There's just something magical about watching an image develop on a piece of photo paper in the developer tray…to see the paper go from being just a blank white piece of paper to becoming a photograph is what many photographers think of when they think of Black & White photography. That process of watching the image develop is what got me hooked on photography over 30 years ago and Black & White is where my heart really lives even though I've done more color work professionally. I used to have the brown stains on my fingers like any good darkroom tech, but commercially, I turned toward color photography. Later, when going digital, I basically gave up being able to ever achieve what used to be commonplace from the darkroom–until just recently.

At about the same time Kodak announced it was going to stop making Black & White photo paper, Epson announced their new line of digital ink jet printers and a new ink, Ultrachrome K3 (3 Blacks-hence the K3), that has given me hope of returning to darkroom quality prints but with a digital printer instead of working in a smelly darkroom environment. Combine the new printers with the power of digital image processing in Adobe Photoshop and the capabilities of recent digital cameras and I think you'll see a strong trend towards photographers going digital to get the best Black & White prints possible.

Making the optimal Black & White print digitally is not simply a click of the shutter and push button printing. There's work that must be done to achieve high quality Black & White prints digitally. Some may argue that even with work, digital prints will never surpass "silver gelatin" prints–that's a bet I'm willing and eager to take…except for the current lack of quality ink jet printing paper. In this one aspect, digital Black & White prints have yet to surpass silver, but I'm willing to bet that obstacle won't stand for long, especially with traditional Black & White papers soon to be a thing of the past.

Part I - Converting a Color Image to Black and White

Ironically, shooting with digital cameras arguably provides photographers with better tools than color film photographers ever had for producing Black & White imagery. I never had much success converting traditional color film photography to Black & White, but digital is a different story. Because just about everything you need to convert to Black & White is already there when you capture digitally.

Fig: 01-color-1

A standard RGB digital image is composed of Red, Green and Blue channels-that interestingly represent what amounts to tri-color separation filters such as the Kodak Wratten designations of Wratten 29 (Red), Wratten 47 (Blue) and Wratten 61 (Green). Thus, in a digital image one already has a full color representation of a photographic scene. The trick is to determine how to convert from color to Black & White, or in other photographic terms, how to make a specific Black & White panchromatic response from a full color image.

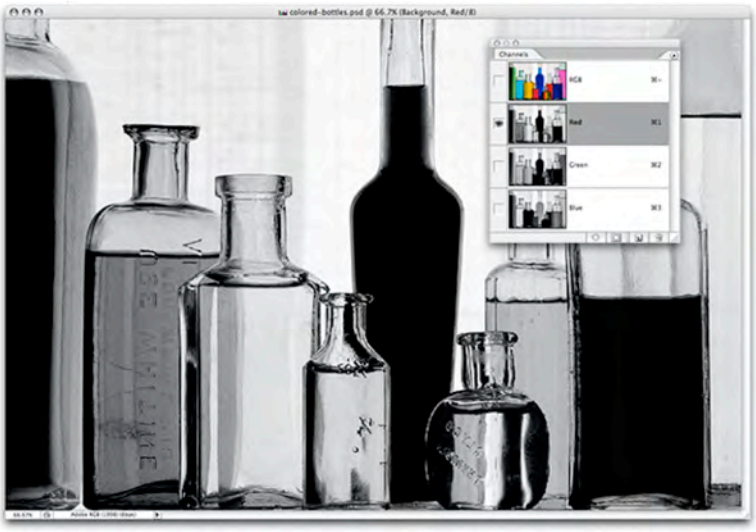

Fig: 02-red-1

The Red channel represents a Wratten 29 separation filter.

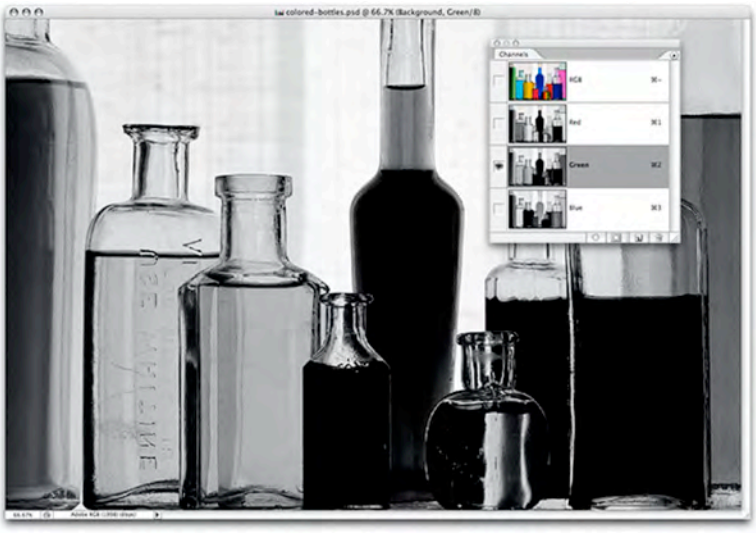

Fig: 03-green-1

The Green channel represents a Wratten 61 separation filter.

