Comparison of new HP Photo Printer and Epson Printer
From InkJet Art

This is the full text version of the newsletter. As always, we send two versions: just the web link and a full text version so even people who can't (or would rather not) visit a web page can still read the latest "going's on" in the inkjet world. You can change your preferences and receive a single "digest" that contains both emails but it isn't sent until the end of the day. You can change your preferences using the "Unsubscribe or Edit Options" button on http://www.inkjetart.com/news.html

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Dear Inkjet NEWS & Tips Subscriber,

EPSON INK JET VS. HP INK JET - INKJETART FAVORITISM?

Ever since InkjetART opened business in October 1998, many have accused us of favoring Epson ink jet printers over HP inkjet printers. Our critics have been somewhat correct in this accusation, at least, until now.

We've always maintained that HP made some of the best laser and ink jet printers on the planet for office use, but they had never to our satisfaction clearly addressed the needs of photographers and other artists. Although there are only about 150,000 professional photographers in the world, this is a niche market that Epson found very profitable. HP entered the photo consumer market with their Photosmart series, but this printer never fully addressed the longevity issues that concerned professional photographers and other artists.

(Canon has been a significant "photo ink jet" player over the years, but came into the "photo" game a little later, and is still trying to play catch up with Epson's market share lead. Their recent introduction of the Canon imagePROGRAF iPF5000 indicates to us that they are now a major player in this market.)

Photographer's early concerns were mainly about getting image clarity and smoothness from an ink jet printer. In 1994, Epson amazed the world with the slow, but high-resolution Epson Stylus Color printer. At 720 x 720 dpi, it produce almost 6 times more ink dots per square inch (518,400 vs 90,000) than anything else on the market (typically, only 300 x 300 dpi). About a year later, Epson increased that resolution to 720 x 1400 dpi.

Despite this major increase in resolution, photographers still complained that ink jet prints were still not as smooth or continuous-tone as true photographic prints. All ink jet printers up until this time had only 4 ink colors: cyan magenta, yellow and black. In 1999 Epson came out with the Epson Stylus Photo 1200, which added two "photo" inks -- a light cyan and light magenta. (Although the 1200 was not Epson's first 6-ink printer, it was the one that made the biggest impression on photographers.)

About this same time, Epson had introduced their "Variable Dot Technology." Up until this time, all ink jet printers varied the distance between the ink droplets (dots) in order to change image density. This meant that dots in the lighter areas of the print were further apart, and were very apparent to the discerning eye. Epson's new technology produced smaller droplets for the lighter areas of the image, allowing the print driver software to pack in more dots and still produce the same density as non-variable technology. These two new technologies <http://www.inkjetart.com/news/dot_comp.html>, the lighter photo inks and the variable droplet sizes, dramatically increased smoothness, and suddenly made Epson prints virtually indistinguishable to photo lab prints.

Epson's next step was to tackle longevity. Four-ink prints would typically last only about 3 to 6 years before fading became noticeable, but the new six-ink photo prints could change color in only a year or two, due to the light magenta's greater susceptibly to fading, <http://www.inkjetart.com/news/wilhelm102999.html> which quickly caused a green-cast color shift. <http://www.inkjetart.com/fade.html> Epson responded in February 2000 with a more fade-resistant dye inkset and the Epson Stylus Photo 1270 printer.

Epson and Wilhelm Imaging Research soon found that dye inks were susceptible not only to light fading, but also fading by oxidation, especially on photo papers which included a water-resistant barrier layer ("RC" or polyethylene). <http://www.inkjetart.com/news/archive/IJN_12-04-00.html> Epson introduced their first desktop pigment "Archival Ink" printer in late Spring of 2000, the Epson Stylus Pro 2000P, boasting a longevity of up to 200 years! <http://www.inkjetart.com/news/archive/IJN_5-25-00.html> In all these introductions (fade-resistant dye and Archival Ink), Epson quickly followed with wide format printers (24" and 44") in order to satisfy the needs of the professional photographer, not just the photo enthusiast.

