

The Case of the Counterfeit Color

Topic: A reader complains that he believes a service bureau is sabotaging his work. Dan investigates, with the help of some of history's most famous detectives.

Column first appeared: February 1996, *Computer Artist* magazine.

Source of this file: A revised and expanded version of the column, as it appeared in Dan's 1996 book *Makeready*. We've made the question-and-answer section of this chapter available as a second downloadable PDF.

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.

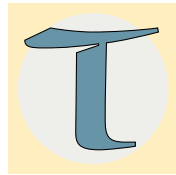
Copyright© 1996, 2007 Dan Margulis. All rights reserved.



3

The Case of the Counterfeit Color

We all know that color separators dislike computer artists. But would they actually stoop to sabotage? Don the deerstalker, get down the glass, scope out the clues...



The mysterious words scrolled up the screen, having emerged from the electronic ether on a foreboding night, full of thunderclaps. *Can you help me flesh out a conspiracy theory I'm working on?*

What a promising start to a message! Everyone loves a conspiracy theory, and everyone loves a good detective story. I would gladly give up all my color knowledge for a few months of being Dalglish, Poirot, Wolfe. Did the stranger who sent the message know this? Let's get back to his recital of facts.

The Theory: "traditional" color separators, threatened by encroachment of desktop systems, purposefully screw up my data when I give them a separation file made in Photoshop.

The Evidence: Almost without exception, files I generate look great when output at a service bureau. Bright, lively, punchy. Exactly what I expect. The same files, when run through a traditional system, look flat, drab, and washed out.

I do retouching for ad agency clients, and I've never had a job bounce when run at a service bureau (the plates seem to run fine at the pubs as well).

Figure 3.1. *Gray component replacement (GCR) alters the balance between black and the other three inks. For each of the two color images at left, either of the black plates shown can theoretically work; if you want a heavier black, you simply reduce the other three colors in more or less equal quantities. As a practical matter, though, one of these images should take the heavier black and the other one not. Do you know which?*

Send the file to a separator, and they invariably come back with a flat proof and an explanation that the separation is inferior. Everyone feels that the “flat” proof is a poor separation, and typically the separator wants to punch up the color on the Scitex, or the client asks me to output to chrome (I work in RGB) so he can have the separator scan the chrome conventionally. Usually THIS sep looks like the one I get from the service bureau from my CMYK file (bright and punchy). Then the separator makes a few smug remarks about “artists doing seps,” and my customer thinks I don’t know what I’m doing. Any idea what gives here?

A press does not behave like a computer. It behaves like what it is: a powerful, fast, and dangerous combination of machines, not conducive to great precision.

That is a fairly complete statement of the case, containing critical clues surrounded by a morass of irrelevant detail. Ellery

Queen, at this point, would issue his Challenge to the Reader, saying, “by the exercise of strict logic and irrefutable deductions from given data, it should be simple...the deductions are natural, but they require sharp and unflagging thought.”

With that in mind, gentle reader, can you now solve the case of the correspondent’s counterfeit color?

Starting off with a puzzle is a time-tested way of suckering the reader into paying attention to a boring topic. Seldom has the device been used more shamelessly than here, since the subject of this column is dot gain. So, let us temporarily set aside the question of whether the separators of this world are engaging in sharp practices against computer artists, and move to a consideration of some of the grim realities of the printing process, and how to take advantage of them for best results.

Getting good printing largely depends on understanding that a press does not behave like a computer. Rather, it behaves like what it is: a large, powerful, and dangerous combination of machines, full of cylinders, fountains, bolts, and rapidly moving gears and parts of all descriptions, all dedicated to smearing large quantities of several varieties of ink and water–alcohol solution at great speed under less than spotless conditions to paper that is flying through it at rates in the five figures of sheets per hour.

Such a beast is not conducive to great precision.

Despite continuing quality improvements, the press is still, by far, the source of the most variability in our entire production process. Worse yet, it comes at a point where we don’t want much

variation. Consider, in the context of getting a photo into print, where we want precision and where there is a little leeway.

It is not at all necessary, to start with, for a photographer to be able to shoot exactly the same exposure tomorrow as today. Creativity is part of the process here, and we understand and accept that there will be individual differences of approach on similar shots.

The photo lab that processes the chromes, on the other hand, is not a place where we would like creativity to creep in. Instead, we want consistent, repeatable results. By and large we get them, but as with any process that involves film and chemicals, there will be some day-to-day variation.

We now proceed to scan and correct the photo, and here again some human variation is acceptable. There is a huge difference between the color range of photograph and press. If we do not compensate at this point by methods such as unsharp masking, our reproduction is going to look flat and blurry—much like what my correspondent thinks the separators are doing to him on purpose. Some tonal correction is almost always desirable, and how much this is will be decided by a human being whose judgment may vary from day to day.

At this point the finished scans are placed in a page makeup program and sent off to a RIP. These digital steps are conceptually perfect. Tomorrow's repetition of today's work ought to yield exactly and precisely the same results, unless some brain-dead user runs the photos through EfiColor one day and not the other.

The last steps before the pressroom are pulling and processing film, and then making a contract proof such as a Matchprint or Cromalin, or sometimes a digital proof such as an Iris. As with the photo lab's work, this is a place where we don't want variation. It occurs to some extent nevertheless. Cromalins made from the same film on successive days will look slightly different, and they will surely look different from Matchprints.

We call these *contract* proofs because they actually serve as the contract between client and printer as to how the finished job is supposed to look. All these proofing methods aim at duplicating what is likely to happen when ink hits paper. To lapse into lingo for a moment, they have their dot gain built in.

In principle, we would like to be able to replace the pressman with a monkey. Unlike the scanner operator, who must visualize how to take a vivid photograph into a smaller, drabber

The incompatibility between proofing systems is getting worse, with the introduction of dye-sublimation printers that are accurate and controllable enough to be used for contract proofs. Cromalins and Matchprints are both film-based proofs, and they still don't match one another. Iris is a different kind of proofer still, a high-quality ink jet printer.

colorspace, a pressman has a perfect map of what is expected, in the form of a proof carefully prepared to his requirements, so that he can match it without any artistic interpretation.

And yet, this whole brilliant system can fall to pieces because of the vagaries of the pressroom. Film changes with age and storage conditions; chemistry, despite the automatic replenishment systems found in graphic arts processors, also varies in potency from hour to hour. But a press? Forget about it! The type of press, the paper, the temperature; the humidity; who manufactured and who mixed the inks; what rotation they are being printed in that day; how well the units were washed, if at all, prior to running our job; how fast the press is being run; the brand of imagesetter and whether it was imaging positive or negative film; the state of the fountains and the dampening system; and, most important of all, the skill of the pressman and whether he is in a good mood that day—these are just some of the variables.

Calibrationists are wont to say that the job of the proof is to predict the press conditions. That is about as achievable as knowing what the weather will be like three weeks from next Friday. No, the job of the proof is to give the printer something to try to adjust the press to.

Asking the printer to match the unmatchable, however, is unreasonable. We cannot give him output from a color copier—which is capable of more intense colors than can be attained on press—and ask him to match it. And, if the press is as unpredictable as the weather, well, the weather is not *totally* unpredictable. I live in New Jersey, where it frequently reaches 80 degrees. I am nevertheless confident, extremely confident, that it will not do so three weeks from Friday. It never has, in February.

The Mystery of Dot Gain

To say that dot gain is one of the most misunderstood topics in our industry is to indulge in a cosmic understatement. Few *printers*, let alone computer artists, have more than a fuzzy comprehension of what it is and what its ramifications are. I have had more requests from readers to write on dot gain than on any other topic relating to image reproduction, and have up until now avoided doing so for fear of making a highly confusing situation even worse. But, since this is a column of detective work, we may as well wheel out the topic here.

[Time out for a reminder. Have you already come up with a

solution to the bizarre charge of sabotage by the separator? If not, remember what Holmes said: “As a rule, the more bizarre a thing is, the less mysterious it proves to be.” Now, back to our regularly scheduled program.]

There is no reasonable way of discussing dot gain except in conjunction with other press phenomena, all of which conspire to make life worse for us when we print our images on lousy paper. Let us, therefore, go over the reasons, of which dot gain is but one, that we should not be surprised when an image printed on, say, newsprint, fails to look like (or as good as) the same one printed on a coated sheet, or the proof, or our monitor.

When ink, or, for that matter, any kind of liquid, hits paper, a certain amount will lie on the surface but a certain amount will be absorbed into the sheet. This absorbed amount will spread away from the area where the liquid originally hit.

