"Eboni" Carbon Variable-Tone
Black and White Inkset
Epson 3800/3880 printers

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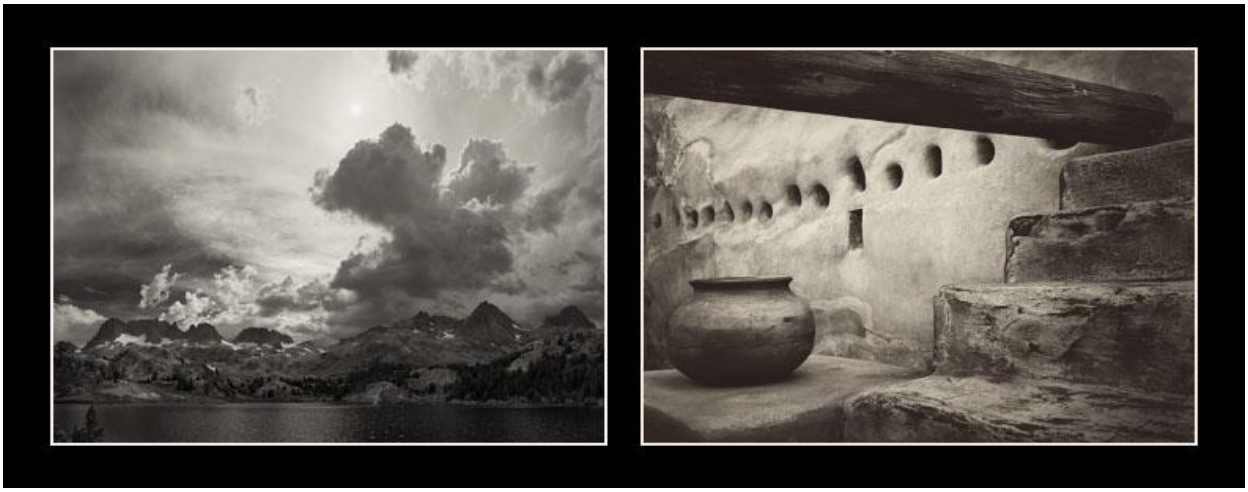
1/2017c

[Note that I no longer have an Epson 3880. As such, there will be no further profiles made for this platform at the present time. This 3880 setup, however, serves as a model for any Epson K3 setup, and with QTR the profiles probably will only need re-linearizing to work on other K3 printers. I am also using a variable tone glossy compatible inkset.[1] The glossy carbons are more flexible, but they will have the usual clogging issues, whereas the matte paper only dilute inks virtually never clog because there is no binder (glue) in the dilution base.]

This PDF discusses an "Eboni-6"[2] based inkset for the Epson 3880 that adds a light blue toner to expand the image tone range of those inksets from warm carbon to cold tone. The goal here is to make the most lightfast,[3] as well as most efficient[4] and cost effective[5] means of producing museum quality B&W 16x20" prints (on 17x22" paper) – and larger panoramas. This inkset prints only on matte paper and is fully Epson driver compatible. On the other hand, for optimum control I most often use QuadToneRip.[6]

With the advent of Epson's new P800 replacement for the 3880, I expect these older but very capable printers will be readily available on the used market.



[1] See http://www.paulroark.com/BW-Info/Glossy-Carbon-Variable-Tone.pdf .
[2] See http://www.paulroark.com/BW-Info/Eboni-6.pdf. See http://www.inksupply.com/eb6.cfm.
[3] A neutral print with more stability than a silver print, as well as an even more stable warm carbon print.
[4] The 3880 footprint is only 27x15 inches. Mine sits on a small bookshelf behind my desk.
[5] MIS bulk (pint) ink princes are about 15%, on a per/ml basis, the price of Epson ink bought from Atlex.com. If you mix your own inks from MIS Eboni MK and generic dilution base (C6b recommended), the cost can be as low as about 3% of the OEM ink costs.
[6] See http://www.quadtonerip.com/html/QTRoverview.html. Profiles can be downloaded from http://www.paulroark.com/BW-Info/3880-EbVT-Profiles.zip.

The above images show the approximate print tones for natural (no OBA) paper, with Stonehenge natural watercolor paper on the right. Note that these are the print tones possible **with profiles that use only 100% carbon pigment**.[7] Producing the best 100% carbon prints is still a top priority, not only in and of itself, but also because to make the best neutral-cool prints, one must start with the most neutral carbon core.[8]

The reason to have the highest percentage of carbon in the inkset is simply because it is by far the most lightfast printing substance available to us, with up to 10 times lower delta-e than even the selenium toned silver print.[9] Carbon also lacks the artifacts that appear when too much color is used.

Carbon is, by nature, warm. However, with the use of the blue toner, truly neutral or cool prints come within the range on this inkset, and they will have the highest percentage of carbon and least amount of color pigments in them of any inkset for any given degree of coolness and smoothness.

With regard to neutral/cool prints that use the blue toner, exceeding the archival qualities of the traditional silver print is also possible with this inkset, though nothing matches the stability of 100% carbon on a cotton paper.

Many papers that are brightened with OBA's (Optical Brightening Agents/dyes) may print cooler and be preferred by some. Many avoid such papers because the OBA dyes fade.[10] On the other hand, one of my favorite images, that has been on my living room wall for years, is printed on Premier Art Smooth Bright White.[11] This paper has traditionally printed the most neutrally with Eboni-6. More often, however, I use the 325 gsm non-OBA version of this paper.[12] Very similar to this is the Epson Hot Press, which comes in both "natural" (no OBA's) and "bright" version.[13]

[7] See http://www.DavidKachel.com/ for the photographer/artist who introduced me to Stonehenge paper.
[8] No printer manufacturer inkset uses a 100% carbon core. Their gray inks are carbon-color blends.
[9] See Appendix 1, below.
[10] There may also be evidence that the faded dyes have a negative effect on longevity. Source -- Mark McCormick-Goodhart, http://www.aardenburg-imaging.com/ .
[11] See http://www.premierimagingproducts.com/smooth-bw-fine-art-paper/ ; Premier Art's OBA-free Smooth Fine Art 325 gsm is the inkjet paper I most often use. See http://www.premierimagingproducts.com/smooth-hot-press-fine-art-paper/ . The 205 gsm version was Epson's "Scrapbook" paper that it claimed was its most archival.
[12] These papers are siblings of Epson's Premier Art Scrapbook paper, which Epson once claimed was their most archival paper. In fade testing at http://aardenburg-imaging.com/ this paper with Eboni carbon produced the best results.
[13] Arches watercolor paper may be the most neutral printing paper, but it requires 2 MK positions to hit its dmax and is not as smooth as inkjet paper. I recommend it only for full sheet (22 x 30"), art-related images; not recommended for most photographers/printers.