Photographers and other artists appreciated the longevity of the Epson Archival Ink, but were still not satisfied with the color gamut of this inkset (compared to photo dye inks), nor with the D-Max, especially on matte papers. Changing color balance (metamerism) <http://www.inkjetart.com/2000p/metamerism.html> of the print plagued artists when the print was displayed under different lighting conditions. These three issues were significantly addressed with the introduction of the Epson UltraChrome Inks in June 2002, which improved color gamut, and increased D-max with the introduction of switchable Photo Black and Matte Black inks, and a light black ink which reduced metamerism and increased gray scale neutrality.

Epson's current inkset, UltraChrome K3, was introduced in the Spring of 2005 <http://www.inkjetart.com/news/archive/IJN_05-13-05.html#1>. This pigment ink further eliminated the differences between dye and pigment ink and increased black and white printing neutrality with the introduction of a third black (a light light black).

Through all these changes and advances, the Epson piezo ink jet delivery system allowed third party innovators to easily adapt Epson printers so that they could use competitive inks. These third party products helped to advance image longevity and color gamut and probably helped prod Epson to keep a step ahead of its competitors.

Hewlett Packard's thermal ink jet delivery system did not allow for third party innovation or competition. HP desktop ink jet printers had cartridges with nozzles built into the bottom of the cartridge, whereas Epson printers had the print nozzles on the printer, and ink cartridges were only a vehicle for carrying the ink. Until now, HP's consumer line of "Photosmart" ink jet printers have all been based this system of cartridges with built-in print nozzle technology, and they have all use dye-based inks. Most HP ink jet printers have held little interest for professional photographers and other artists.

One exception has been the HP Designjet 130 (dye ink), but we feel it limits photographers and artists to only two swellable-polymer papers (a gloss and a satin).
http://www.inkjetart.com/news/archive/IJN_05-27-04.html#6
http://www.inkjetart.com/news/archive/IJN_06-29-04.html#11

Another exception has been the HP Designjet 5000 UV series (discontinued) and the HP Designjet 5500 UV series. While the photographic smoothness of these printers have never been equal (in our opinion) to the Epson Stylus Pro 9600 and 9800 printers, they are capable of greater print speed and greater width (up to 60"). However, even the 42" HP model is considerably more expensive ($7,995) than the 44" Epson 9800 model ($4,995).
<http://h10010.www1.hp.com/wwpc/us/en/sm/WF05a/18972-236251-236266-12600-236266-82218.html>

WIND OF CHANGE: Over the past three years, HP has been quietly researching and getting the input of top professional photographers from around the world as to what their "dream" ink jet printer should have and be capable of doing. HP's introduction of their new HP Photosmart Pro B9180 ink jet printer (see next article) is the initial results of this input and research. From what the editor and staff at InkjetART have seen in recent weeks (and what we see on the horizon), we believe HP is going to be a formidable force in the photographic and fine art ink jet printing world. HP appears to have made a substantial commitment to this segment of the industry, and they have the resources to back up that commitment. Expect competition and change that can only benefit the professional and pro-sumer photographer!

REVIEW: HP'S NEW PHOTOSMART PRO B9180 INK JET PRINTER

(this article contains reference to image files that are available in the web version of the newsletter at http://www.inkjetart.com/news/archive/IJN_07-27-06.html)

This is HP's first ever pigment ink printer for the desktop, and their first ink jet printer using their new Vivera pigment photo inks -- tested by Wilhelm Imaging Research for more than 200 years fade resistance.

One of our staff's first impressions about the HP Photosmart Pro B9180 was "heft." This is a substantially-built ink jet printer, almost overbuilt. It weighs in at 38 pounds -- 11 pounds more that the Epson Stylus Photo R2400 (both printers have a maximum printing width of 13 inches). The construction of the HP printer is similar in reputation to their business laser printers. It also reminds one of the way Epson's first professional 13" wide ink jet printer, the Epson Stylus Pro 5000 was constructed -- but the 5000 cost $5,000 ($10,000 with a hardware RIP) back in 1999.

