

## Digital Printers for Final Art and Commercial Output

I'm sitting on the deck having continental breakfast looking at the palm trees swaying in the light breeze and glistening with the morning sun. South Beach Miami is a great place to spend a day or two reflecting on the amazing time I just had at the FotoFusion conference for photographers and digital artists. Being one of the 50 speakers at this conference, held at the Palm Beach Photographic Center in Del Ray Beach Florida, has been an honor for me. Its especially exciting that two of the most well known landscape photographers, David and Mark Muench, are now using a digital darkroom to create their new books and digital prints for their final artwork. Almost everyone at the Fotofusion conference can see that the digital process, especially for digital darkroom work and printing is now a complete reality for photographers. We can do far more in the digital darkroom than in the traditional one and also get higher quality and more color permanent digital prints than the traditional darkroom could produce. All this comes without the exposure to the dangerous chemicals that traditional Ilfachrome printing requires.

In this article, we will review some of the best digital printers now available for producing final artwork and also for proofing artwork for final output to other devices. The printers we will look at are the Epson Stylus Photo 1270, 870, 875DC and 1200, the HP Deskjet 1220C, 970Cse, PhotoSmart P1000 and P1100, the Fuji 3000 and 4000 Pictography Printers, and the Symbolic Sciences Lightjet 5000. This is second in a series of articles resulting from initial research into topics for my upcoming book, "Making the Digital Print". As background information for this article you should read my first article, in the January/February issue of CA (also online at [www.maxart.com](http://www.maxart.com) and [www.communicationarts.com](http://www.communicationarts.com)).

The EPson Stylus Photo 1270, 1200, 870 and 875DC  
(\*show photos of 1270 and 875DC with roll adapter\*)

I've had the Epson Stylus Photo 1200 since it first came out last year and have found it a very exciting printer for producing high quality photographic prints of up to 13 by 44 inches in size. Epson continues to be the leader in creating desktop printers than can produce quality photographic prints. At a street price of \$400 or less, the 1200 is a great printer. The Epson inks for the 1200, when printed on Epson Photo Paper, have had a color permanence of about 2 years when displayed in daylight conditions. This means that if you frame one of these prints on the wall, in your home or a gallery situation, a print that is lit daily may have its color noticeably change after a period of 2 years.

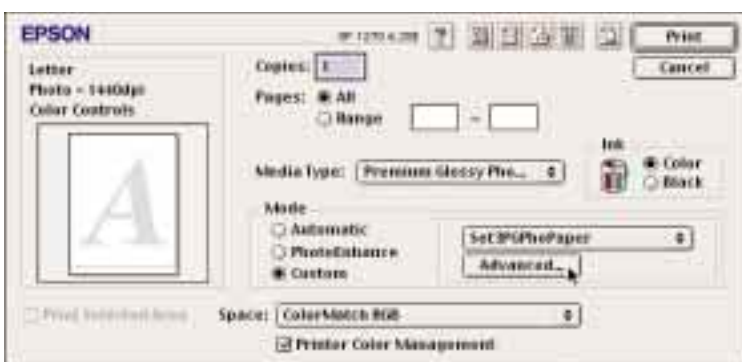
There are some 3rd party ink companies, notably Lyson and MIS Associates, that produce more permanent inks and papers for the 1200, 3000 and other Epson printers. These have color permanence in the range from 4 to 120 years depending on the ink/paper combination. The use of 3rd party inks may or may not cause problems with the functionality of the printers, like clogging the jets, and Epson will usually void your warranty if you use 3rd party inks. The color gamut of these 3rd party inks, which is the range of colors they can print, is often less than the gamut of the Epson inks on the Epson papers. When you change ink cartridges on an Epson printer, you continue to use the same inkjets, which are built into their printers, so if 3rd party inks cause the Epson jets to clog, this can be an expensive repair problem. With the HP inkjet printers, changing the ink cartridge also changes the inkjets, since they are built into the cartridge. Clogged jets is a less expensive problem with HP printers since you just get a new cartridge. The moral to this story is to make sure any 3rd party inks you try have been tested and blessed within the industry. Some places to look for information are: The Adobe User Forums, where many people use Epson and other printers with various inks and papers, can be reached at: <http://www.adobe.com/support/forums/main.html>, the Leben Epson List has been recommended to me by several Epson users and is at: <http://www.leben.com/lists/epson-inkjet>, you can also go to: <http://support.epson.com> for downloads of the latest Epson software for your printer. At the time this article was written, Epson had not given official blessing to any 3rd party inks. You need to realize, to keep this matter in perspective, that most of the inkjet printer companies (Epson, HP, etc.) make their largest profit on this type

of printer from selling inks and paper.