Ink Arrangement

Y = Toner (13.75% Blue, 11.25% Cyan Canon Lucia pigments,[14] 75% clear base.[15])
(The toner color pigment mix is 55% Canon Blue, 45% Canon Cyan. This is then mixed 25% color pigments, 75% clear c6b base.
LM = 6% MK (Eb6-LM)[16]
M = 18% MK (Eb6-M)
LC = 9% MK (Eb6-LC)
C = 30% MK (Eb6-C)
LK = 18% MK (Eb6-M)
LLK = 6% MK (Eb6-LM)
K = 100% MK (Eb6-K)

Note that while this PDF focuses on the 3880 (and 3800), this approach is rather universal. I expect this general approach to work on all Epson printers.[17]

Cartridges and Chips

There are now a variety of competitors selling cartridges that will work with this family of printers. I am currently using Inkjetmall's version.[18] You do need a set of OEM Epson chips from used Epson cartridges. The filling procedure is easy and well documented, but see the video. The PDF instructions have an older method of priming the carts. One weakness I see in the system is that the Epson ink Status Monitor shows the inks as always full. However, since both Jon Cone and I recommend you agitate pigment inks every couple of weeks, you'll be able to see how full the carts are every time you pull them for agitation. I have also experienced some random issues with a cart/chip not registering or all of the carts being shown as empty. A shutdown and reboot of the printer has cured all of these glitches.

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[14] Canon Lucia Blue (PFI-106B) and Cyan (PFI-106C) are the inks used in Canon's iPF6300 printer. See for example, https://www.itsupplies.com/Canon/Canon-imagePROGRAF-iPF6300/iPF6350. To drain Lucia tanks, I just poke holes in the soft plastic with a clean awl – one high on the side for air to enter and one near the bottom on the side for the inks to pour out of into a 4 oz. bottle. I do this over a sink.

[15] Clear base version C6B is recommended. See http://www.paulroark.com/BW-Info/Ink%20Mixing%20Generally.pdf . It can be purchased pre-mixed from MIS at http://www.inksupply.com/roarkslab.cfm (no royalties to me; all of my formulas are totally open source and free).

[16] MIS sells Eboni-6 pre-mixed at http://www.inksupply.com/eb6.cfm. I consider their dilution base to be essentially equal to my C6B base and when last tested the profiles were the same for it and the c6b base dilutions. I use the generic base c6b for everything (but not for glossy MIS pigments). The Canon and HP pigments have their own glossy coating that is compatible with c6b. Thus the generic base can also be used for glossy inksets using the best HP and Canon pigment inputs. They run very well on Epson printers.

[17] I initially used a lighter toner in my 1400/1430 version and 7800 version because I was not trying to utilize the ABW mode of printing. I now recommend the 75% dilution for all variable tone inksets.

[18] See http://shopping.netsuite.com/s.nl/c.362672/it.A/id.5665/.f. I initially tried refilling OEM Epson carts and resetting the chips. This resulted in carts that leaked (major mess) and chips that only reset once. Pay for good carts. It's worth it. See the instructions for refilling and using these carts at https://www.youtube.com/watch?v=vY8beG2obu8&feature=iv&src_vid=OvrjjF-Gdf8&annotation_id=annotation_1879476043 .

I recommend you open the ink cartridge cover just before shutting the printer off. That way the next time you want to agitate the carts or check the ink levels, the door is open. If loading or agitation is needed, it can be done before the printer is turned on next time. With either agitation or ink refilling, it might be a good idea to let the ink sit for a few hours to be sure any bubbles rise to the top and any too-large particles settle.

Toner & Color Pigments

(To summarize this section, a neutral print on OBA free paper should be more stable than a silver print, and placement in the Y position makes it very easy to control with the Epson driver or QTR.)

I have mixed and worked with a number of blue toners over the years in the various MIS Associates' UltraTone B&W inksets as well as those I've mixed from OEM and other third party color pigments.[19] The basic approach that has worked the best is that a single toner is put in the Yellow ink position and is diluted to the point where it is not seen.[20] Under a loupe one might be able to see some fine dots, but the most visible are carbon. There is no visible color dot structure.[21]

Of course, a full color set allows more flexibility in toning, but I'm a black and white photographer. My images stand or fall based on composition and content, not color. With a single toner that covers the traditional neutral to medium warm silver print tones – and is hard to make a bad or weird tone with – I can focus on B&W and make a uniform show or set of prints that will not clash with any other colors, while tapping into our B&W photography traditions – very simply and efficiently B&W. With only one light blue toner, all the other positions can be relatively neutral carbon, adding to the smoothness of the print.

The Yellow position is use because it is the only one that allows direct control via the Epson driver, and it spans the entire range of the print, aside from the paper white and 100% black. The Epson ABW controls the toner via the vertical (yellow-blue) controls, and ICCs are easily made with QTR's Create ICC-RGB that give a "color managed" workflow. With a Photoshop image adjustment curve embedded in an ICC, the full range from carbon to cold is available through the Epson driver. The same basic warm/carbon and neutral curves seem to be very close to correct for almost all matte papers. To make an ICC for a new paper, all one has to do is print an RGB test strip with one of the supplied curves, feed the curve and Lab L values read from that test strip[22] into Create ICC-RGB, and an ICC pops out that provides a "color managed" (gray ramp matches calibrated monitor) workflow.

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[19] The first "variable tone" B&W inkset was made by me using Piezo inks in March 2001. See a bit of the history at http://www.spinics.net/lists/epson/old/2001_01/msg02842.html .

[20] The primary variable in "cool" to "warm" traditional silver prints is the Lab B value. Lab A can increase substantially in sepia prints, but that is beyond the scope of this project. When more than a single color variable is in the mix, very few people can effectively profile it. Simplicity and avoiding the dangers of weird colors and cross-overs is part of the goal here.

[21] The toner Lab L or density is approximately the same as the lightest carbon ink, which is the 6% MK (Eb6 LM). Even with a 2400 dpi RGB scan the color toner dots do not show. A 2400 dpi RGB scan of the highlight area of a neutralized carbon H. Photo Rag test strip is at http://www.paulroark.com/BW-Info/3880-EbVT-HPR-Neutral-2400-scan.jpg. This was printed by QTR.

[22] A spectro is nice, but a flatbed scanner can to the job. Download QTR's StepWedge Tool and read the PDF. See http://www.quadtonerip.com/html/QTRdownload.html

This 3880 Eboni VT inkset uses a toner made with Canon Cyan and Blue Lucia EX pigments and the generic dilution base "C6b" which can be mixed with readily available chemicals or purchased from MIS Associates.[23] The use of a blue Canon pigment minimizes the hue angle between the two pigments needed to mix the toner. In this case, the cyan-blue hue angle is 50 degrees, as opposed to about 120 degrees for a typical cyan-magenta mix. By minimizing the difference between the pigments used, more cooling is achieved with less color, and the degree of color shifting of the image due to differential fade of the two pigments is minimized.[24] The ideal might be a single-pigment toner, but there is no single-pigment blue that correctly offsets the carbon warmth. So, using the best blue and cyan available seems like the second best solution. With the relatively narrow hue angle, the pigments won't be offsetting the colors of each other, as opposed to offsetting the carbon yellow.