Speaking of cost, the suggested price of the HP B9180 is $699.00 -- about $150 less than the Epson R2400, which retails for $849.99. The HP B9180 was first announced in February, but is not expected to be available until mid to late August 2006.

Like the early Epson 5000 printer and today's 17" Epson 4800, the ink cartridges of the HP B9180 are behind a door and piped over by tubes to the print heads (unlike the Epson R2400, where the small cartridges sit on top of the print heads). The cartridges of the HP B9180 are not as large as those of the Epson 4800 (110ml or optional 220ml), but they are considerably bigger (27ml) than those of the Epson R2400 (17ml). As yet, we do not know the suggested retail price for these HP cartridges.

HP'S NEW VIRERA PIGMENT PHOTO INKS. The HP uses 8 cartridges just like the Epson K3 inkset, however this new Vivera pigment photo inkset does not have a third black. Instead of black, a light black and a light light black, HP uses a black and a light gray -- and plumbs BOTH its photo black and matte black cartridges so they are always available without having to manually switch black ink cartridges (like Epson does) and having to flush the heads via a cleaning operation. In that regard it's like a Epson 4000 which has both blacks online at all times.

CARBON BLACK FOR NEUTRALITY AND LONGEVITY. While this HP ingenuity may save hassles and ink, some may wonder if some tonal range and neutrality are lost when compared to the Epson K3 inkset of three blacks. We think a little grayscale tonal range may be lost, but not neutrality, because HP's Vivera pigment light gray is made of up of carbon black -- making it a more neutral pigment to begin with than Epson's K3 blacks. (The following two micro-photographic images, supplied by HP, illustrates the neutrality of their Vivera Gray Ink compared to Epson's K3.) <carbon-black-ink.jpg>

Our own tests found the HP B9180 prints to be quite neutral in their grayscale reproduction, even when using all seven colors. When the HP printer driver is set to print with only the black and light gray inks, the results are indeed more neutral than Epson's "Advanced B&W" setting, which does use some of the light colors (light cyan, light

magenta and yellow) to help make their grays -- whereas the prints using the HP Vivera inks showed only gray dots at high magnification. Even with two inks (black & light gray), the tonal range was smooth and rich -- albeit slightly less rich than Epson's "Advanced B&W", which has one more black, and cheats by adding 3 more light colors! (The following two images were scanned from 1/8" x 1/8" sections of their respective B9180 and R2400 prints -- and how neutral HP's carbon black Vivera inks are.) <Gray-B9180-crop.jpg> <Gray-R2400-crop.jpg>

We did notice some copperish, reflective "bronzing" with these HP Virera carbon black pigment inks on glossy papers when no over-coat is used. This will be somewhat annoying to some B&W photographers. There was no bronzing on matte or fine art papers.

HP has chosen to use carbon black not only for its neutrality, but for its longevity, which Wilhelm Imaging Research estimates at more than 250 years fade resistance for black & white prints made with this inkset, and gives the total color inkset a 200+ years fade resistance. <http://www.wilhelm-research.com/hp/WIR_HP_B9180_2006_02_23.pdf>

Similar to the Epson K3 inkset, users of the HP Vivera pigment inkset will find that light magenta inks are typically used a littler more that the other inks. However, HP warns us that their Vivera Light Gray ink is often used up to 2.5 times more than the other colors -- so one might want to have more of these cartridges on hand! Our own experience showed the yellow and light magenta were used up at about the same rate (about 30%-70% more than the other inks), and the light gray was used almost twice as much as the other colors. HP Vivera light cyan did not seem to be used up as quickly as did the Epson K3 light cyan. <ink_levels-crop.gif>