Generally speaking, the worse the quality of the paper, the more absorbent it is. If you would like to test this for yourself, you can do so with a cup of coffee, a magazine, and a copy of your local newspaper. Spill one drop of coffee on each periodical, and see how much wider the brown stain gets on the newsprint.

If we are printing halftone dots, with ink instead of coffee, the same thing will happen. We will perceive the dots to be larger if they are printed on poorer paper. This will make the image appear darker overall. Thus, dot gain.

Suppose we have a sample printed on a fine coated paper. What differences should we expect if we go to a lesser sheet? There are four major ones I can think of, each with a different impact—and each, in its own way, a form of dot gain.

1. **Real dot gain in the midtones.** The lesser paper will have more of it. If you are mathematically inclined, you can work out the theory that suggests that it will be most noticeable in dots that originally range between 50 and 70 percent, the midtone and three-quarter tone, in other words. On the poor paper, these tones will appear darker than on the good stock.

2. **Counter-dot gain in the shadows.** Dot gain fools the eye into believing the image is darker by removing some of the white space between dots. But what if there is not that much white space to begin with? On a poor paper we may perceive that shadow areas have become solid, with no space at all between dots. You would think that would mean deep shadow areas would seem darker on a poor paper just as the midtones

would be. It isn't true. When a *lot* of ink is hitting the paper—and in shadow areas, it is—what we perceive as darkness is based less on dot diameter than on how much of that nice glossy ink sits on the surface of the sheet instead of being absorbed. And on a fine sheet, that is what most of the ink will do, and the shadows will look *darker* than they would on newsprint, dot gain be damned.

3. **Pseudo-dot gain in the quartertones.** Although, as indicated above, dot gain is theoretically greatest in the midtones, we see it as being heavier in the quartertones. This perception is caused by an even more important factor than dot gain: the underlying color of the paper.

A poorer-quality paper usually is not as white as its more expensive counterparts. This has profound implications. Since we can't produce a color in our image lighter than the paper itself,

we are stuck with a smaller color range, and will get flatter-looking reproduction.

Starting with a grayish paper is roughly equivalent to adding, say, 10C10M10Y to whatever colors we happen to be calling for. Adding ink in equal quantities will emphasize the ink that had the lowest value in the first place.

Thus, if the color is green, the gray paper

will seem to add magenta to it; if the color is blue, it will seem to add yellow.

Professionals and color scientists usually call said lowest-value ink the *unwanted color*, or the *contaminating color*. Those terms sort of sum up its function. What it does, obviously, is make every pure color look muddier.

4. **Human dot gain throughout.** How heavily the ink flows onto the paper is obviously critical. That flow is controlled by the pressman. If it is different from what is anticipated, this will have more of an impact on the image than the other three factors put together.

An inking deviation in one or all colors can be the result of carelessness, or the pressman may be doing it on purpose. Either way, the move will probably be toward more ink, not less.

A pressman adjusts ink flow globally or in selected portions of the sheet to make the job as a whole look better. As an aid in this process, virtually all jobs will have a quality-control bar like that of Figure 3.2, which can then be read by a densitometer.

Dot gain can only be understood in the context of other press phenomena, all of which conspire to make our lives difficult when we print on lousy paper.

Densitometers, though, are dull, prosaic machines. They are not to be relied on for sensitive judgments, for they lack that most fundamental of human visual skills: the ability to evaluate color in context. They may be able to measure that the press sheet densities match the densities of the proof—but that doesn't mean the two will *look* alike. For that, one needs a person—and the person will make adjustments.

Whatever adjustments are made cannot isolate an element from whatever happens to be printing above and below it. Design and layout, therefore, may determine ink flow to our image. If, for example, the typeface is Baskerville or Bodoni or anything else that features thin strokes, bet on the pressman increasing black to avoid washing the letters out. The fact that this excess ink may also muddy up an image will seem to him the lesser of two evils.

These interventions by the pressman are as predictable as they are purposeful. We can compensate for them. But what if the change in ink flow is inadvertent, a mistake? If we have no clue what the pressman is going to do, we can't adjust, can we?

Yes. Yes, indeed. With a little forethought, we *can*.

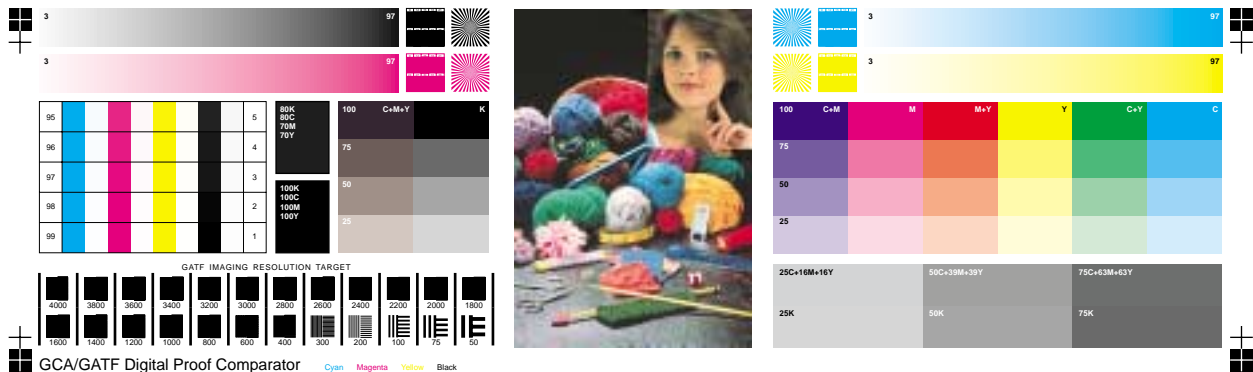
Figure 3.2. A pressman can use a densitometer on this quality-control swatch to find out if inks are coming down at appropriate levels, but the numbers don't tell the whole story. Many prefer just to make the picture of the young woman look good, assuming that this will compensate for intangibles such as the underlying color of the paper.

The Photoshop Response

Of these factors, Photoshop's dot gain compensation scheme only addresses the first, which is the least important of the four.

Increasing Photoshop's dot gain setting (through Edit>Preferences>Printing Inks Setup) doesn't change the actual CMYK file, but it does alter the monitor preview. It does so by increasing the displayed midtone value, darkening the image overall.

This crude method does not really do justice to the complex interaction of factors described above. True, in a heavy dot gain



situation, the image *will* look darker overall, but that is not nearly all that will happen. Accordingly, even if you have tweaked your monitor to the point that you trust it slightly for normal commercial jobs, just raising Photoshop's dot gain setting will *not* give you an adequate preview of how a file is going to print on poor paper.

By default, Photoshop uses 20 percent dot gain. This figure is not the amount by which the dots increase in apparent size. Instead, unbelievably, it is the absolute amount that a 50 percent dot in film will appear to increase by on press. (Adobe cannot be blamed for using this absurd method of expressing dot gain; it is in fact the industry standard.) Twenty percent dot gain means, a 50 percent dot will look to the viewer like 70 percent.

Most of the time, a poorer-quality paper is not as white as its more expensive counterparts. Starting with a grayish paper will make every pure color look muddier.

If 20 percent seems extreme, actually it is rather conservative. By this definition, a dot gain of less than 15 or 16 percent is unheard of even under the finest printing conditions, and 20 percent is somewhat low even for commercial sheetfed printing. 25 percent is more like it for magazines, and newspapers will be 30 percent or even higher.

These figures are subject to huge variation on any given day. SWOP, the industry-sponsored organization that suggests technical standards for publication printing and prepress, says dot gain in a magazine is typically 24 percent in cyan and magenta, 22 percent in yellow, and 28 percent in black. More ominous, though, is the uncertainty: plus or minus four points for any or all of them.

For magazine work, therefore, plan for dot gain to be anywhere from about 21 to about 29 percent. That is an enormous range, as Figure 3.3 indicates.

We should not, however, throw up our hands and say it's hopeless. We can't predict the exact temperature in February, but we can state with some certainty what it will *not* be. It will not be in the 80s. Shorts and golf shirt will not be suitable attire.

In exactly the same way that we can select our clothing intelligently for some future date, without knowing precisely what the weather will be, we can take measures in preparing our images that will cater to the likely problems that we will meet on press, without knowing specifically what they will be.

Figure 3.3. An industry standards group estimates magazine dot gain at between 21 and 29 percent. That's a huge range, shown top and bottom left. But in high dot gain situations, Photoshop's preview is not accurate: at bottom right, a more plausible version of how an image might look printed in a newspaper—if we don't take the steps needed to save it.