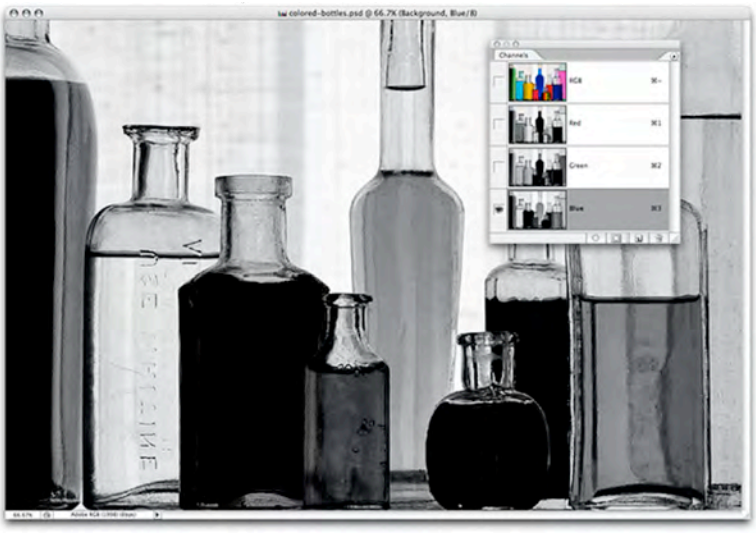

Fig: 04-blue-1

The Blue channel represents a Wratten 47 separation filter.

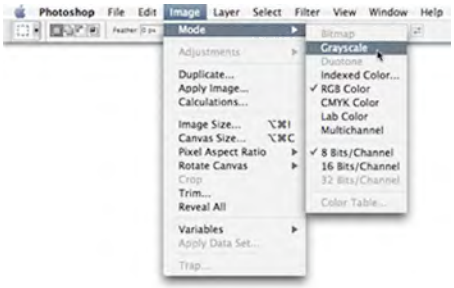

Fig: 05-image-mode-grayscale

When you take a color image and do a mode change to Grayscale via Photoshop, there is a specific "panchromatic response" that takes place when the conversion is made.

Fig: 06-grayscale-image-1

Photoshop's default Grayscale mode change performs a calculation that is roughly equal to 30% of the Red channel, 60% of the Green channel and 10% of the Blue channel. I say "roughly" because the exact formula is dependent upon the RGB working space and the Grayscale working space and there seems to be some additional "tweaking" involved.

There are other methods of converting color to B&W available inside of Photoshop.

Fig: 07-channelmix-30-60-10

Using the Channel Mixer adjustment and plugging in 30, 60, 10 while in Monochrome mode will give you one flavor of color>B&W conversion.

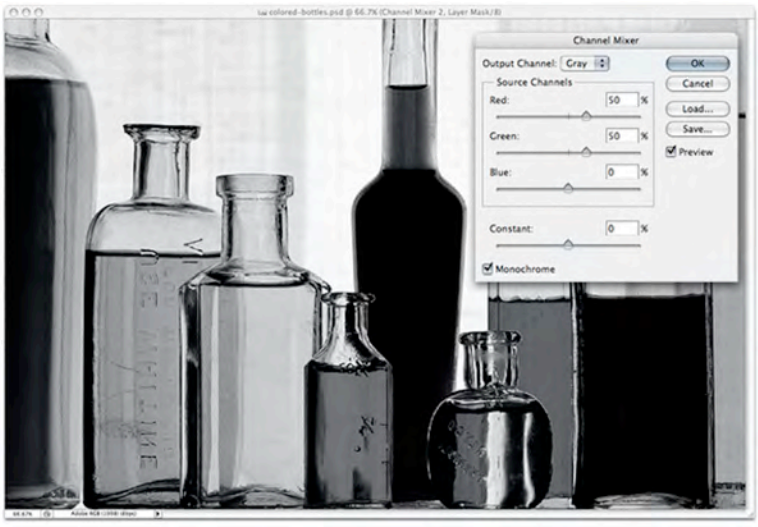

Fig: 11-Channel-mixer-50-50

By varying the percentages in Channel Mixer, one can adjust the relative amounts of the various color channels when making a conversion.