DEEPER, RICHER BLACKS? HP's pre-release literature promotes their Virera pigment photo inks as having a lower "L* minimum" (a greater darkness level) than the Epson R2400 K3 inkset or than that of a silver halide print. <blackness_compare.jpg> While we definitely agree that the HP Virera pigment photo inks are darker than the deepest blacks in a silver halide prints, we did not find them any darker than the Epson Ultrachrome K3 inks. Our densitometer readings showed the following D-Max readings, which are virtually identical:

2.30 D-Max HP B9180 printed on HP Advanced Photo Glossy paper
2.30 D-Max Epson R2400 printed on Epson Premium Glossy Photo paper
1.68 D-Max HP B9180 printed on Epson Enhanced Matte (using matte black)
1.69 D-Max Epson R2400 printed on Epson Enhanced Matte (using matte black)

ELECTROSTERIC ENCAPSULATION TECHNOLOGY (EET). Similar to Epson's UltraChrome inks, the HP Virera pigment photo inks have pigment particles that are covered with a resin layer. What makes the HP Virera inks unique is that their resin layer has negative charges. <negative_charge_part.jpg>

HP claims these negatively charged pigment particles flow better (the repulsion force

between particles helps prevents clumping and nozzle clogging) and helps to create better ink penetration into and onto media coatings -- producing higher gloss (less "gloss differential") on glossy media, improve reliability (more scuff-resistance), and darker photo blacks. While we were not able to prove these claims, we didn't find anything to complain about either.

PRINT HEAD RELIABILITY. What we think might be even more impressive is HP's New Electrostatic Drop Detection (NEDD) printhead management system that closely monitors all 8,448 print nozzles to ensure optimal, high-quality printing and consistent, reliable results over the life of the printer. Here's how HP's describes NEDD:

"If a print nozzle is out, the system detects the specific nozzle and automatically compensates by placing ink from another nozzle in the exact location on the page. This ensures that customers will not experience any degradation in image quality as a result of a failed nozzle. The ability to closely monitor all nozzles for each printhead also helps minimize ink waste.

"Here's how electrostatic drop detection works: The printhead is positioned over the NEDD sensor. As the printhead fires ink drops, a charge plate at the top of the sensor assembly induces an electrostatic charge in the drops, just before the drops break free from the printhead. The electrostatically charged drops fly past a capacitive sense plate and induce an electrical charge on the sensor. The sensor amplifies the signal literally billions of times. This amplified signal, which corresponds to the charge of the ink drops, is used to determine the condition of the print nozzles-healthy or missing. Highly sensitive electrostatic drop detection assesses the condition of each print nozzle and compensates for failing nozzles by automatically prompting the writing system to fire ink from a neighboring print nozzle to deliver consistent image quality. <NEDD-system.jpg>

"Electrostatic drop detection also helps extend the life of the printhead and the printer by predicting when print quality may be unacceptable and attempting to recover missing nozzles. If the system determines that the condition of a nozzle is such that it cannot be recovered with cleaning cycles or, that the number of missing nozzles is too many for the system to adequately compensate, the printer will notify the user to replace the printhead. Unlike some competitive printing systems, HP replaceable printheads are quickly and easily replaced by the user, so there's no need to send the printer out for printhead maintenance or replacement." <HP-printhead.jpg> <HP-printheads-replace.jpg> <printhead_life.gif>

The HP B9180 has four user replaceable print heads (two ink colors per head). HP has told us that these heads under regular use should last for a few years, but if they need to be replaced, the cost will be about $43.00 per head. In contrast, the print heads for the Epson R2400 are not user replaceable, and out of warranty replacements are so expensive (because the complete print head must be replaced), that many 2200 and R2400 owners would just opt for buying a new printer.

INK CONSERVATION. HP's NEDD system should mean considerable ink savings for

the user over Epson's piezo ink droplet delivery system found in its R2400 and larger UltraChrome K3 printers. All desktop Epson ink jet printers have a large ink waste absorption pad located under the printer. Their wide-format printers employ a Replacement Ink Maintenance Tank, which are filled with absorbent pads. These pads are to absorb the large amount of ink that is pumped through the Epson piezo print heads to keep the nozzle clean and when changing black inks.