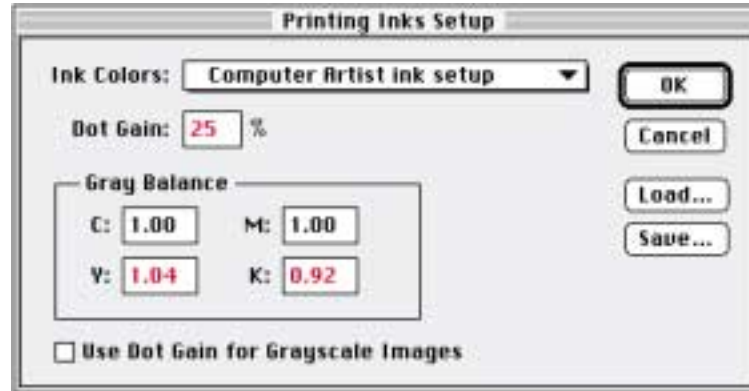
The Artist Strikes Back

If you work for a newspaper, or otherwise have to deal with poor press conditions on a day-to-day basis, you can customize your process to a considerable extent. Here, please assume that you have not done so, and that you have a color image that you believe will print well under high-quality conditions. However, you have to prepare it for a high-dot gain situation, and you have no satisfactory means of proofing.

Given these unfortunate circumstances, here are my recommendations.

1. **Use the best Printing Inks Setup.** Photoshop treats all inks as equals for the purposes of dot gain adjustment. This is notoriously incorrect. Compensate by using the values shown in Figure 3.4, adjusting the overall gain up or down depending on what sort of printing you are doing. If you are in CMYK to begin with, this will affect only the appearance on the monitor, but if you start off in RGB or LAB, it will (favorably) affect the separation to CMYK. If you have ever thought to yourself that Photoshop gives muddy-looking separations, the

Figure 3.4. Photoshop's default Printing Inks Setup assumes that dot gain is the same in all colors. It isn't; these values should give better results for magazine work. For higher-quality applications, the overall dot gain percentage should be lower, and for newspaper work, it should be higher.



main reason is its defaults: a) the GCR setting gives more black than is customary; b) overall dot gain is assumed to be too low; c) no account is taken of the fact that dot gain will be heavier in black than the other three inks. Mix these three ingredients together, and you get mud.

2. **Drop the midtone in CMY.** In a high-dot gain situation, there will be a drastic loss of contrast in the darker ranges of the image, worse than shows up on your screen display. If nothing of importance in the image has detail in the shadows, fine. But if there is significant detail that you wish to save, lower the midtone in all colors except black. This can be done either through the Levels or the Curves command. Of course, if you know of more accurate ways to exaggerate contrast, use them by all means.

3. **Increase saturation.** Open Photoshop's Image>Adjust Hue/Saturation and add 10 to 20 points to general saturation, as in Figure 3.5. This move may be excused for being so crude by the fact that it works. Recall that Photoshop does not compensate for the underlying grayness of the paper. This means that the colors you see on the screen will be cleaner than what you get on press. Compensate by making the screen preview seem lurid.

4. **Use GCR intelligently.** GCR—the substitution of black ink for some of the CMY inks—can be an antidote for human dot gain of the unintentional kind. Although we cannot control what an incompetent pressman will do, we can make damaging our job a lot tougher for him by asking ourselves the following question: Would it be worse for this image if it prints too dark, or if it prints with a color cast?

In the frogman of Figure 3.1, too much black would be a disaster. Everything depends on holding detail in the dark areas of his suit, and if black for whatever reason comes down too

heavily quality will go to Davy Jones’s locker. Too much of some other color would not be nearly as bad, since we don’t have much color perception in objects this dark. The image of the bride, on the other hand, will be badly damaged by a color cast, and not so much by just printing darker. If a bridal gown is not supposed to be *white*, it’s hard to know what is.

We take the bomb out of the pressman’s hands, therefore, by using GCR in the lighter image, but not in the darker.

5. **When in doubt, assume the worst.** The pressman is more likely to run the inks too heavy than too light. If he sees a washed-out image, he is *sure* to do it, a nice safety belt for us. Cater to it by assuming a dot gain that’s on the heavy side. For magazines, use 25 percent.

Figure 3.5. *If the paper is not very white, more than contrast gets lost. If the paper is gray, the impact is similar to adding small, but equal, amounts of all three CMY inks to the image. And if equal amounts are added to all three inks, whichever of the three was weakest to begin with will be helped the most. The weakest ink is the contaminating, or unwanted, color. Therefore, if the paper is gray, every color will appear dirtier overall on paper—but it won’t on your monitor, since Photoshop doesn’t alter its display to compensate for paper color. Therefore, assume that your monitor is showing you cleaner colors than you will get, and clean them up more. Increasing saturation, right, is a crude but effective way of doing this.*

J’Accuse!

The time has now come to name the culprit. You remember: the correspondent accused separators of sabotage, since his files seemed to look much better when a service bureau handled them.

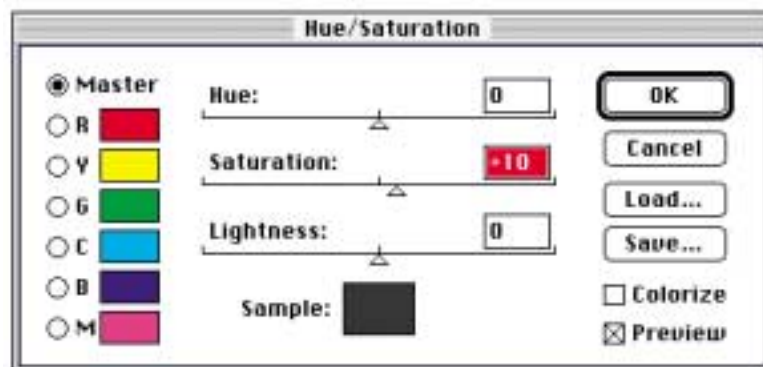
I will resist the temptation to call this case “elementary,” and cut to the chase. The printer did it.

Say *what?*

How can this be? How, and why, did *he* get involved?

“If a thing could only have been done one way, and if only one person could have done it that way,” replies Lord Peter Wimsey, “then you’ve got your criminal, motive or no motive.”

Confronted with work from the separator that looks much worse than the service bureau’s, the writer suspects the obvious, that somehow the files were the victim of foul play at the separator. Not too likely, in my opinion: in the Scitex workflow,



such sabotage would be quite inconvenient, not to mention dangerous as all get-out. Additionally, since the writer appears to use more than one separator, this theory would require a wildly improbable conspiracy. When we hear hoofbeats in the distance, we detectives think horses, not zebras.

The writer said, "*the plates seem to run fine at the pubs as well.*"

"At such moments," says Poirot, "the brain should be working feverishly, not sinking into sluggish repose. The mental activity, it is so interesting, so stimulating. The employment of the little grey cells is a mental pleasure. They and they only can be trusted to lead one through fog to the truth."

When I heard about the pubs, I knew that the printer was guilty. And my proof? Well, the proof is the proof, in this case.

How do you think the writer came to his conclusion that the separator's work was worse, by consulting a crystal ball, or what? Of course not! He believed the evidence of his own eyes, examining the contract proofs from both sources. His mistake was in believing that the two proofs were in any way comparable, and that is how the color-killer got away.

Contract proofs have to behave like presses if printers are to be able to match them. Manufacturers therefore build in a compensation for dot gain, so that the color in their proofs becomes heavier than in the film, just as happens on press.

By default, though, the proof is calibrated to commercial printing on good paper. The base paper of the proof is a brilliant white. Dot gain, although there, is low.

This is the kind of proof that, I deduce, the printer asked the separator *not* to supply, because it would not be possible to match it under publication conditions.

For magazine and lower-quality work, such a proof leads to overoptimism on the part of the client. The printed result is fated to be flat and disappointing by comparison. One can't ask the printer to achieve a color whiter than the paper.

Accordingly, all of the manufacturers of contract proofs offer other options. The base can be white (commercial), off-white (pub), or gray (newsprint). The dot gain can be established as low, moderate, or heavy. Magazine printing presumptively has off-white paper and moderate to heavy dot gain.

A separator works more closely with the printer than a service bureau does, and often is told by the printer what kind of proof to make. The service bureau may not even know that its

client intends to use his color in a magazine. Unless specifically told otherwise, a service bureau will make a commercial proof.

The separator, on the other hand, will keep the printer happy by providing a pub proof for what it knows to be publication work. Compared to the service bureau's, it will indeed look "flat, drab, and washed out"—just as any image on pub paper will, next to one that appears on stock twice as expensive.