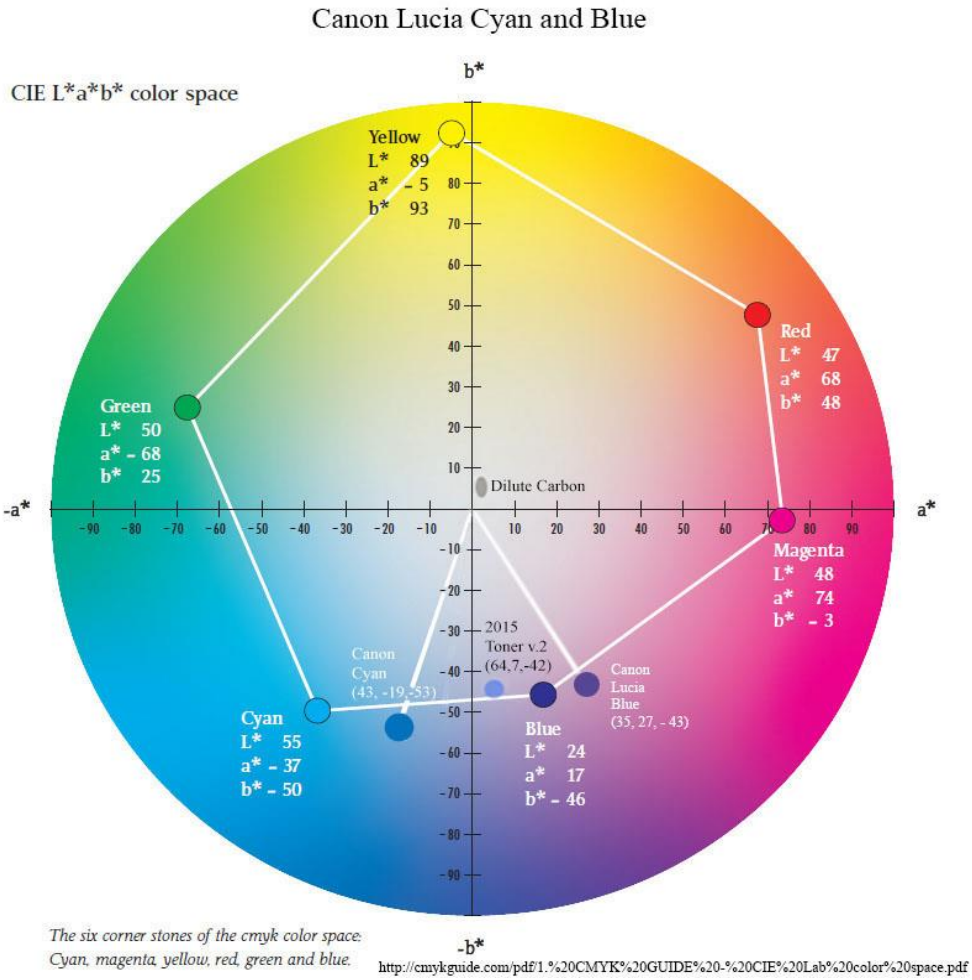
One advantage of a toner made with two color pigments is that the Lab A values can be altered by changing the ratios of the cyan to blue pigments, while the narrow hue angle minimizes the risks of overdoing this and minimizes batch to batch variations. I usually target a slight increase in Lab A over the paper white. In general, I've found a negative Lab A – green – is not desirable. On the other hand, a slightly elevated Lab A is what the classic "selenium toned" silver print had.

The Lab color circle, below, illustrates what the pigment colors are. The typical CMY and RGB colors were included on the original, connected in a rough hexagon shape.[25] I've added the Canon pigment colors, the final toner color, and the dilute carbon color. The toner color listed was read from the 35% test patch of a QTR Calibration Mode print. The higher the density, the greater the gamut. The Lucia EX Blue and Cyan patches were measured from draw-downs of the Canon inks.

[23] See http://www.inksupply.com/roarkslab.cfm . An earlier effort used Epson K3 cyan, but it appears there is a long term stability problem with that mix.

[24] The delta-e of the Canon "cyan" and "blue" test patches in http://www.aardenburg-imaging.com/ fade testing were both 1.9 at 140 Mlux-hours (Canon iPF6300 Lucia EX ink, H. Photo Rag paper). See a reproduction of that test page at http://www.paulroark.com/BW-Info/LuciaEX.JPG .

[25] See http://cmykguide.com/pdf/1.%20CMYK%20GUIDE%20-%20CIE%20Lab%20color%20space.pdf



The most noticeable problems with third party toners and blended carbon-plus-color inks in the past have related to ink separation and green shifting images as the magenta used for toning faded much faster than the cyan.[26]

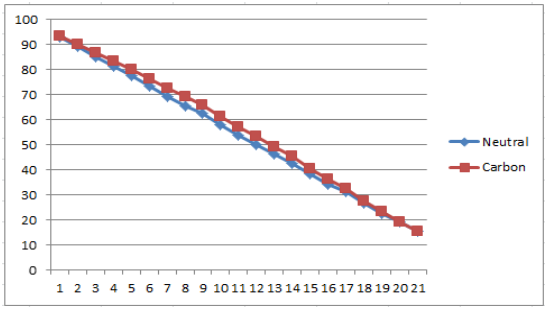
With respect to the ink separation, I have tested the toner mix above with my centrifuge, and its performance in that test was as close to perfect as any ink – including OEM LK inks – that I have ever tested. I continue to monitor long term tests of stability.

With respect to color shifting over time, while a neutral toned print cannot do as well as a 100% carbon print, matching or exceeding the performance of a silver print is realistic. In the Aardenburg-Imaging fade test of Lucia EX, the B2 "purplish blue" test patch is very close in its Lab A and B to the toner mix. At 100 Mlux-hours of light fade, that test patch lost 1.6 units of Lab A. Its Lab B is about -40 at the print density of the test patch. The carbon on a number of good non-OBA papers has a Lab B increase over the paper white of about a about 4 units. Some papers can get up to a delta B = 7. Assuming one uses a paper that has a delta Lab B = 4, to offset this increase (warmth), only 1/10th of the toner amount needed to achieve a Lab B = -40 is needed. This may indicate that the Lab A drift at 100 Mlux-hours

[26] See http://www.paulroark.com/BW-Info/Eboni-v-Cone-N-HPR-140hrs.jpg for a comparison of carbon v. a popular neutral third party B&W ink.

(about 51 Wilhelm display years) would be -0.16. The silver print tested by Aardenburg-Imaging had a negative Lab A drift at 100 Mlux-hours of 3 times this amount.[27] A single Lab unit of measure is often described as "barely visible."

Above, looking at just the Lab A and B, it looked like enough toner to supply 1/10th the carbon "color" would be needed. Below, I look at the Lab L impact of the toner. The Lab L graph, below, compares a neutral test strip with a 100% carbon version, where the carbon inks were printed with the identical QTR profile.[28]



As can be seen in the above graphs, the additional density added by the toner is, at most, about 5% -- the difference between the steps of the 21-step test strip. If the color pigments totally disappeared, aside from a side-by-side comparison, viewers would probably not notice a density difference. The print tone, of course, would move from neutral (Lab A and B of the image equal to the paper tone) to medium warm (about a delta Lab B = 4). At 140 Mlux-hours of fade (about 71 Wilhelm years of display) the pigments used lost less than 5% of their "density" (Lab L increase).