The HP B9180 does NOT have these large ink absorption pads because it not only does not need to change and clean out different black inks, but it uses a much smaller amount of ink to clean the HP B9180 nozzles (there are 8448 of them, packed in at 1200 per inch). When power to the B9180 is left on, it checks every six hours for clogged or poor performing nozzles, and cleans out ONLY those nozzles that are in error. In contrast, Epson's piezo system requires you to manually check for errant nozzles and clean ALL the nozzles just to fix a few problem nozzles!

IMAGE PRINT QUALITY. As we explain in the "Print Speed" section, the HP B9180's print quality is equal to the Epson R2400, and in some cases better. But to get that quality, you'll have to increase image input resolution. Let us explain:

Epson printers give their most effective and efficient results with an image input resolution of 360 or 720 pixels per inch ("native resolution"), depending on the model. Desktop printers, like the R2400 use 720, and large format printers like the 7800 use 360, that said, you're likely to never see any quality difference on the R2400 by using 720 instead of 360. From this input resolution, one can make prints at a variety of PRINTER output resolutions, i.e. 360 x 360 dpi, 360 x 720 dpi, 720 x 720 dpi, 720 x 1440 dpi, 1440 x 1440 dpi and 1440 x 2880 dpi. Increasing the input resolution to an Epson printer does NOT significantly increase output quality. This makes the Epson very efficient and significantly decreases image file sizes and printer spooling times.

HP, Canon, Lexmark and other printers typically have a "native resolution" of 300 ppi. Our tests showed that the HP B9180's print quality does benefit significantly (on super close examination) from an increase in image input resolution. The HP B9180 printer driver indicates that when printing at their "Maximum DPI" mode, the printer will benefit from a 1200 ppi input file. Unfortunately, this makes for HUGE image files, even for an 8x10-inch print, and caused a printer spooling time, using the current beta drivers, of over 35 minutes (before printing started) on one of our fairly fast computers! We found that an input resolution of 600 ppi produced virtually the same quality as 1200 ppi, and was four times more effective in file size and spooling time (only took 2 minutes to spool). Please keep in mind that the difference between 300 ppi input and 600 ppi input is only noticeable on small prints (8x10 or smaller), or when examining larger prints with a loupe (yes, some photographers are that critical).

PRINT SPEED. HP claims that the B9180 is almost twice as fast as the Epson R2400, and that it can print a 13x19 image in only 90 seconds. We couldn't get a 90-second 13x19, except in draft mode -- all of our 13x19 prints took about 4:00 minutes when printed in the medium quality mode ("Best" for the HP, and "Best Photo" for the Epson

R2400, 4800 or 7800). The only exception was the Canon imagePROGRAF iPF5000, which zip out a 13x19 in 2 minutes, 20 seconds!

It could be that HP's claim to almost twice the speed as the Epson R2400 (hey, those huge 7/8" wide HP print heads are a pretty impressive width) may be based on a comparison of image print quality. Upon super close examination, we did find that the HP B9180's image quality at "Normal" print mode (equivalent to Epson's "Photo" mode) was practically as good as Epson's higher quality "Best Photo" mode. When you compared print speed in this way, the HP was almost twice a fast as the Epson.