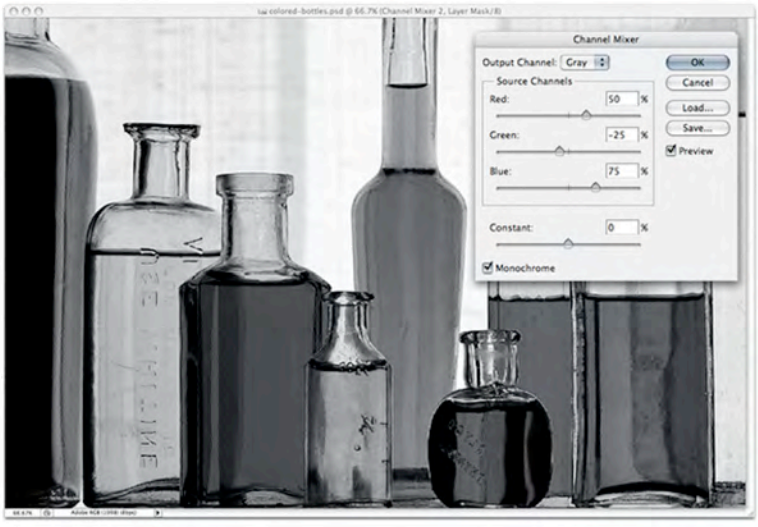

Fig: 12-Channel-mixer-50-25-75

What is not intuitive but useful is that you can use negative numbers in combination with positive numbers when plugging in the conversion parameters. In general, you want the sum total to equal 100% so no additional tone adjustments occur.

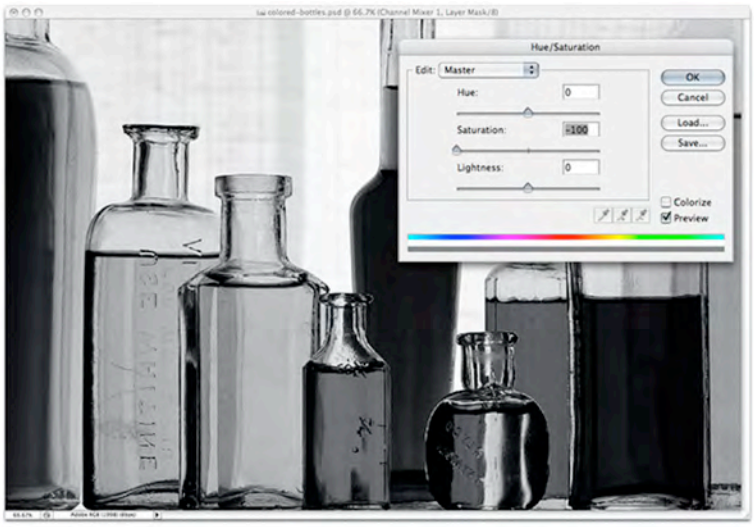

Fig: 13-Hue-Sat-desat

An additional method of making a color to B&W conversion is to use the Hue & Saturation adjustment and de-saturate the saturation to zero.

Fig: 14-lab-lightness-image-1

Yet another variation is to convert the image from RGB to Lab and discard the ‘a’ & ‘b’ channels. This results in a grayscale rendering based upon the luminance of the original RGB color image.

An additional technique, first shown a few years ago by Russell Preston Brown from Adobe, is to use dual Hue and Saturation adjustment layers to accomplish a specific panchromatic response.

Fig: HS-02-huesat-1-palette

The technique requires two Hue & Saturation adjustment layers. The first one is added with no adjustment in the dialog. Simply create the adjustment layer and immediately click “OK”.

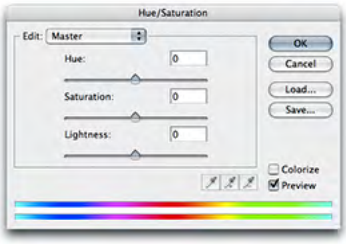

Fig: HS-03-huesat-1-delog

The next step is to set the layer blending mode to “Color”.

Fig: HS-04-huesat-1-blend-palette

Then another Hue & Saturation adjustment layer is added.

Fig: HS-05-huesat-2-palette

This second adjustment layer is adjusted to reduce the Saturation control to zero.

Fig: HS-06-huesat-2-dlog-1

By adjusting the second (top) adjustment layer to zero Saturation, you produce a de-saturated adjustment and get a grayscale result.

