources themselves.

That's all well and good, but the significant word is *significant.* In the Statue of Liberty picture, the Auto move does improve the image, but it falls well short of the version done with the eyedroppers.

Notice the sloppy cropping of these images, leaving a strip of black margin at the bottom where the sprocket of the film was. This should give a clue as to what has gone wrong.

The Auto command does not read minds. It doesn't know that the black strip isn't really a part of the picture. It sees only a gang of black

pixels, which it happily sets to be the dark point in all three channels.

No advanced degree in astrophysics is required to realize what lousy judgment this is on Auto's part. Things outside of the image need not be taken into account. Many people, however, won't take the next step, which is to say that things *inside* the image shouldn't be taken into account either, if they are things of no importance.

There are whitecaps in the water. Also, some of the pedestrians around the statue are wearing white shirts. The Auto command finds these small areas, and makes one of them the light

The Auto command has no sense of priorities. It creates (upper right) a much better version than the original, bottom left. But it is too literal; it chooses (orange arrows below) a white point in the water, and a black point in the film margin. Choosing more significant points (green arrows) gives the image more contrast where it counts (lower right version).
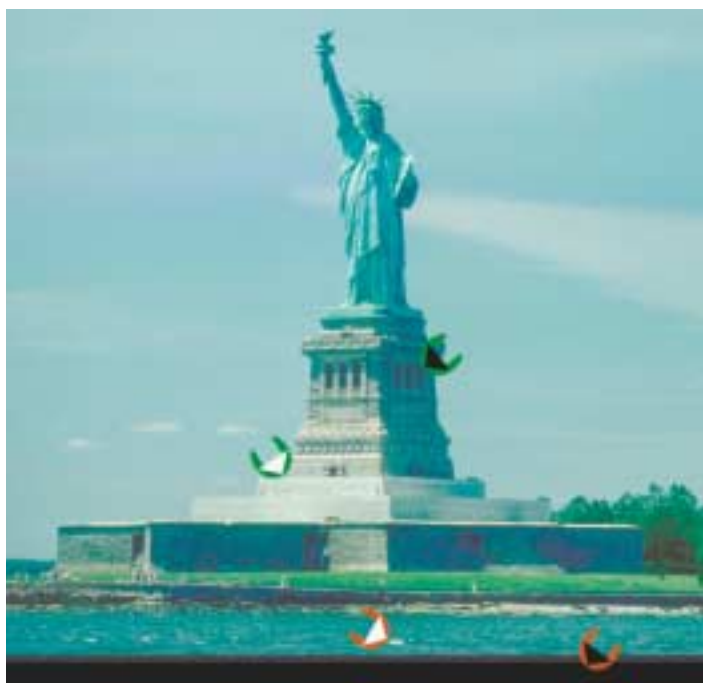
Good color correction depends on contrast allocation. An Auto correction (above right) is much better than the flat original (above left) but not nearly as effective as a curve that gives more real estate to the aircraft and less to the background (left).

point, or, more accurately, the white point, since all three channels converge here, as they do in the black point in the margin.

Those whitecaps and shirts, in my opinion, are as irrelevant as the margin. So, I ignored them. I clicked the white and black eyedroppers in *significant* areas of the picture.

Taking off for more snap

As you may know, I am pretty serious about color correction, and would be as likely to use the eyedropper tools in a live job as to jump out of the airplane shown above with or without a parachute. And indeed, these "corrections" of mine are pretty bad, in the overall scheme of things. I didn't eliminate the all-pervasive yellow in the theater image. And the statue image is too blue, because the point I chose to be white should actually be somewhat brown.

Yet all improve on the original, in terms of contrast and detail. Furthermore, they illustrate a basic technique of color correction, and hint strongly at more advanced methods.

Setting the highlight and shadow properly is very important if going to the Web, and absolutely fundamental

in going to print. How fundamental? You'd be surprised. I know I was. I teach hands-on color-for-print classes that draw many photographers. In photography, use of a full tonal range isn't mandatory, so some photographers blow off the idea that it's essential in print work—for a little while.

It turns out that no matter how experienced with images, no matter how good the artistic conception, no matter how expert at Photoshop, a person who doesn't know the white point-black point trick almost always loses to amateurs who do.

While picking the light and dark point is to some extent monkey work, allocating contrast is not. That's the real secret. Look back at the target images on Page ⚫. Forgetting the ridiculous Auto version, there are three plausible renditions of the flat original. Which one is right depends on where we want the contrast. The bottom variant emphasizes the disparity between the two inner rings. The one above it favors contrast between the next two rings. And the second from the top is nonpartisan: it adds contrast uniformly.

Arranging for contrast to fall in the important areas of the image is merely a variation of the Statue of Liberty technique. There, with the eyedropper tool as an accomplice, I told Photoshop a wicked, wanton whopper. I said that the base of the statue was the

whitest point, knowing perfectly well that the whitecaps and the white shirts were whiter.

This, er, white lie could be justified by an artistic determination that detail in the truly whitest areas is unimportant and can be wiped out altogether. I don't actually agree with this; on a live job I would be more careful.

A more usual scenario is that certain areas can be suppressed somewhat, but not completely. Here, the plane has obvious white and black points, so Auto, as you can see, does well, as well as I could do with the eyedropper.

And yet it doesn't quite fly. The third version focuses attention on the aircraft in a more convincing way that can't be done either with Auto or with the eyedroppers. People hire professionals to do this kind of correction because it is thought to be a horrifyingly complex technique. It isn't; it's rather easy, in fact, *if* you understand why the Auto command works some, but not all of the time.

We'll get into that next time. Meanwhile, if you think a lot of your correction skills, every now and then try comparing them to the results you would get by simply using Auto. And if you get an unpleasant surprise, try analyzing what it is that Auto is doing that you are not. Once you get it, you'll never lose to an amateur again.

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