MEDIA HANDLING: One thing that has set the Epson 2200 and R2400 printers apart from other prosumer inkjet printers on the market has been their ability to handle thick fine art papers. The HP B9180 also excels in this area by being able to handle media up to 1.5mm thick (that's over 60 mil or 0.06")! HP makes this process very easy with their front-loading, single sheet tray ("Special Media Tray"). Thick media is loaded into the front, pushed out through a rear slot, and then printed forward and out the same feed tray. Like the Epson R2400, one must allow adequate space behind the printer (equivalent to the length of the media), and the media must be loaded one sheet at a time. We found the HP B9180 to be more tolerant and self-adjusting than the R2400, allowing it accommodate varying media thickness, especially canvas. (Compare the hassle required to print canvas on the R2400 <http://www.inkjetart.com/2400/canvas/>)

Even on slow-drying media, the HP B9180 showed its superior media handling abilities. Epson's "pizza wheel" ejection rollers can sometimes track ink dots or even streaks across slow drying prints (i.e. canvas). To test the HP B9180, we purposely ran a print through the printer twice (ok, it was actually an accident =), using the same test image, causing the ink to pool in all the dense areas. We had NO ejection roller tracking, dots or streaks. Amazing!

The HP B9180 also includes a main tray that hold up to 200 sheets of plain paper, or up to 70 sheets of HP Advanced Photo paper. The main tray automatically loads multiple sheets of thin, flexible media such as brochure, photo, inkjet and plain papers.

The HP B9180 does NOT include any provisions for roll paper feed (the Epson R2400 does include a roll paper adapter).

HP EXTRAS. We notice three extra features that the HP B9180 included that adds considerable value to their printer, when compared to other ink jet photo printers targeted for the 13" wide professional and prosumer photo market:

1. DENSITOMIC CLOSED LOOP COLOR CALIBRATION. Here's how it works:
* A sensor in the printer undergoes calibration during the manufacturing process.
* During initial printer setup, or whenever the customer desires to calibrate their printer, the B9180 prints a target page with individual color blocks and automatically feeds the page back into the printer.
* The sensor 'reads' each color block on the target page, measures the color density, and

compares it with factory calibration settings, resident in the printer.
* If the sensor detects any variation from factory settings, closed loop color calibration adjusts colors as necessary to deliver the precise amount of ink to the page to ensure consistent, accurate color. <HP-calibration.jpg>

HP describes it this way: "The densitometric sensor moves with the printer carriage, similar to a scanning device, to shine light onto the page from any of four color LEDs. The sensor measures the color density on the page by measuring the reflection of each color and compares it to the target color density. Closed loop color calibration compensates adjustments as necessary to ensure consistent output. Sensors also detect the presence of media in the paper tray(s), the width of the media, and automatically adjust skew if media is not properly aligned in the tray.

"The sensor is first calibrated during the manufacturing process and remains operational throughout the life of the printer. The HP Photosmart Pro performs color calibration during printer setup and when ink cartridges are installed or replaced to prevent color shifts and ensure that color remains accurate. Customers can use the system to calibrate their printer at any time. The feature is accessible from the front panel or from the Printer Toolbox."

2. PLUG-IN FOR ADOBE PHOTOSHOP. A new print plug-in included with the HP Photosmart Pro printer software streamlines the digital workflow for Adobe Photoshop users with a unified print screen for color management and other print settings. The print plug-in combines settings from the printer driver and Photoshop "Print with Preview" settings on one screen to significantly reduce the number of steps to print: one print screen versus up to seven screens when printing with Photoshop.

The HP Photosmart Pro print plug-in for Adobe Photoshop automatically installs with the printer software. The Photosmart Pro print plug-in saves customers time by allowing them to view key color management settings on a single screen and saves setup time by retaining print image settings. The plug-in automatically synchronizes Photoshop color management with the printer driver and allows customers to attain predictable, accurate color output in fewer steps.

3. BUILT-IN NETWORKING. The HP Photosmart Pro B9180 has built-in Ethernet (802.3) for easy wired network printing. Integrated Ethernet networking capabilities allow customers to share the printer on small networks, including mixed operating environments of PCs and Macs. This feature alone, adds about a $200 value to the printer. <HP-ethernet.jpg>

WAITING LIST: The HP B9180 should be available by late August 2006. To receive more information on the HP Photosmart Pro B9180 Photo Printer (and/or to get on our no-obligation waiting list), submit your name and email online at http://www.inkjetart.com/news/archive/IJN_07-27-06.html

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