Fig: HS-06-huesat-2-image

Here is the result of the de-saturate conversion.

Fig: HS-07-rename-palette

At this point, it's useful to rename the adjustment layers to help distinguish what they will accomplish.

Fig: HS-08-hueadj-palette

The next step is to target the first Hue & Sat adjustment, double click to bring up the dialog and adjust the Hue controls.

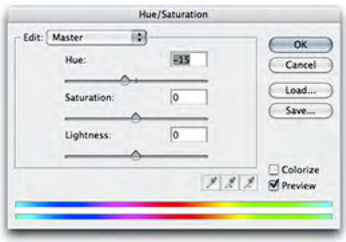

Fig: HS-08-hueadj-dlog

By adjusting the Hue control, you can vary the manner in which the colors are represented by the second de-saturate adjustment layer. Because this first adjustment is set to color blend, only the color will be

effected by the hue adjustment. This technique allows for considerable variation and adjustment in a rather dramatic and interactive method. It should be noted, however, that you are radically adjusting the hues of the image. If you turn off the top de-saturation adjustment layer, you'll usually see a rather unpleasant color image.

Fig: HS-10-hueadj-3-palette

Fig: HS-10-hueadj-3

After adjusting the hue of the image and turning off the top adjustment, you'll see how much your color image has been "adjusted". But since the end result you are trying to achieve is that of a color to grayscale conversion, the color results are not relevant.

Fig: HS-12-dlog-1

Yet another variation involving adjustment layers is to substitute a Selective Color adjustment for the first Hue & Sat layer. The layer blend mode still needs to be set to "Color", but the Selective Color adjustment allows for more precise conversions on some colors.

Fig: HS-13-dlog-blue-selective

Fig: HS-14-dlog-blue-1

This is the result of using a strong "Blues" adjustment in a Selective Color adjustment.

So far, 6 different methods of converting from color to B&W have been outlined. Each has its strengths and each may produce an optimal result for some images. However, each of the methods have one rather strong limitation–they are all "Global" conversions from color to B&W. None of the above methods are really capable of addressing "Local" needs of an image. For the ultimate control over a conversion, you need the ability to apply local adjustments to the conversion process.

This next method may seem a bit complex, however, the basic setup and process can easily be automated by creating an action to produce the basic layered results. For this method, I'll also switch to a different image–one that will be used for the second part of the article, outputting B&W.

Fig: CBW-00-image

This method starts with a standard RGB color image.

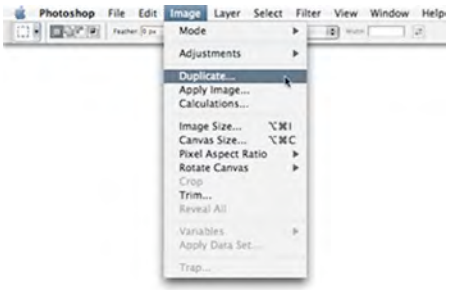

Fig: CBW-01-duplicate

This first step is to duplicate the color image…

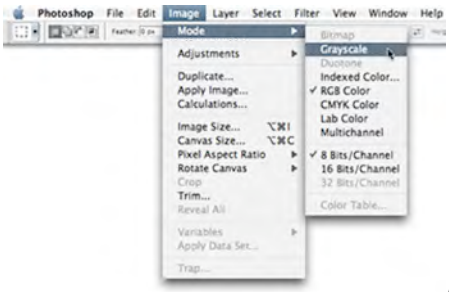

Fig: CBW-03-grayscale-command

…and then immediately convert the duplicate to a grayscale image.

Fig: CBW-03-grayscale copy

You will end up with both a color and grayscale version of your image open at the same time. The next step is the most critical to understand–you will need to copy the color channel from the color image and paste it as a layer in the grayscale document. This basic concept–of using a color channel as a grayscale layer is the basis of this method.

Fig: CBW-04-blue-copy

The color document is the active image window. You target the individual color channel–in this case the Blue channel–select all and then copy.

Fig: CBW-05-blue-paste

The next step is to click on the grayscale document to make it active and merely paste. This will paste into the grayscale document the image data from the original color file's individual color channel.

Continue by going back to the color document, activating the green channel then activate the grayscale document and paste. In the end, you'll end up with three separate channels pasted as layers in the grayscale document.

Fig: CBW-09-red-paste

Ideally, you should rename the layers in the grayscale document to represent the channels that the layers originated from. If you were to adjust the layer opacities of the individual grayscale layers you could arrive at your own special blend of the base color to grayscale conversion (Photoshop's default) plus the Red, Green and Blue channels derived from the original color image. This would still only be a global conversion relying upon layer opacities. To further employ this method, you must use layer masks to locally adjust the individual layer opacities of the red, green and blue layers.