Overall, even the best inkjet color pigments have a fade rate of about 2 to 3 times that of the Eboni carbon. However, since the color inks' total contribution to the density of the print is so low, a neutral print, mathematically, will only have a Lab L/density mid-tone fade rate[29] of approximately 10% more than the 100% carbon print. That compares to over 100% or greater Lab L/density fade rate disadvantage of the OEM B&W approaches.[30] The difference is due to the combination of a more neutral starting carbon and a more efficient as well as much smaller use of color pigments.

This inkset arrangement is compatible with different toner mixes, and I will probably develop newer, better and/or less expensive or more convenient toners, if possible. I assume pigment technology will

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[27] See http://www.paulroark.com/BW-Info/Carbon-Silver-Print-Lightfastness-Compared.jpg. Note also that, although Aardenburg Imaging tests have cyan and blue test patches, those test patches may include other pigments, as determined by the printer drivers. Nonetheless, in such tests, at 140 Mlux-hours on H. Photo Rag, the Canon cyan and blue test patches had the same total delta-e measures. See my screen grab of the test page at http://www.paulroark.com/BW-Info/LuciaEX.JPG . See http://www.aardenburg-imaging.com/ for the original testing results.

[28] The paper was Premier Art Smooth Fine Art 325. The linearized *neutral* test strip was printed, and then the toner in that profile was turned off (not used) and a 100% carbon pigment test strip printed with the same linearized profile.

[29] Technically, I measure the increase in Lab L. In more common language, however, the density of the print is decreasing. That is, the print is "fading."

[30] Compare Lab L changes of Eboni v. HP and Epson ABW grayscale tests on Hahnemuhle Photo Rag at 140 Mlux-hrs reported at http://www.aardenburg-imaging.com/ . See also Appendix 1, at the end of this PDF.

continue to advance, and this ink arrangement seems like the most flexible in terms of control and near universal compatibility with Epson inkjet printers.[31] At the moment, the Canon based toner appears to be the best shot at beating the silver print image stability with a neutral inkjet print.

Printing Characteristics and Profiles

My profiles are posted at http://www.paulroark.com/BW-Info/3880-EbVT-Profiles.zip. I update this routinely as profiles are made.

This inkset is compatible with the Epson driver as well as QTR. The Epson driver is probably the simplest approach, while QTR allows a much greater level of control for more complex profiles, including split-toning.

In general, carbon pigments all tend to be warm to some degree. The glossy compatible ones are the warmest. That is one reason the OEM inksets have to use more color inks. Eboni is the most neutral carbon matte black ink I am aware of that has no dyes in it.

Different papers print with different degrees of warmth. This warmth is most easily measured by the Lab B values of the prints. Glossy papers with glossy compatible carbon pigments will have a Lab B (yellowish-warm) of up to 14, about half way to a true sepia tone. The glossy carbons on matte paper will have a Lab B of about 8. Eboni-6 usually has a Lab B of between 4 and 7.[32]

In actual display, the increase in Lab B over the paper base is often the primary source of visual warmth. When a print is displayed on the wall, away from a very cold computer monitor or brightened typing paper, the eye will do a "white balance" on the mat paper or paper white of the print. Thus the "delta Lab B" of an ink profile and paper is perhaps the most important single measure we have for the apparent warmth of an image on near-neutral paper.

My QTR profiles have the pre-linearization Lab L, A and B readings of a 21-step test print in their Notes sections. So, even with just Notepad, you can double click on the *.qidf file and see how the paper prints. Likewise, Notepad can open an ICC, and, again, the full pre-linearized Lab L, A and B will appear. The "carbon" profiles show how the carbon by itself prints on the particular paper.

So far in profiling with this Eboni-6 v. 1.1 and the 3880, Red River Aurora Natural has the lowest delta Lab B among inkjet papers, followed closely by Premier Art's Fine Art, Smooth Hot Press 325. Hahnemuhle Photo Rag is among the warmest printing neutral papers. Surprisingly, the amount of toner needed to neutralize the warmth is not much different among the papers.

The densest Eboni inks are more neutral than the more dilute ones. A "black only" (only the Eboni MK ink) print on some papers is almost neutral. The Eb6-C (30% Eboni MK) dilution can also be more

[31] The Epson piezo electric head technology is more tolerant of higher viscosity inks, which allows larger, more neutral carbon particles to be suspended in the ink. Thermal technology of Canon and HP are excellent, but at this time Epson remains the best for this type of carbon B&W inkset. It is interesting to note that the HP PK pigments diluted in generic base to make an LK did better in centrifuge testing than did the OEM HP LK.

[32] I most often refer to the delta Lab B – that is the difference between the paper and the maximum Lab B reading of the test strip – as the "lab b" of the paper.

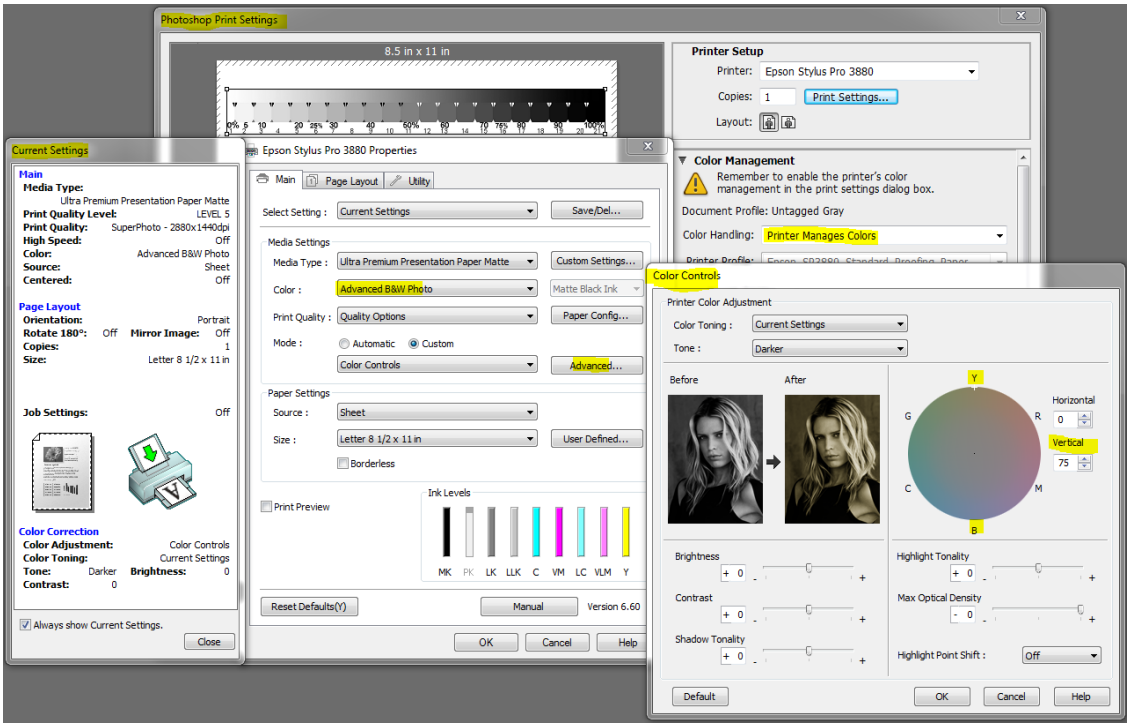
neutral than the more dilute inks. As such, using these denser inks along with the dilute inks can produce a print that, while not being as smooth as a standard Eboni-6 print, can be smooth enough for large wall displays and have a delta Lab B of below 3, which will look quite neutral in wall displays. However, with these complex approaches QTR is needed, and there is a trade-off between smoothness and coolness with no toner is used. For most printing, using the toner is the way to get any degree of coolness desired as well as outstanding smoothness, easily, and both QTR and the Epson driver can do this easily.