The service bureau's proof looks nicer, but the separator's proof is the one that reflects reality.

So, there is no conspiracy among the separators, but we may have to credit the separator's derisive remarks about "artists doing seps." If the separator can "punch the color up on the Scitex" and get better results than what we supplied, well, then, what we supplied must not have been so hot.

The poorer the quality of printing, the more important pre-press skill becomes. Compensating for heavy dot gain is an art. The better separators can squeeze every ounce of contrast out of an image. But it isn't because they have a Scitex system; it's because they are doing something similar to what I have suggested here. It is skill, not equipment. If their work is better than ours, let us tip our hats, and resolve to do better next time.

In color correction, each image is its own mystery. The best color detectives find clues, draw the logical conclusions, take the necessary steps. Conspiracy theories are unnecessary, extraneous, pointless. The true solutions are out there, waiting for us to discover them. ●

Afterword

Calibrationists and computer artists alike are very reluctant to accept how much variation there is in offset printing. If you are one of these skeptics who thinks that a press is merely an overgrown version of a composite color printer, and just as easily managed, I have arranged a small demonstration.

Some of the pictures in this book print in more than one place. Image-setting, processing, and platemaking

conditions should be virtually identical, as are the digital files. The press is the only variable. Two of the seal pictures in Figure 2.6 are repeated in Figure 2.7. These figures fall on the same press signature, which means they were printed at the same time by the same press crew. I still expect differences.

The two variants of the little girl in Figure 6.3 also appear in the Epilogue, as images D and F. These *don't* fall on the

same signature, and I am betting on even more variation, vastly more than you would get on any any two competing brands of contract proof, or for that matter, than between the alternate versions shown in Figure 6.1, which are *not* identical, yet have the advantage of appearing directly below one another, so that whatever ink settings are in use for one will affect the other.

We'll see what happens. My money, as I say, is on substantial differences. The images look identical on the contract proofs, of course.

Every printer realizes the futility of trying to predict exactly how a given press is going to behave on a given day. Calibrationists do not; they scurry about with densitometers, swatch books, and various other moonbeam-catchers, developing a "profile" of a given press, which promptly changes drastically during the next washup or whenever the next shift takes over.

It is one thing to accept the notion that the pressrun is a crapshoot, and quite another to bet on the shooter rolling a 13. This is why standards like SWOP exist, almost as a least common denominator approach to the process, trying to ensure matchable proofs.

Everybody knows that a toner-based color copier is worthless as a contract proofer, but recent advances in dye-sublimation printers have made it possible for many of us to own devices that are in principle capable of contract-proof kind of quality. With this availability (they are around \$15,000, at this writing, plus \$5 to \$10 materials cost per proof, still much cheaper than a tradi-

tional film proof) comes responsibility. The object is not to make a pretty proof but a realistic one, one the printer can match. That usually requires tweaking.

The column's point that we should expect accuracy and repeatability in the proof and not the press is very old, but well worth repeating. Always shoot for perfection in the agreed-upon proof—but if you can take an educated guess at how the press is likely to *vary* from the proof, so much the better.

The correspondent's point is a good one, too. We have reached a time when a number of parties who never used to compete with one another are now doing so. The correspondent thinks that the separators feel threatened by his work. Well, what does he want them to do, give him a kiss? Independent computer artists *are* competitors to color separators in today's world.

I have known some pretty disreputable dealings by separators and service bureaus in my time, but have never encountered actual sabotage. On the other hand, how much difference is there between sabotage and turning a blind eye to obvious problems? If the service bureau sees a typo in a client-supplied file, chances are it will get fixed. But how many separators will step in when their clients include horrifically bad images?

In this case, I think the correspondent is guilty and the separator not, but the real crime is the lack of trust between vendor and client that allowed the idea of sabotage to germinate. And the development of trust is very much the responsibility of both parties. ●

Jargon Watch

ad agency Advertising agencies are notoriously the most finicky and unreasonable clients for prepress work.

Baskerville Descriptive of certain typefaces designed in the late eighteenth century by John Baskerville. Baskerville types have some thin areas and are rather difficult to print, especially in smaller sizes. Samples are shown in Column 10.

Bodoni Descriptive of certain typefaces designed in the early nineteenth century by Giambattista Bodoni. Bodoni types feature extreme contrast between the thick and thin areas of their strokes. They have traditionally been nightmarish for printers to cope with. See discussion in Columns 10 and 11.

calibrationist One who is more willing to believe a densitometer reading than his eyes.

chrome Photography in positive film form, especially if taken by a professional.

CMYK Cyan, magenta, yellow, and black, the inks used on press, but also a major colorspace used in electronic imaging applications.

contact proof Often confused with *contract proof*, a contact proof is one produced by direct exposure to final film. Contact proofs are normally used to show position only, such as the blue- and brownlines used in book publishing. In black and white work, some types of contact proof are used to show halftone quality as well.

contract proof A color proof of

sufficient quality that printers will accept it as a valid predictor of what will happen on press. As the column points out, there are many different flavors of contract proof. They vary in whiteness of paper as well as the amount of dot gain they predict.

Cromalin A major brand name of film-based contract proof, marketed by DuPont.

densitometer Device that measures the amount of reflected or transmitted light. Often used to guarantee that film or similar output is being processed under correct conditions.

EfiColor An ill-fated color management system chiefly known for being included as a default in QuarkXPress 3. Most users delete it as being unnecessary and in many cases damaging.

GCR Gray component replacement, the substitution of black ink for more or less equal values of cyan, magenta, and yellow.

LAB Also known as CIELAB or L*a*b*, Photoshop's native colorspace. Its uses in color correction are explored in Column 7 of this book.

Matchprint Major brand of contract proof, marketed by Imation Corp.

midtone Areas of an image channel that are roughly halfway between light and dark; sometimes used specifically to mean the midpoint of a reproduction curve.

Photo CD Image format developed by Kodak. Although it is possible for images scanned from other sources to

appear in Photo CD format, ordinarily Photo CDs have been digitized with a proprietary Kodak scanner. See Column 4 for techniques for working with Photo CD images.

quarternone Areas of an image channel that fall roughly halfway between a highlight and a midtone, that is, at about 25 percent ink coverage on press.

RGB Red, green, and blue, the colors of light to which human vision is principally sensitive; also, a major color-space for electronic imaging.

RIP Raster Image Processor, hardware or software that drives an image-setter or other output device by converting incoming image data (usually PostScript) to the pixel-by-pixel structure that is needed.

saturation Measure of a color's purity. Can be visualized as the relative presence or absence of the opposite color. For example, a brick and a fire engine are the same color, red, but the brick is much less saturated. On press, that would mean the brick has a far higher percentage of the opposite color, cyan, than the fire engine does.

Scitex The leading vendor in high-end prepress, manufacturer of workstations, imagesetters and many other professional products; a favorite of many separators. "The Scitex" as used in this

column means the separator's Scitex retouching workstation.

separator A company specializing in the production of color separations and related services.

service bureau A company specializing in film output and supporting services for electronic files supplied by its clients. The line between service bureau and separator has become rather murky. A separator probably, but not always, has more expensive equipment, more experienced personnel, a better reputation for quality, and higher prices than a service bureau. Separators often work directly with the printer of a job; service bureaus do this rarely.

shadow The darkest neutral areas of an image, sometimes used in color correction to mean the single darkest such area.

SWOP Specifications for Web Offset Publications, a set of standards and technical rules followed by many printers, web and otherwise.

three-quarternone Areas of an image channel that fall roughly halfway between a midtone and a shadow.

web Descriptive of the presses designed for high-volume printing. Web presses are fed by continuous rolls of paper as opposed to sheets, and can run at vastly faster speeds than sheetfed presses.

Dialog Box

In Photoshop, it seems so *easy* to make a color separation. But, as you are about to see, it is a real minefield. The dot gain adjustments discussed in the preceding column are only one part of the overall equation. Photoshop's defaults are pretty miserable, but still, you might think, how deeply can one plumb these questions of shadow value, black generation, dot gain, and GCR?

Well, prepare to find out, at great length. Some of these separation problems are similar, but each correspondent has a special case, when you get right down to it.

Dry stuff, perhaps, but desperately important to those whose livelihoods depend on getting good color on press—not just on a proof. It was no exaggeration when I stated in the column that this is the topic I've gotten the most requests to cover, and rightly so.

Most of these missives deal with the pivotal role of black ink, and the equally important question of how to get as dark a shadow as possible, without losing detail. This is tough sledding. I do not propose to pretend that this section is anything other than the most technically difficult of the entire book.