Fig: CBW-10-add-mask

By holding down the Option key for Mac or the Alt key for Windows and selecting the Add Layer Mask command (here selected from the layers palette) you can easily add a "Hide All" layer mask to each of the individual grayscale layers.

Fig: CBW-11-masks-added

By targeting the individual layer mask for each layer, you can literally "paint in" your own custom localized blend of red, green and blue layers to achieve an optimal B&W conversion.

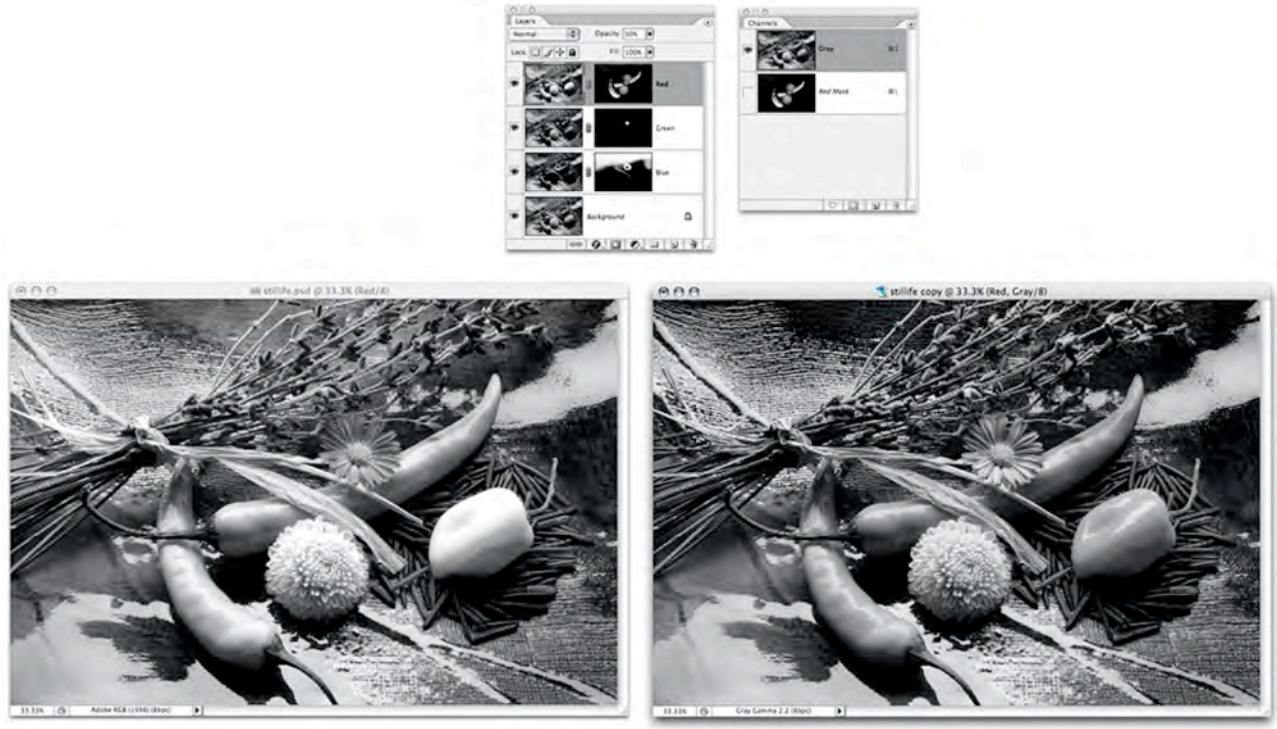

Fig: CBW-12-masks-painted

In this result, each of the individual layers have had layer masks applied and adjusted to produce an optimized color to grayscale conversion and the result has only relied upon the different native color channel information of the original color file–no image adjustments, such as levels or curves, have been applied.

Why do I keep the color image open even after producing the layered B&W image file? Well, once the image has been reduced to grayscale, one powerful tool for making selections based upon color has been rendered relatively ineffective–Color Range.

Fig: CBW-13-color-range

By keeping the color image open, I can use Color Range to make a specific color based selection and then drag the active selection from the color image into the B&W image (hint, since the images are exactly the same pixel dimensions, once you start to drag the selection over, hold down the shift key to pin register the selection in the exact spot in the grayscale image).