Epson Driver

The 3880 has several paper paths. The normal sheet feed is for thinner papers – under 300 gsm. However, I've found it to be fine with the slightly thicker 325 gsm paper I use most, and it allows the printer to be used in a narrower space. As such, unless otherwise state, I use the sheet feeder with media type setting "Ultra Premium Presentation Paper Matte," and profiles are written for those settings.[33]

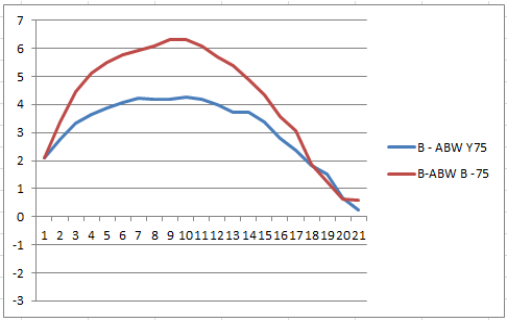
Advanced Black and White Mode

The Epson "Advanced B&W" mode printing works very well with this inkset, making a slightly smoother print than when the "color" mode is used. ABW also achieves a slightly better dmax. The standard settings I use are shown below. The Epson driver settings are in front, with the Photoshop Print screen setting behind them. (You may want to magnify the image to read the settings.)



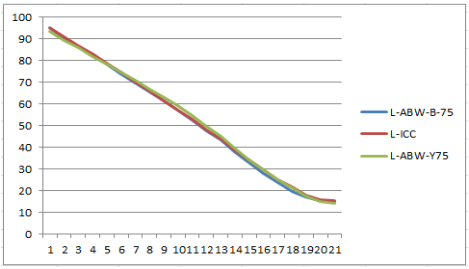
[33] When the rear manual feed is used, use UltraSmooth media type and a profile that is made for that setting.

The Color Controls of the ABW driver approach can achieve some control of print tones from about the carbon warm to a delta Lab B of 2 for some papers, which will appear quite neutral on the wall, away from brightened papers and cold monitors. A neutral/cool print with a flat Lab B, however, is out of range. For that type of neutral/cool print either PS curves, with or without an ICC, or QTR is needed. The graph below shows the Lab B range or the ABW mode controls for Red River Aurora Natural.



Paper white 100% Black

The Lab L graphs, below, show the Lab L values (aka "gray ramp" or "characteristic curve") for the ABW mode prints with these settings as well as an ideal Gray Gamma 2.2 response that one gets with an ICC. They are very close.



Many have noted that the new Epson P800 replacement for the 3880 has a remarkable dmax. That may be so, but Eboni in the 3880 does slightly better. The Epson Hot Press Natural Lab L, in ABW mode, measured in the LuLa review was 13.96.[34] In the ABW mode Lab L graphs above for Eboni the EPHn Lab L values averaged 13.5. (Lower is darker.)

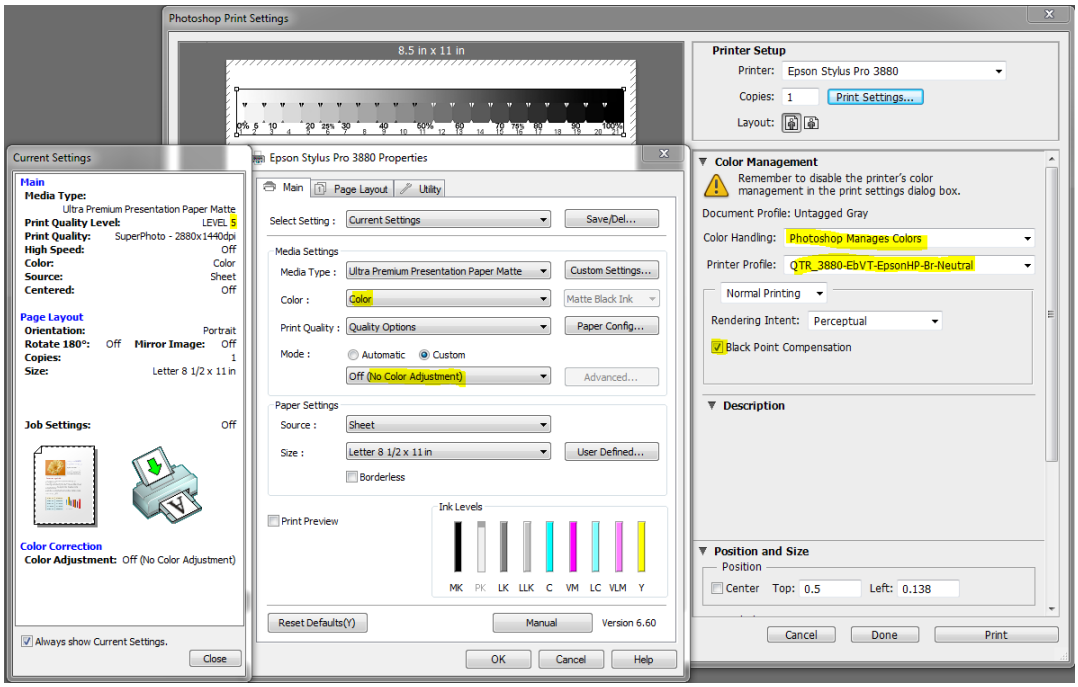
For many if not most papers, the Epson drive in its ABW mode makes a very easy way to get outstanding, slightly warm prints without the need for any other profile.

Note that ICCs can be combined with the ABW driver settings for those who want, but the ABW gray ramps are so good as is (assuming the image is edited in Gray Gamma 2.2 or Adobe RGB), it may not be worth the trouble.

Color Mode with Photoshop Curves and ICC's

When control of the print tone is desired via PS curves or an ICC (that may have curves embedded in it), or when a more perfect "color managed" gray ramp is desired via an ICC, the following driver settings are used:

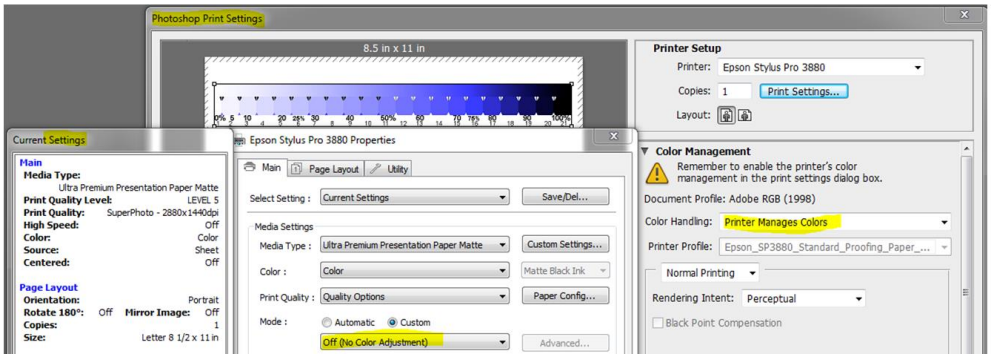
[34] https://luminous-landscape.com/new-epson-surecolor-p800-printer-review/



When an ICC is used or going to be made, the driver settings use “color” and Mode “Off (No Color Adjustment).”