With that disclaimer, let's see how the world is coping with the necessity of making the separation meet the press conditions.

Default Photoshop sep setup as a recipe for “the most ghastly scans”

We in South Africa mostly use 5C3M3Y as standard highlight, and 94C89M90Y75K as a standard shadow setting. I have no knowledge of anyone

here using undercolour removal to any great degree, and therefore have no experience with it. My question is why is Photoshop's default Separation Setup is so far from both this and the setup you recommend? As we scan to CMYK “on the fly,” it doesn't affect us much, but hordes of people scanning on low-end scanners, who do not know of adjusting the Separation setup, produce the most ghastly scans after using Photoshop to convert RGB to CMYK. 100% Black does nothing for Cromalin proofs, let alone a press run where black is usually run heavier for the type. I have found that a 75% Black Ink Limit and a Total Ink Limit of 348%, set on GCR with medium black generation, produces excellent proofs as well as press runs. What part of Adobe's thinking am I not understanding?

Your suggested highlight is fair enough, if conservative, but the shadow value would not be typical of U.S. work.

I would surmise that this is because here, there are so many possible destinations for the work that we cannot be sure who is going to be printing it under what conditions, or on what kind of press. Therefore we must almost assume worst-case conditions and go with a lighter shadow than we would like. If we are certain that the press can handle a shadow as dark as the 95C90M90Y75K you suggest without loss of detail (or if there is no important detail in the shadow that we are worried about losing), then of course we do it.

Absent other instructions, U.S. suppliers produce work to standards suggested by a group known as SWOP, Inc. (stands for: Specifications for Web Offset Publications). SWOP dictates that film is unacceptable if the maximum shadow value exceeds a combined total of 300. Many American magazines go further and insist, for ease of handling on press, that maximum ink value be 280, or even lower. Magazine printers employ film inspectors whose sole joy in life is to reject client advertising that fails to meet these guidelines.

Under these circumstances undercolor removal is mandatory as a practical matter, as to get a realistically dark shadow the black will have to be as heavy, if not more so, than any of the three colored inks.

Conceding this, Adobe's default is quite poor. Allowing 100% black leads to thin-looking shadows, difficulties in color correction, and closure of shadows in many cases. I therefore recommend 85% in the Separation setup dialog box, although your value is certainly reasonable.

Another reason for the muddy-looking seps from Photoshop is not so much that a rather heavy GCR is used as that, in its calculation, Photoshop erroneously assumes that the black behaves like any other ink. As you point out, dot gain will almost certainly be heavier in black—even if the pressman is not doing it intentionally, to compensate for type or something else.

Therefore, Photoshop's black plate tends to be entirely too heavy for practical use. The two ways to avoid this are 1) to use Light GCR and/or 2) change color balance within Printing Inks setup, using a value of .92 or so for black. ●

GCR, UCR, skeleton blacks, shadows without detail, and 3-color seps

I've always suspected that GCR was causing me grief—your column seems to confirm that. I get jobs back from the sep house

sometimes with too much black where the original has little—and this seems to get darker still at my printer—so I usually under-expose the black final when I suspect a problem.

Yecch! That's no way to do things.

I have a question: If I tell my sep house no GCR, does that mean a 3-color separation? (or almost a 3-color separation)

No. It means a “skeleton” black, where the black only appears in depth-of-detail areas and not in areas that have a perceptible color, such as a face. Using moderate GCR, a face may have some small amount of black in it, and if the printer is running heavy black (like, for example, if he is trying to compensate for light type on the same page) this may make your image look muddy. With a “skeleton” black, on the other hand, if the printer overinks, you may start to lose detail in the deep shadows, but that's it.

Strictly speaking, if you are giving the printer this instruction, you should include a maximum total ink value as well, such as: No GCR, 280 total ink. An equivalent phrase would be: UCR only, 280 total ink.

If your sep house uses “Light GCR” (Photoshop definition), there is a slight technical difference between this and UCR only, but not enough to worry about; this will give you the same kind of skeleton black that you seem to want. ●

Why do the experts recommend Light GCR and 85% maximum black?

I've noticed that you and other authors recommend a Photoshop Separation setup default of (roughly) GCR Light, 85% maximum

black, 300 maximum total ink, 0% UCA. One author has mentioned that he believes that PS is optimized for GCR seps and states that he has noticed some unwanted grain produced in Photoshop UCRs.

I and most of the clients I work with are getting most of our scans from service bureaus with high-end drum scanners.

While the service bureau rarely discusses this matter with you, they typically make UCR seps. Many corporate clients (even the ones with desktop drum scanners) don't know the difference between UCR and GCR. The clients are gathering/producing seps from a number of different sources and then combining them in the same brochure, ad, etc. I'm sure you know where this is going—the client can easily develop a library of images that drive the pressman a little nuts.

Is GCR Light close enough to typical UCR seps to keep the pressman happy?

To all intents and purposes they are identical. As long as we get a “skeleton” black plate, meaning no black at all in relatively clean color areas, the image will handle the same on press. GCR Light, as a term, is a Photoshop invention. “Typical UCR seps” vary wildly from scanner to scanner, anyway.

With this type of situation in mind, how do you recommend clients make their “in house” seps?

Generally, in the manner you have described. If scanning into CMYK, choose UCR or whatever the equivalent is on the scanner. If scanning into RGB, use Light 85/300/0 in Separation setup during the conversion to CMYK. There are exceptions, mind you, and some of them are mentioned in the column. However, in the absence of what seems to you a good reason to depart from the general rule, leave the black relatively light. ●

If Photoshop's programmers were pressmen, there'd be no problem

Besides not knowing what is happening, what's wrong with setting the endpoints with the levels eyedroppers like Adobe says?

1. It will zero out your highlight unless you change Photoshop's defaults.
2. It does not control black generation.
3. It does not allow you to shape the curves so as to maximize contrast in the interest areas of the image.
4. Lots of images don't have easily measurable white points or midpoints.

Also, why is their shadow value so different from your 80C70M70Y70K? Theirs is something like 55C55M55Y100K.

If Photoshop's programmers were pressmen the difference would vanish rapidly. This is largely a function of Preferences>Separation setup. If you change yours from 100% to 85% maximum black, the problem will go away and you will get a shadow similar to mine. Allowing 100% black is very inferior. ●

Lowering the total ink limit to keep shadows from plugging on press

I recently came under serious criticism by my predecessor because of your book. I would greatly appreciate your opinion.

My predecessor left the drum scanner set for 340% total ink limit. Your book states that 280 is standard for web, and "for sheetfed printing 320 is acceptable. Should you be using very high quality paper, or printing on a waterless press, an even higher limit may be attainable."

Based on this, I decided to start scanning at 280 for work that was to be printed on our sheetfed press. My predecessor, insisting that I had a reading problem and was without a clue to the difference between a web and sheetfed, cited your book as proof of my ignorance. (I'm paraphrasing his words quite generously.)

My reasons for attempting to use SWOP settings on our sheetfed:

- 1. My pressman has had trouble keeping the shadows from plugging. He had asked for lower ink limits for some time. He felt he had no room for adjustment, particularly at 150 lpi and above.*
- 2. This is a small, price-conscious town, and we are the only 4-color press here. So many jobs are run on second grade paper, or even recycled stocks. Premium coated paper is not the norm.*
- 3. Our press is one finicky beast. The pressman here works miracles. He's the only one here that can balance the water to get decent prints.*

Obviously, 280% can and should change from job to job, even image to image. A client wants 200 lpi work next week, and I think it's going to be a big headache.

The problem here is, as in your articles, that your book cannot be simply read and quoted verbatim (please don't take my use of the word

“problem” literally). I felt that I was reaching into what you wrote and came away with a better understanding of the purpose of the Total Ink Limit.

My SWOP scans haven’t come off the press yet, so I have no concrete results. But, I felt I had to question 340, and will always question my own work. One can get overconfident and complacent if they don’t keep asking questions.

The first order of business is to find out what in blazes is going on! You need to know how heavy a shadow you can put down on your press and still hold detail. From what you are saying under your particular conditions 340 sounds way too high. A test run of several versions of an image that has significant shadow detail seems like the indicated first step. Try out several different separation parameters, rather than guessing at the scanner.

Ink density and screen ruling are interrelated. A lot of times if the screen ruling is too fine, shadow detail can be lost. You say that you have a questionable press and are printing on a lot of questionable stocks. If so, 150 line work is *really* questionable. The higher the screen ruling, the more difficult to handle on press. Try a test with 133 or 120 and see if it looks better—it probably will. Or better yet, run 120, 133, 150, and 200 side by side on the same sheet. You may not be able to see a drastic difference from afar but if you take a loupe to them you’ll see where the dots are plugging.