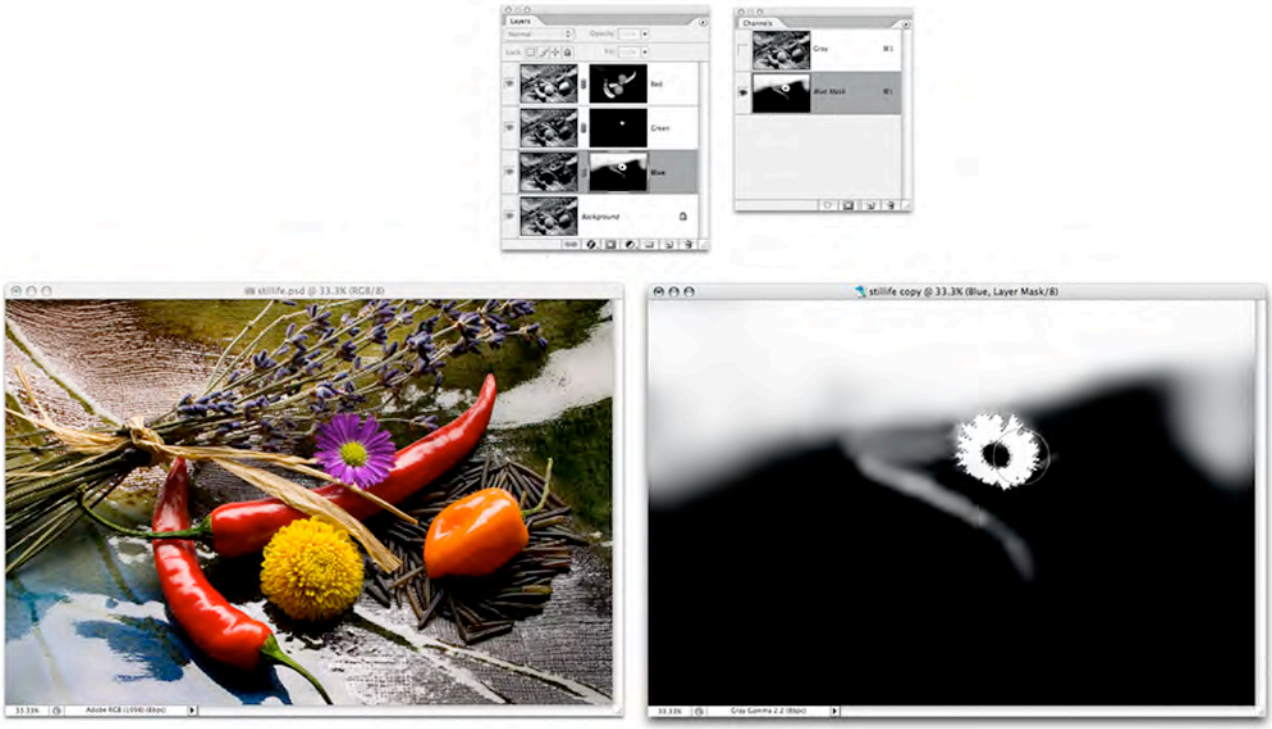

Fig: CBW-17-paint

Here the Color Range selection has been dragged into place on the grayscale image and the Blue channel layer mask has been targeted and the area of the blue flower is being "painted in".

Part II - Outputting a Digital Black and White Print

Up to now, the primary focus has been converting color images to optimal B&W images. But, at some point you must actually output the images to print if you want to frame it and hang it on the wall–and to most photographers, the print is EVERYTHING. Now making high quality digital B&W prints has become a lot easier and, arguably, a lot better.

This is not to say that image-makers couldn't output digital B&W prints in the past…there have been a variety of 3rd party solutions for outputting digital B&W. However, many solutions required the conversion of a color printer to a dedicated "Quad-tone" B&W printer and forced the user to use an arcane and often difficult method of fooling the printer into thinking it still had color ink loaded. Other solutions required the addition of specialty software dedicated to producing neutral B&W prints. Either solution required additional purchases and often entailed dedicated workflows or dedicated printers. Even with these solutions there was one rather notable lack–D-Max or the maximum density that was attainable.

Once you have converted an image from color to B&W, there are two basic approaches to digital printing. One is to use a color management solution-meaning profiles and color corrections for B&W output and the other way is to use a dedicated B&W output method. If you choose the color management approach you can combine color in a way that is very similar to traditional chemical toning. The other method requires the use of a dedicated system.

Taking the result of the previous exercise, a layered grayscale image, to use color management, you must re-convert the image back to RGB.