The Photoshop Print Settings when an ICC is used includes “Photoshop Manages Colors” and then the particular ICC is pulled up just below that. Note the Rendering intent is “Perceptual” with “Black Point Compensation” checked.

Where one is making an ICC or where just PS curves are used to control the print tone, the PS Print Settings are different. They should be set to, “Printer Manages Colors.”



The ICCs (with curves embedded) are most useful where one wants to use the Epson driver to print a neutral print. The Profiles that are marked “Neutral” have a Lab B response that is essentially a straight line between the paper white and the maximum black or deep shadows. Often the 100% black point is cooler, which makes it look darker in typically warm indoor lighting. It is very difficult to see very subtle color in the deep shadows.

Where a warm print is needed, just using the ABW mode controls is the easiest approach. On the other hand, I have in the Profiles zip file PS curves that should work for most papers to make neutral or warm ICCs or direct prints, though the gray ramps on the different papers will not be exactly like the Gray Gamma 2.2 standard ramp. The "linearization" or coordination of that density distribution with the working space is the major benefit of an ICC.

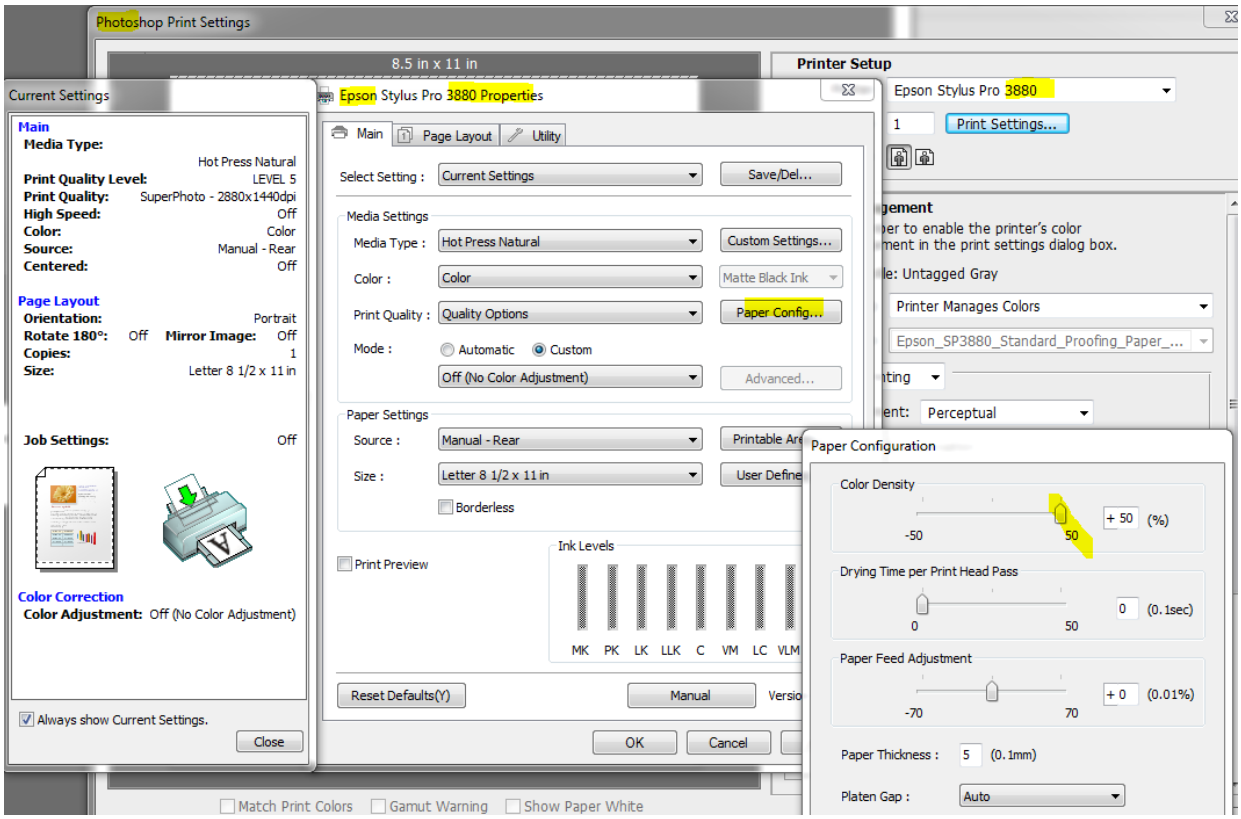
I would seldom use the warm and cool curves to directly control the print tone unless I was going to make a print that had both tones in it. The print below is an example of what can be done with direct control of print tones by PS curves and by selection area or layers.

In the "Whaler's Cabin" print, shown above, the tree ("lighted by the moon") is "neutral" (equal to the paper tone, Lab b = 0). The cabin window and area behind the cabin ("lighted by the fire boiling the whale fat") is printed with the warm carbon pigments only, Lab B = 6. With Photoshop curves, split-toning can be accomplished by area.

Arches Watercolor Paper

Although I recommend most people stay with inkjet paper, Eboni carbon can print well on Arches uncoated Hot and Cold press watercolor paper. I prefer the Hot Press Bright White (no OBAs) 140 lb. While QTR and two MK positions gives the best dmax, the Epson driver might actually produce a nice watercolor print with a decent dmax and possibly smoother than QTR. The key to a reasonable dmax is to adjust the color density in the Epson driver.[35] See the screen shot below for what I recommend as a starting place for Arches printing:

[35] On the 7800, QTR and two MK positions can produce an average dmax of 1.68. With the Epson driver and a single MK, and with the density adjustment maximized, 1.62 is about the norm.



I did not experiment with this when I set up the 3880, so I have no curves or profiles. However, simple RGB PS curves to get the print color tone desired and also straighten the Lab L a bit will probably allow good ICC printing when an ICC is made with QTR's Create ICC-RGB.

In addition to the above settings, it might be good to adjust the platen gap to "wider," but I have printed a lot of Arches 140 lb. paper without bothering. So, I don't know the risk.

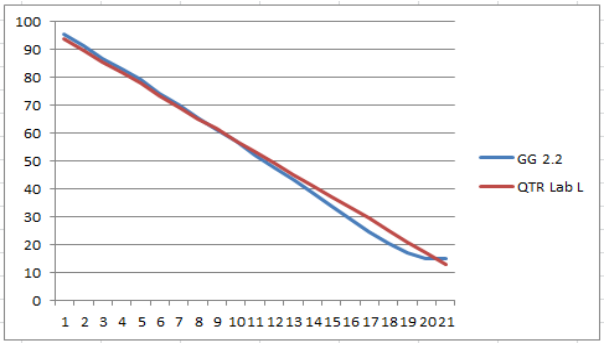
The strengths of Arches includes its lack of coating to flake off, easier retouching, and long history of quality and acceptance in the art world. The weaknesses include a more prominent paper texture, relative lack of smoothness in areas like plain dark skies, and sometimes a batch that has a lot of loose fibers. Some prefer printing on the back side as it tends to have less, if any, of these loose fibers.[36] It's a specialty paper that might have some appeal in the art market. Printing with the deckle edge at the bottom of the sheet (iron it to flatten it and burnish the cut edges), and then floating the paper in a frame might prove attractive in the art market.