SWOP calls for 300 total density, not 280. Most magazines take it down to 280 because of concerns about handling problems on press (ink contamination from unit to unit; drying/smearing problems if sheet is too tacky, etc.) It is not unheard of for 340 to work but from what you are describing it sounds high.

The real issue is, how heavy a dot can your press hold and still portray detail? If 340 is your maximum total ink, shadow should nominally be 90C80M80Y90K. That is indeed quite heavy, and under the conditions you describe I question that it is possible.

It makes sense to me to scan to a maximum shadow of 80C70M70Y70K all the time since that will work for almost any application short of newsprint. Nothing stops you from tweaking it up in Photoshop if you know that the particular press conditions support higher values, or if your shadow is a glass pot of coffee or something else that has no detail to begin with. ●

Reseparation and other sneaky methods to reduce total ink density

After optimizing color and gradation, many times we have pushed total ink beyond the original specs. We always do a final check immediately

prior to running the film. If total ink is too high, I convert to LAB mode and change sep setup to UCR and total ink to what we need, before reconvert to CMYK. I've found that method, or selective color correction of the black, to be the most reliable way to do it without screwing up my curves too much.

There are a number of approaches one can take. If you are just off by a little, selective color correction of the black, as you say, is undetectable. On the other hand, converting into LAB gives us the opportunity to do some useful correcting there as well. Don't see why UCR is necessary on the reseparation, since the total ink will be OK regardless of what black generation you use.

Another interesting use of selective color is that one can perform manual GCR on blacks only. Select blacks, and then subtract the CMY components and then add compensating black ink. We have found that on some pickup jobs where we have to adjust total ink way down, say from 320 to 260, after our usual CMYK to LAB to CMYK scheme, we can close up the black dot giving more visual weight to the shadows without exceeding the total ink spec. It works quite well and it is really amazing the difference closing up the rosette can make. We still don't exceed 95% in the black dot of course.

In a situation like this we are in bad shape no matter what. I don't trust selective color correction of the black to accommodate a 60-point drop gracefully. Whether you use that approach or CMYK>LAB>CMYK, you face a choice of a shadow that is too light or a black that is too heavy, hurting detail. If the printer is asking for only 260 total ink, his paper must be pretty poor, worse than pub grade. And if that's the case there is no way he can hold detail in 95% of any color, let alone black. He would be lucky to hold detail in 80%.

I try to use a combined approach in such cases: I reparate to get down to 290–300, but then when doing the selective color correction, I really hammer the yellow and only reduce the cyan

and magenta a small amount. Yellow doesn't pull its weight in the shadow, so if something has to go that is the first choice. By having an unbalanced shadow that is chiefly CMK we can get both darkness and detail. ●

What's wrong with using UCA to guarantee a properly dark shadow?

I've been told that some UCA is usually best to ensure a proper dark shadow. This goes back to my drum scanner training. Why aren't you

using it in your suggested separation setup? You say several times that your shadow value of 80C70M70Y70K is conservative (too light?) so why not darken it with UCA? That is a lighter shadow than I've ever dealt with.

It may be lighter, but it isn't thinner than Photoshop's default. People who say they get better results with UCA are generally using it as a form of damage control to compensate for failure to set Black Ink Limit to something sensible.

All UCA does is pour CMY ink willy-nilly into shadow areas.

Figure 3.6. Under-color addition (UCA), at least in Photoshop's rendition, forces more cyan, magenta and yellow into the shadows, but as the ends of the curves in the bottom version show, all it adds is depth, not detail. There are better ways to strengthen a shadow.

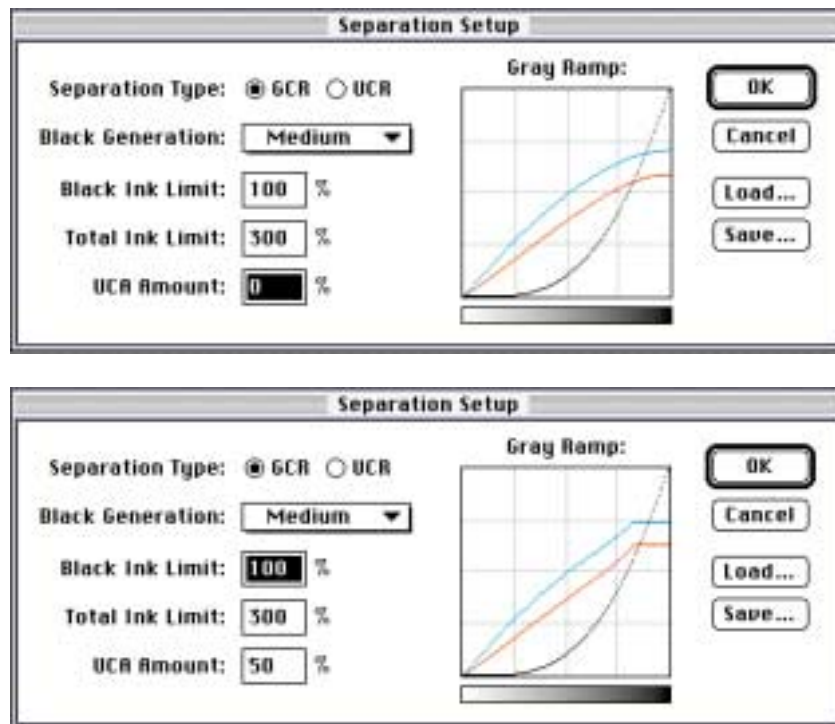


Figure 3.7. Under-color addition loses shadow contrast, and is generally inferior to steepening the black curve. However, in this image, UCA is right. The less detail in the black areas of the cards, the better; at the same time, we would like to guarantee a dark shadow.

It does nothing at all to add detail, which is the nominal reason we want deep shadows.

The reason I advocate a shadow value with black set at only 70 percent is not that I believe a press can't handle higher. Rather, I think it is harder to add detail to a picture than it is to subtract it. This lesson has been brought home to me painfully by many of my students. At 80C70M70Y70K I am sure I will not be losing detail under almost any printing condition. The Photoshop default shadow of roughly 65C55M55Y95K, on the other hand, gets you the worst of both worlds. It is *guaranteed* to lose shadow detail because of clotting in the black, and on a bad day it will actually print *lighter* than the one I recommend.

As you know, a lot of the time shadow detail isn't that big of a deal.

Right, because of the characteristics of the individual image. If we have a picture of a black cat we want to hold detail in the fur. If it's a picture of a black squash ball, we probably don't care whether whatever detail can be found in it stands up or not. Accordingly, we can and should go with a darker shadow.



My method of attaining this would be to lengthen the black curve so that the shadow became, say, 80C70M70Y85K. Because I am using a skeleton black (Light GCR) to begin with, this move is going to be very helpful to the image as a whole. It will add snap and life everywhere, not just in the shadows, because contrast is being added to the black plate.

Compare that to the alternative shadow-darkening method of UCA. As Figure 3.6 illustrates, UCA just pours in flat tints of the CMY inks into shadow areas. It does not add detail in any way, and squanders the opportunity to improve the image.

About the only time I would want to use UCA is in separating an image such as Figure 3.7. There, if I lose detail in the shadows, I like it. The black paint of the cards is the only thing that's even remotely close to a shadow. Any detail that's there is probably a scratch or a reflection or some other thing that we don't want. So, naturally, the heavier the shadow the better, and UCA will help cover up any imperfections that are in the black plate. ●

Bright reds, dark blacks, and lousy transitions: is this a GCR problem?

I had a tough GCR problem the other day. The subject was a red car; the chrome was excellent [Figure 3.8, I trust, is comparable—DM]. The

car's ducts and vents made large, solid shadow areas in the striking red paint. These areas were large enough to cause drying problems when separated at a light/skeletal GCR; the areas would be at the total ink limit.

So, naturally, I separated at a fairly medium GCR. Total ink in the shadows added up to just 210 (about 40C35M35Y100K). Just fine for our press, which has trouble with anything over 300 total ink.

The problem came in the transitions. Around some shadow areas, between the red paint and black shadow, the paper showed through like a halo. I know what happened; the car (about 10C95M90Y0K) and shadow (about 40C35M35Y100K) transition caused rapid removal of magenta and yellow, letting paper show.

Already, you have engineered in three major problems:

1. The overall shadow is too light despite the 100% black; if you can get 300 points total ink why are you settling for 210?