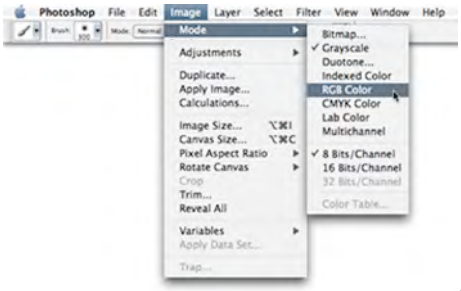

Fig: CT-01-convert-RGB

Fig: CT-02-palette

This will take your image and convert it back to essentially, 3 even color channels all with the same channel information. From there, you can apply adjustments to the image to achieve a color toned result.

Fig: CT-03-colorize-palette

This particular approach uses two adjustment layers; one, a Hue and Saturation adjustment set to "Colorize" and a second Color Balance adjustment layer to fine tune the color tone.

Fig: CT-04-colorize-hue-sat-1

Adding a Hue & Sat adjustment layer set to colorize allows you to select a specific hue to apply to your image. Generally, the saturation controls need to be reduced from their default of 25.

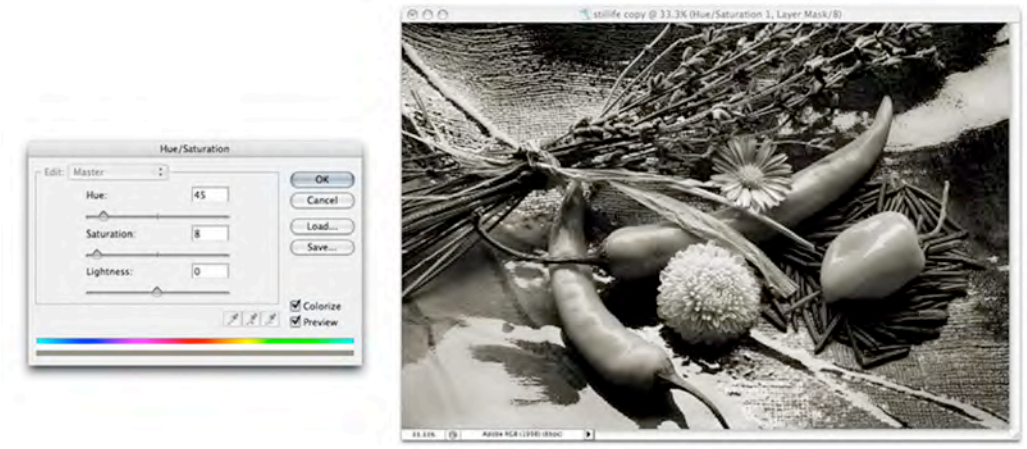

Fig: CT-05-reduce-1

In this figure, the hue has been set to achieve a warm toned result and the saturation has been reduced.

Fig: CT-06-balance-palette

To further the effect of a warm toned "sepia" toned print, I use a Color Balance adjustment layer on top of the Hue and Sat adjustment layer.

Fig: CT-07-hilites-1

I use the highlight slider to adjust the lighter colors more towards yellow to replicate the chemical results of bleaching and re-developing in actual sepia toning in the darkroom.

Fig: CT-08-shadows-1

To replicate the results of combined sepia/selenium toning, the shadows are adjusted cooler. To print this out, I use the standard way of allowing Photoshop to handle the color management and set the print driver to the "No Color Adjustment" mode (see the short Color Management sidebar for details).

The following images are actual scans directly from prints made with an Epson 4800 printer. The images were printed on Epson Premium Luster paper using either the Epson supplied ICC profile (for the color and the B&W through ICC profiles) or using the Advanced B&W mode of the Epson print driver. The prints were then scanned on an Epson 4990 Pro scanner with very little modification of the actual scans. The printed images have been submitted to Digital Photo Pro for verification and accuracy for this article.

Color

Fig: SCANS-01CM-color-output

This is the result of printing the original color image via Photoshop's Color Management using the suggested color managed method.

B&W-through ICC profile

Fig: SCANS-03BW-thru-ICC

This is the result of using color management to reproduce the color toned B&W image using the Hue & Sat and Color Balance adjustment layers. The result is a relatively neutral print with a slight warmth to the highlights and a slight coolness to the shadows.

Fig: SCANS-02Color-Neutral-Dark

One of the unique aspects of the Epson Advanced B&W driver mode is that you can actually print color images directly through the driver without first converting to a grayscale image. The image above was printed in this method. However, you'll note that this method eliminates the ability to do a locally adjusted conversion from color to B&W.