[36] At http://www.wetcanvas.com/forums/archive/index.php/t-1324017.html a commenter noted that the watermarked, front side "had this kind of very fine, fuzzy texture to it, almost like pilling. … You can see the fibers sticking up off the paper surface when you look closely." Blick Art Materials responded, "The Arches Watercolor Paper … is meant for watercolor, it has to remain slightly more absorbent and thus the fuzzy texture you are describing."

Printing with QuadToneRip

QTR is the printer utility I have usec for most of my serious printing. Note that I use Windows 7 and the QTR Windows GUI. Mac users will have a different interface and workflow, but the profiles are compatible.

At the outset, know that QTR, when printed from the Windows GUI, prints with a straight line Lab L characteristic curve. See the comparison of the Gray Gamma 2.2 and the QTR Lab L curves, below.

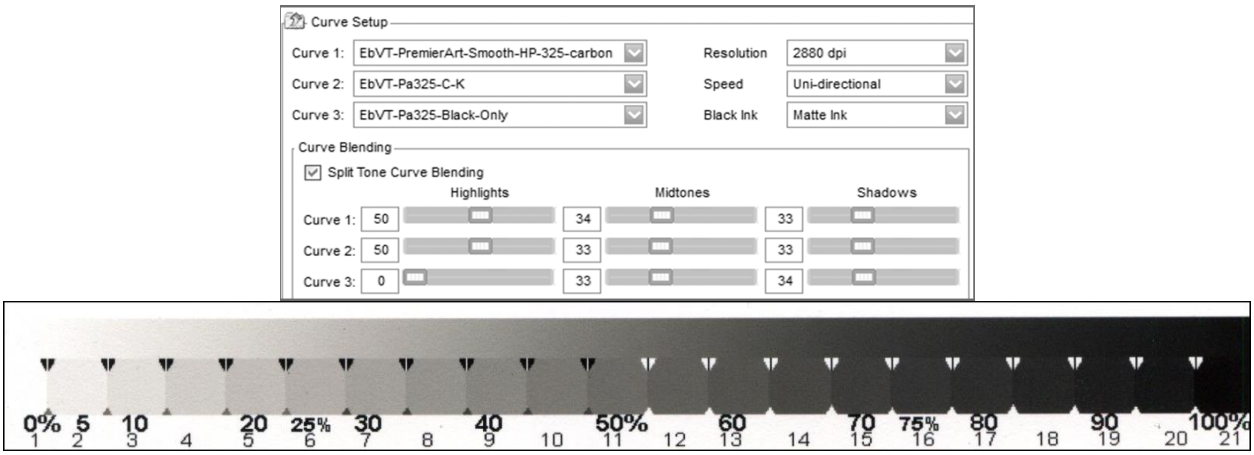


Because I edit in Gray Gamma 2.2, I need to adjust the print to compensate for the differences in how they print. To do this, I apply a Photoshop curve (after I have saved my master file) that offsets this printing difference just before I print the file. I save this printing file to the Desktop with "QTR" in its name. It can just be dragged and dropped into the QTR GUI. After printing, I delete the QTR-adjusted file. The Photoshop image adjustment curve I use is called "GG22-to-QTR.acv" and is in the Profiles Zip file.

One can also make this adjustment by converting the workspace to QTR_Gray_Matte_Paper, an ICC that is supplied in the QTR download. In either case, be clear that you are no longer in Gray Gamma 2.2, and the images will look dark in that space. The internet uses the gamma 2.2 space, as does Adobe RGB, which is what our cameras generally capture images in (sRGB is very similar also). So, I recommend working in Adobe RGB (1998) and Gray Gamma 2.2. I use the converted files only for printing; then I delete them.

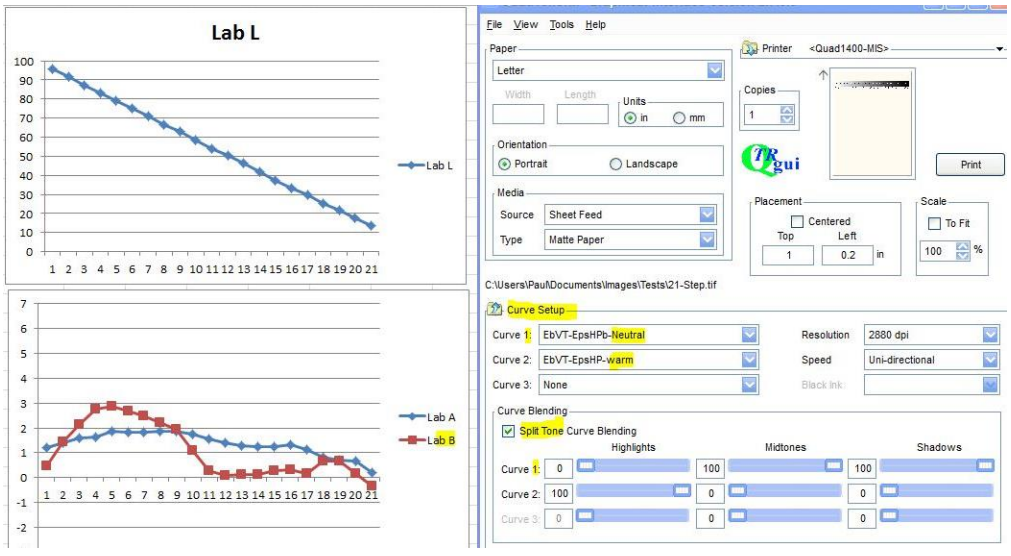
One of the advantages of QTR is that one can use more than a single profile at the same time. This is useful for split toning (use a warm profile in the highlights and a cooler one in the shadows) and for combining different 100% carbon profiles to achieve a 100% carbon print that is cooler, even if a bit mote grainy.

The image below shows the setup and resulting print where a QTR profile using all the dilute inks was combined with one using only the C and K inks as well as a Black Only profile to achieve a 100% carbon print with a delta Lab B of 2.6.



For large wall prints, it is doubtful that anyone will notice the slight graininess of this print. This test strip original was 8 inches wide. The image is 200 dpi. The Lab B of the paper was adjusted to Lab B = 0 so that the "brighter" background of the Word document would not bias the delta B = 2.6 of the print as it would be seen displayed on the wall (and not around bright paper or monitors). The colors of the scan are not particularly accurate.

When the 100% carbon and neutral profiles use the same carbon core, using the sliders in QTR, even with an extreme split tone, keeps the Lab L about as straight as the original profiles. All the slider is doing is, in effect, changing the amount of toner and making very small offsetting changes in the linearization multiplier. See an example, below, made with the 1400 version of this approach. The main point is that the split tone sliders do not affect the Lab L curve the way they often do if two different partitions of differently toned gray inks are used.