2. There is now a big hole in your magenta and yellow plates in the shadow, as Figure 3.9 indicates (you have rightly pointed to this as a major problem in the job).

3. Your black should not be at 100%, as this will make for a very bad transition; at some point detail will be lost (Figure 3.10).

For shadow areas, GCR setting (light, medium, heavy) makes no difference. The only pertinent numbers are total ink and maximum black. Maximum black should be no higher than 85 percent, always. Total ink should be whatever you feel comfortable with. Photoshop will be feeding black ink as necessary to meet these target numbers regardless of what your GCR settings are.

How can I avoid this blemish in an otherwise beautiful job?

If you had separated at a normal 85%–280, your shadow would have been something like 75C65M65Y75K. This would probably have solved your problem right there, since there is now no significant hole in the magenta.

Better way still: separate at 85%–320. Shadow should now be something like 85C75C75M85K. This is too dark, of course, but

Figure 3.8. Improper GCR settings can cause bad transitions in a difficult image like this. Overleaf, note the defects in the black and magenta plates when the separation is done at the settings the correspondent used.



Figure 3.9. The correspondent's magenta plate, top, has holes in the black areas in the grillwork at top rear of the car, causing poor transitions. Below, a normally separated magenta.

we aren't done. Open Adjust: Selective Color and choose Blacks. Move the yellow slider all the way to the left, decrease cyan slightly and increase magenta. Now, your shadow will become something like 80C85M40Y85K. (If there is anything else of significance in the image other than the car, you should select the car and work on it only, since God knows what impact this move may have on other areas.)



Figure 3.10. Comparing the black plates shows a similar problem. Detail in the tires is lost at top, Furthermore, the shadows in the car are sudden, harsh. Below, a normal black separation.

This gives you a very dark shadow, but only 280 ink coverage. Also, there is now no hole to speak of in your magenta plate. Yellow is so light that it has little impact in shadow areas. You won't notice the hole that remains in the yellow. And if you are having an ink coverage problem in shadow areas, but you still want them nice and dark, you don't get nearly as much bang for your buck with yellow as with magenta or cyan. ●



The perils of preparing separations for web newsprint reproduction

*Dear Mr. Margulis,
I have read your book on
correcting in Photoshop and
found it to be the BEST
resource for production work*

*in Photoshop. I have the utmost respect for your knowledge on correct-
ing and can't begin to tell you how much your book has improved my
work. In fact I'm such a novice I am just now reaching "ape" level.
Having said that, I have also had many, many frustrations trying to
get consistent results on web newsprint "rag" pieces. The following is
a help request that I was going to post to one of the Adobe folders when
I saw your name helping other people that have asked for help. The fol-
lowing was too large for a simple post, so I thought that you might be
so kind as to help me if I e-mailed what I was going to post. Being the
guru that you are, I hope you will excuse the novice, stupid questions
and comments that some of this will undoubtedly be. [Post follows]*

*I have some questions regarding proper steps in preparing
scanned and Photo CD files for film output to be printed on newsprint
on a web press. I don't seem to have much problem getting images to
look good on a good sheetfed using a good stock. But I'm having big
problems trying to get good, consistent color on a web/newsprint com-
bination. One project will be beautiful, the next has red faces and
washed out backgrounds or shadows totally clogged up or something
else is wrong with the color.*

*I've read every book, article, posting or anything else I could get
my hands on regarding getting good consistent desktop color. It seems
that everyone contradicts everyone else, and I come away scratching my
head. One person says that it's all in calibrating the scanner to
monitor to output device. Obviously, you should have these things all
closely matching so you can get some idea that seeing what's on the
monitor is something close to what is going to print. There are lots of
software packages on the market that claim that their software will get
it all working in sync. Then you have someone like Dan Margulis in
his book on color correcting with Photoshop saying to completely
ignore what you see on the screen and go by the numbers that you
sample with the eyedropper tool. Admittedly, using his techniques
have improved my novice color correcting to a semi-comfortable place.*

*At the risk of completely oversimplifying Margulis' book, basi-
cally his approach is that if you get what you know the colors should be*

to be the right numbers, the rest of the colors should fall into place. I have found this to be completely true for the most part. I can get things looking great on the screen, and even great looking proofs. Getting them to go on web newsprint is something else.

I am in a position that I have control over every facet in the process except making the plates and running the press. This brings up the questions about Photoshop's preferences settings:

Re: Monitor setup

1. Does the monitor setup interfere with the settings I have in the Gamma control panel that I have automatically starting at computer bootup?

They work in tandem.

2. I have a 20" Radius Precision Trinitron monitor. The monitor drop-down menu does not list this monitor. What should I select, default?

Any Trinitron setting should do.

3. Do the settings in this dialog box affect the actual file or just they way the screen looks in Photoshop?

If your file is in LAB or CMYK, only the screen display. If the file is in RGB, there will be a slight variation in the actual data when you convert it to either of the other two colorspaces.

Re: Printing Inks setup

1. Does selecting the various ink/paperstock/dot gain settings here affect the image file itself or does it simulate on my monitor what the printed piece would look like, thus enabling me to visually adjust the image for the intended press/paper/dot gain combination?

If you have a CMYK file already, the file itself will be unaffected by a change in these settings, but if you have an RGB or LAB file, two different Printing Inks setups will result in two different files once you convert to CMYK. Changing the Printing Inks setup also alters the monitor display in CMYK, but not in the other two colorspaces.

2. When I calibrate my imagesetter, I can send (have been sending) with the calibration, a compensation for dot gain. If I use the SWOP (Newsprint) setting at 30% dot gain in the Printing Inks setup in

Photoshop, and adjust my image to look good on the monitor, can I assume that dot gain is accounted for at that point, or do I also account for dot gain when I calibrate my imagesetter?

If your printing conditions vary, compensate in Photoshop, not on your imagesetter. Its calibration should be the same regardless of final destination. You need (at least) two different Photoshop Printing Inks setups, one to load for commercial jobs and one for newsprint. While a good monitor can help, keep in mind its limitations in portraying what will happen in high dot gain situations, discussed in the preceding column.

3. *What does the gray balance do?*

It compensates for unusually heavy dot gain in one specific ink, or a known printing anomaly. Since Photoshop incorrectly assumes that dot gain is the same in all four colors, I recommend using the values of Figure 3.4 instead. Thereafter, if you find a consistent color imbalance (everything prints too red, for example), you can make further adjustments.

Be very careful of ad hoc changes in monitor settings, though. It is critically important that you not base such an adjustment on one or two samples only, as you could just be spinning your wheels, adjusting to unusually sloppy presswork.

Re: Separation setup. I have been using GCR/Black Generation Light/80% Black ink Limit/ Total Ink 250%. This gives me a dull, flat image in RGB to CMYK conversions. I then go to curves, start at getting the highlight dot somewhere close to 6C2M2Y, then darkest shadows near 70C60M60Y60K. Most of the images I use are people poses, so next I go to work on the skin tones bringing them to an average of around 20C40M40Y0K (for Caucasians). I don't worry too much about black levels until this point, even though the image is still very dull and flat. Next I go to the black curve and start adding black at the midrange to highlights. This of course brings in all the definition and sharpness.

The fleshtone values you are citing are too high in the cyan and magenta, even for commercial printing, and newsprint would be worse. On newsprint, cyan should be no more than a quarter of magenta and yellow should always be higher than magenta.

Your shadow values are correctly balanced, but they are too light. Your 250 maximum ink density is probably correct, but your final values should be around 65C55M55Y75K, which is much darker than the 70C60M60Y60K you cited.

1. *Is my Separation setup correct for going to web/newsprint?*

Yes.

2. *Are these good separation setup settings for different press/stock combinations?*

No, Light/85/300 is more customary.

3. *What about all this software I'm seeing advertised that promises to separate to CMYK from RGB scans or Photo CD, color correct, and sharpen, for whatever press/paperstock combination, all flawless and automatic with one small click of the mouse?*

If you are willing to spend five to ten minutes correcting manually, you will be able to do much better. If you are not willing to do this these programs will be better than nothing.

With the flood of all the articles, books, software manuals, seminars, calls to vendors, reading on-line postings and all of my own trial and error on the subject, it seems like the answers to consistent color on web/newsprint would be attainable. But I seem to be getting more confused. It seems that decent, consistent color on lower quality "rag" style web/newsprint would be the easiest to attain. I find it much harder than on better quality paper/sheetfed combinations.