Fig: EP-01-Settings-ABW-select

Selecting the Advanced B&W mode allows access to specialized driver controls dedicated to producing B&W prints.

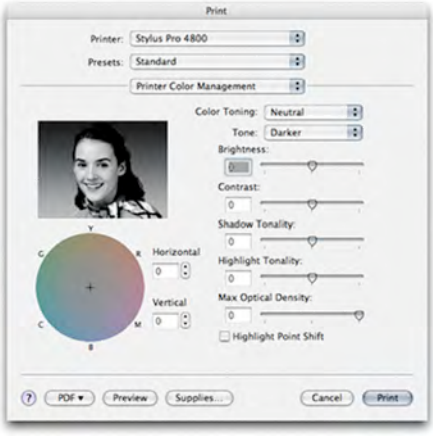

Fig: EP-03-neutral-darker

When selecting the "Color Management" panel of the driver, you are presented with a variety of tone and color controls to adjust the image density and output color. By default, the "Neutral" setting comes with a tone setting of "Darker". While it does produce a generally darker image, I've found that when printing images whose gamma is 2.2, I prefer the tonal output of the "Dark" setting.

Fig: EP-04-neutral-dark

Neutral Dark

Fig: SCANS-04Neutral-Dark

The image above was output from the custom grayscale conversion using the layered channel method. It was output using the "Neutral" and "Dark" setting with no other adjustments in the driver applied.

Fig: EP-06-Select

Within the dialog, one can choose from a drop down menu of preset color toning. The toning is applied in a linear tint from dark to light without any adjustments in the color of the highlights or the shadows. This is one unfortunate limitation of the current driver.

Fig: SCANS-05Cool-Dark

Fig: SCANS-06Warm-Dark

Fig: SCANS-07Sepia-Dark

To my taste the default color tones are generally a bit too saturated.

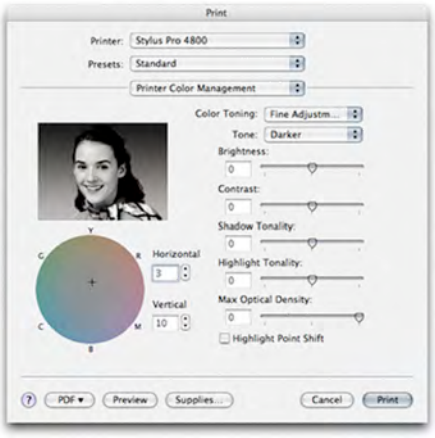

Fig: EP-10-warm-custom

My preference is to reduce the intensity of the horizontal and vertical color axis thereby reducing the amount of the colors used in printing. For the record, one of the attributes of the Advanced B&W Photo mode is to alter the usual use of color inks. With this method, only the three black inks, dark cyan, dark magenta and if needed a tiny amount of yellow are used. The light cyan and light magenta inks are not used at all.

An additional benefit to the ink limiting of the Advanced B&W Photo mode is that the primary inks used, the black inks, are composed of highly-stable carbon pigments. This results in significantly higher print permanence ratings as reported by Wilhelm Research (see: www.wilhelm-research.com). Preliminary results indicate that Epson Premium Luster paper framed behind UV glass will last over 200 years. Epson Premium Glossy and Epson UltraSmooth Fine Art papers will last up to 300 years in album/dark storage (73ºF & 50% RH).

So, this is the current State of the Art of B&W conversion and digital printing. Never before has it been this easy and with such high quality as digital B&W offers right now. Will it displace the traditional darkroom and silver gelatin prints? For the vast majority of photographers, it will. The quality of printing available with the Epson UltraChrome K3 Ink printers and the absolute control offered by Photoshop will enable photographers to take their digital B&W images to a level that meets or exceeds traditional darkroom prints.

In tests I made using traditional silver gelatin prints, previous ink jet printers and the new Epson printers, I've found the level of neutrality to be remarkable. The holy grail of B&W prints is the D-Max and that's where the new printers shine. I read prints from an Epson R2400, a 2200 and traditional silver based prints and found that the prints from the R2400 (as well as the 4800/7800/9800 printers) produced a D-Max of 2.39 on Epson Premium Luster paper while the Epson 2200 delivered only 2.04 while silver gelatin prints topped out at about 2.24–substantially less black than the R2400 prints. Combined with the long-term permanence and the fact that traditional B&W photo papers are being phased out, it's clear that at long last, digital B&W printing has arrived and will finally take over from traditional silver gelatin printing in traditional darkrooms. How does this make me feel? I'm really excited at the prospect of finally getting back into B&W photography after all these years.