A more common use of the QTR sliders is simply to combine a carbon/warm with a neutral profile to achieve a print tone that is between the two. Thus with the 100% carbon and toned "neutral" profiles, all the intermediate print tones are available.

For colder prints – where the Lab B dips between the paper white and black point – one has to go to the "neutral" profile and increase the Ink Load of the Yellow position (blue toner) ink. This will add some density to the image, such that a re-linearization is technically needed. However, in practice, the amount of blue one might want is probably going to have only a minimal impact on the Lab L/gray ramp values.

Printing on Canvas – Not for novices

Desktop printers, including the 3880, can print on canvas, but without the vacuum systems of the more serious professional printers, there can be issues with head strikes. Also, with no roll paper feature, loading the canvas is tricky.

To minimize the chances of head strikes, I recommend setting the platen gap to "Wider." There is some decrease in sharpness, but on the wall, it is doubtful anyone will ever notice it. Additionally, if the edges turn up, bending them down a little just before feeding the paper might help. It's likely also that very generous top and bottom margins should be used. If only one set of rollers is engaged, the likelihood of a corner turning up is higher.

To load canvas sheets, it works best to tape a 1" piece of paper to the entire width of the leading edge of the paper. Plain paper works for letter size sheets, but for larger sheets a normal/thin inkjet paper would be better. The top of the canvas and the bottom of the 1" piece of paper should abut, and the tape should be on the back. The paper size in the driver should be increased by 1" and the image should have 1" of white added to the top using PS's "canvas size."

Matte canvas is the appropriate type to use. My testing is consistent with Premier Imaging's statements that their Generations Matte Canvas achieves the best dmax (up to 1.74, and coating does not significantly increase this). This appears also to be about the only canvas that is available in letter size sheets for testing. Epson Matte Canvas Natural also has a good dmax (up to 1.69). Interestingly, the non-OBA Epson is almost as "bright" (negative Lab B, of "cool") as the OBA-containing Generations Matte Canvas. In fact, it often looks whiter. Note that there is typically a "gesso" layer between the tan canvas and the inkjet coating. Brighteners of various kinds might be in this gesso layer.

One attraction of canvas is that it can be displayed using a "canvas wrap" approach, avoiding the cost and weight of a large frame and glass/acrylic. Modern, pre-cut, easy to use stretcher bars are available from outfits like Breathing Color. While avoiding the cost of a frame and glass is attractive, the stretcher bars and other issues with canvas may offset this at the sizes the 3880 can print. Frankly, my use of the 3880 was just as a test bed for a 9880. At large sizes the advantages of canvas may be greater.

Most say that a heavy, water-based coating is needed on canvas to protect it. On the other hand, my local Samy's service bureau has no spray booth and uses Premier Imaging Print Shield (the solvent-based, aerosol product), as opposed to the Eco Print Shield that Premier Imaging recommends. The non-elastic, solvent-based Print Shield is good for papers but cracks when stretched and bent over stretcher bars.

To do a good job with water based coatings, a HVLP sprayer and dust free spray booth is needed, particularly for large prints. On the other hand, the best "giclee" service bureau in my area now uses rollers to apply the coatings. To get an even and dust free rolled coating is tricky.

The most even and perhaps best overall roller-applied coating I've seen and made used a method shown to me by Premier Imaging. It involves 3 thin coats of the varnish. The first 2 are glossy; the third uses their satin Eco Print Shield. Foam rollers are used, and the print is taped to a smooth surface to keep it flat. After a heavy coat of varnish is applied, a dry roller is used to remove the excess. As little as 15 minutes can be enough time to wait between coats. This takes practice and the opportunity for dust is obvious.

The faster method is what I refer to as the "Breathing Color" method. This is just a single heavy coat, decreasing the pressure as one goes over the print in all directions. Getting this even is not easy.

Frankly, I find that the matte canvas with no coating looks the best. Once there is even a satin coating on the print, the canvas texture picks up highlights and masks the dark & black areas. To keep the matte look and decrease the possibility of some rub off in the 100% black areas, my usual Lascaux Fixativ spray works just fine. For my uses, this is probably what I will do, advising those who want more protection to have someone with a spray booth do the coating or use a frame with acrylic to display the image.

These canvas products appear to have a rather normal tonal range with Eboni carbon. Of interest, however, is that, due to the pattern of the canvas, a QTR blend of three profiles – neutral, black only, and C-K only – produces a print with only slightly higher apparent graininess in the midtones. This makes a relatively neutral looking print with very little color toner in it. So, while I do not currently know of a canvas that prints relatively neutral with dilute Eboni, the surface texture allows such a print to be made that should be very free from color fading issues.

(That's it for now.)

Appendix 1

Carbon Pigment Lightfastness

Fade Test Data[37]

Aside from the toner, which does not need to be used (and is being fade tested now), the inkset I am describing is 100% Eboni carbon, and 100% carbon pigment images have resulted in the best digital prints tested by Aardenburg Imaging and Archives. What is unique about Eboni is that it results in a more neutral print tone that the other carbon pigments.

Comparing the Midtone L* = 50 test patches among the popular alternative printing approaches, all at 140 Mlux-hours of light exposure and all on Hahnemuhle Photo Rag, these are the delta-e[38] values reported. Lower is better.

MIS Eboni carbon = 0.6
Cone Carbon Sepia = 0.5
Epson 3800 ABW = 3.6[39]
HP Z3100 = 1.9
Cone Piezo Neutral K6 = 3.5[40]

Another comparison former darkroom printers may relate to looks at a wet-process, fiber based, selenium toned silver print. Aardenburg Imaging has tested the silver prints to 100 Mlux-hours of exposure. So, below I list the delta-e values for the L* = 50 test patch for the best inkjet print versus the selenium toned silver print that is most similar to what most of us used to print in the darkroom.

MIS Eboni, PremierArt Fine Art Smooth 205 gsm paper, Print shield spray = 0.1
Ilford Galerie FB Silver print, Selenium toned 1:20, Durst Theta printer = 1.2[41]

This, no doubt, exaggerates the extent to which the carbon print is more lightfast than the silver print. However, when one also looks at the fact of un-buffered silver print paper being destroyed by airborne acids, whereas the buffered inkjet paper is protected, maybe these comparisons are not too far off. Add the problems of the gelatin coating on silver print compared to an un-coated Arches watercolor paper, and it becomes even more apparent that the expected life of a high carbon content inkjet print probably is significantly longer than that of a silver print.

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[37] http://www.aardenburg-imaging.com/ is simply the best database of fade test information that is available to those of us who are serious about our medium.
[38] Delta-e measures the total movement in Lab L, A and B – i.e., density fade as well as color shift.
[39] Epson ABW does better with a more neutral print, however, I did not find a test of one on H. Photo Rag. In general, the Epson pigments can be close to the HP test values.
[40] See http://www.paulroark.com/BW-Info/Eboni-v-Cone-N-HPR-140hrs.jpg to get a better feeling for what these numbers mean.
[41] Part of the silver print's problem was that the paper contained some OBAs. If we look just at the Lab L values or the test patches, the changes were as follows: Eboni carbon = 0.1, silver print = 0.3.