It is. Color correction is a compensation for poor conditions. The worse the range of colors available to us, the more important it is to get all the contrast we can. Newsprint is going to give us a flatter picture than fine paper no matter what we do, and our skill level is very important to compensate. Look at it this way: suppose that because your newsprint work is so unsatisfactory, tomorrow your company cuts your pay by 25 percent, and you can't find another job, so you have to accept this. The question is, now that you have less money available in your paycheck, is it more important or less important that you spend your money wisely? In going from fine paper to newsprint, you take a contrast cut instead of a salary cut, but the principle is exactly the same. ●

Is the RIP a good place to apply a curve to compensate for dot gain?

HELP! I'm doing a large job on an unfamiliar and lower quality press than I'm used to, and I've got some ink questions I can't figure out. We're

bringing the prepress in house to get better control, quicker turn-around, better quality, etc. The specs I've gotten from the printer include: 45-lb coated paper (similar to the advertising inserts you get in the Sunday paper), 270% max ink coverage, 75% GCR, 133-line screen.

I've done a lot of web work, but never on a press/paper combination with quality this low before. The main thing that strikes me about the previous magazine is the loss of highlight detail; particularly in images of marble statuary, the highlights have been almost completely blown out. I received some of the scans from the previous issue, and have looked at the highlight dots, and am thinking that I might be able to improve on the quality by using different GCR and highlight settings.

The printer uses Matchprints to proof files. They then remake the film and apply a curve on the RIP that takes the 50% dots to 35%. I'm thinking that this might be part of the problem...

I'm thinking it might be most of the problem. Such a curve decreases contrast in the lighter half of the image and increases it in the darker half. This would account for the lack of detail in the highlight. Sounds like a big mistake to me.

...and that a carefully constructed curve in Photoshop would give better results.

You bet it would.

A sample highlight number from their drum scanned file is 2C2M3Y3K. Applying their RIP curve in Photoshop, this gets taken down to 2C1M2Y2K.

This is one of the most fouled-up numbers I've ever heard of. There should not be any black in the highlight. The cyan has to be at least two points higher than the yellow. It is unlikely they can hold the 1 percent magenta dot under these printing conditions. I'll bet that they are using some kind of color management system

and have somehow been persuaded by a densitometer salesman that what they are doing is right. This almost has to be calibrationism at work—it's virtually impossible for a human to come up with a setup this bad.

I resealed this file in Photoshop (Heavy GCR, Black Ink Limit 85%, Total Ink Limit 270%, UCA 0%). This gives me a highlight of 5C4M5Y. Applying their RIP curve, this gets taken down to 3C2M3Y.

This is better than what they had, but will result in a red cast. The cyan ink must be higher, otherwise the highlight will not be neutral, and neither will much of the rest of the image.

The GCR in the printer's file seems to continue all the way into the highlights; in fact, the minimum black dot in the original image is 3K.

You should call the police and send them over to the printer. Somebody there should be facing arrest on charges of impersonating a scanner operator.

My Photoshop separations with Heavy GCR don't put any black dot in the highlights at all. Is this an advantage or a disadvantage? It seems to me that having such heavy black in the highlights drops down the values of the other three inks to the point where they break up, possibly leading to the loss of highlight detail.

The GCR setting shouldn't have much of an impact in the highlight—there shouldn't be any black there no matter what. I would be a little chary about using Heavy GCR in this setting because newspaper black dot gain can be absurdly high and Heavy GCR shifts crucial detail into the black plate. If you are going to do this, you definitely need to use the Printing Inks setup adjustment recommended in Figure 3.4.

My first thought is to shoot for a highlight of 9C3M3Y, which would get taken down by their RIP curve to 5C2M2Y. My second thought is to do the curve myself in Photoshop, and engineer a curve that would spare the highlight values, and possibly increase contrast a bit in the highlights.

#2 sounds like a much better plan.

I'd really like to know what kind of highlight I should shoot for in this situation. 5C2M2Y seems low to me.

5C2M2Y is a conservative highlight, appropriate even for newsprint. The question is whether your press can hold a 2% dot on this paper. Most can. Possibly 6C3M3Y might be more prudent, but I doubt it. You use the term “blown out” to describe your complaint about the highlights. Most people use this term to mean that the highlight is missing altogether and you see paper only, not dots. What you are describing sounds like general lack of detail, not lack of dots. ●

When adding undercolors actually makes the shadow seem lighter

I'm working on short-run, large format displays on a new plotter with a number of interesting controls. In running my color tests, I've found that the

400% 4-color black actually appears duller and less intense than the 100%K.

I assume this has to do with the “reverse dot-gain” you mentioned in the column, where the extra saturation causes ink to be absorbed into the paper instead of reflecting light while lying on top of the paper.

No, it doesn't, sorry. The counter-dot gain I was talking about there was where adding ink makes the image darker, just not as fast as one would think. Whereas, when we are in a heavy dot gain situation we are accustomed to color getting darker *faster* than we think. In principle, if you add ink, of no matter what color, you *have* to be making the image darker. Your printer, though, doesn't use conventional ink; it probably uses heat-released dyes.

What you are talking about is an entirely different animal: a situation where you add ink (or equivalent) and yet the image gets *lighter*. This happens typically with dye-sublimation printers, apparently because the heat generated to activate the cyan, magenta, and yellow dyes vaporizes some of the black.

I know the phenomenon exists but haven't had enough experience with it to offer any intelligent suggestions on what to do. My guess would be that UCR only, 100 maximum black, 200 total ink, would be a good start. This would yield an almost totally black shadow, without paying the consequences of that decision in the rest of the image. ●

The prepress conspiracy revealed: It's the fault of those Americans!

We're a small design studio in Prague, and since there's no information of any kind about anything, we've had to figure out prepress and lithography

ourselves. We have pictures scanned, and color-correct them ourselves, without calibration (except a CMYK color chart). A bit of a joke, but we get better results than local printers and lithographers!

However, I have one question not answered by your article (and 100 more to ask!). When we have traditional drum scans made, delivered as CMYK, we usually have to convert to RGB and reparate as CMYK using GCR in PhotoShop. We've spotted the following: the scanners use UCR, resulting in flat pictures and flat blacks. We've taken exactly the same picture and prepared it both ways, and confirmed our method. While we understand the losses involved in the conversions, we, too, have wondered about a prepress conspiracy. We also receive the same answers, and one new one! They refer to bright pictures with rich blacks as "American"!

Many older drum scanners have this same problem of giving much too much black in the shadow and not enough elsewhere. Frequently, one cause will be that they have programmed the scanner to give a specific maximum of all four inks in the shadows (usually 300 in the U.S.). If this is the case you can ask them to give you a heavier shadow in the CMY colors; if they do this, you may be able to color-correct the black to something you like better, without converting. If you do have to convert as you are doing now, at least the conversion will be better.

We often do 2- to 4-color spot color photo-realistic images. We can't find what opacity we should set ink colors in Photoshop to preview mixing of spot inks. Am I dreaming, or is it possible?

It is difficult at best and also not particularly accurate, since Photoshop only allows you to set the values for 100% of one ink alone or combinations of 100% of two or more inks. It assumes that a 50–50 blend of two inks, would be based on the 100%–100% values and that is not always true. You can try this if you like but a better way in my opinion is to use specialized software such as that of the Dutch firm, Visu Technologies.

When we print a metallic ink, we're not sure if there's a problem printing on top of it. It should be OK, but we can't get an answer.

This depends on the specific metallic ink. Drying characteristics are different for each one. Ordinarily, you are correct, just as ordinarily, the metallic ink is thought to be darker than black for trapping purposes.

We've experimented with crude stochastics in CMYK and can't get the dot-gain right, especially since we (and the printers) don't have densitometers. They work well in 2-color. We use the Diffusion Dither bitmapping in Photoshop to do it. Any suggestions? After 45%, dot gain becomes dramatic. Black is at 85%.

No one has yet been able to conquer the dot gain problem with stochastic screening, which is why the technique has never caught on, except with newspapers. Its dot gain is much heavier than in normal printing. The smaller the dot, the greater the dot gain, and obviously stochastic dots are *extremely* small. This is the same reason that dot gain increases with a finer screen ruling.

Even if you can predict the dot gain from the imagesetter, if you are having your film contacted or otherwise duplicated by hand this introduces another variable, because normal contacting methods are not sufficiently controlled to guarantee precise reproduction of stochastic dots.

For these reasons I recommend that you not use stochastic except on plates that mostly give color and not detail. There is no problem with having conventional screens on some plates and stochastic screens on others. In fact, if you are doing 5-color printing, a stochastic fifth color is probably better, as it avoids moiré. If you are printing five colors, the fifth color is mostly to add depth. Even if you miscalculate the dot gain, the printer will probably be able to control it on press. ●