To help solve this ink permanence problem with Epson inks, this February Epson introduced a new line of printers and their new inks. The Epson Stylus Photo 870 (\$299), 875DC (\$399) and 1270 (\$499) all use the new **Intelligence™** ink cartridges that contain more color permanent inks. These new inks, which are not offered with the older printers like the 1200, have considerably more color permanence. With Epson Photo Paper and the new inks, a print will now last 6-7 years versus 2 with the Epson 1200 inks. To make things even better there are now two new Epson papers, Premium Glossy Photo Paper and Matte Paper Heavyweight, that allow for a color longevity of 9-10 years and 24-26 years respectively when printed with these new Epson **Intelligence™** inks. These color longevity times are comparable to those for traditional printing on typical color negative papers, like you get at the local film processor, and they are also similar to those for the much more expensive Fuji Pictography printers. In my opinion, correctly printed Premium Glossy Photo Paper prints from the Epson 1270 can look just as good as Fuji Pictography or Lightjet 5000 prints.

The Epson 1200 and 1270 allow you to print on the super B/A3 paper having a size of 13" x 19" and print area of about 12.7 x 17.9 from Photoshop 5.5. Using the Epson panoramic paper you can actually produce a print of up to 13" x 44" in size having a print area of 12.76" by 43.76". The Epson 870 and 875DC offer the same quality and 4 picoliter ink droplet technology as the 1270, along with the new more color permanent **Intelligence™** inks. All three new Epson printers use a dot size 33% smaller than the 1200. The largest paper size for these 870 and 875DC printers is 8.5 x 44 offering an image area of 8.26 x 43.76. The 875DC is the same printer as the 870 with the additional ability to print from all three of the standard digital camera memory card formats, Compact Flash, Smart Media and Sony Memory Stick. Unlike the HP Photosmart 1100, which can make prints from Compact Flash and Smart Media memory cards without a computer connected, the 875DC does require a computer to make prints from the memory cards. You can also use the card readers on the 875DC as input devices to read digital files into Photoshop and other applications running on your Mac or PC.

The Epson 870, 875DC and 1270 printers have roll paper holders that allow you to use 4", 8.25" and 13" (1270 only) wide rolls of Premium Glossy Photo Paper. This, along with the 875DC and Epson software on your computer, will allow you to easily make your own prints from all or selected images taken with a digital camera. All three of the new Epson printers work with both Mac and Windows. The 1270 and 870 have both IEEE 1284 parallel and USB connectors and the 875DC has USB only. Check to be sure that your version of the Mac or Windows OS and your hardware connectors compatible. The Epson 1270 is much quieter than its predecessor, the 1200, but not as quiet as the HP 970Cse or the HP PhotoSmart printers. All three new Epson printers now have bi-directional printing, the head can print in both directions. This allows faster printing than the Epson 1200 and earlier models. The 1200 and 1270 have or will have optional Adobe PressReady drivers. See more info on PressReady later in this article. These printers can print on a number of papers from Epson and other sources ranging in thickness from regular inkjet paper up to Arches and Somerset heavy art papers and even canvas.



In the main Epson print dialog, set Space to ColorMatch RGB, Media Type to the paper you are using then choose Custom and Advanced to set the rest of your options.

To make great prints on the Epson printers without making a custom color profile, in the main print dialog set the Media Type to Premium Glossy Photo Paper, set Space to ColorMatch RGB and leave Printer Color Management turned on. In the Advanced print dialog, set Media Type to Premium Glossy Photo Paper, Print Quality is set to Photo - 1440 dpi, High Quality Halftoning is on and Color Management is set to Color Controls - Automatic. Click on Save Settings to give these settings a name. You can then choose them from the regular



In the Advanced Epson dialog, set the Media Type for the paper you are using, Print Quality to PPhoto-1440 dpi, Halftoning to High Quality Halftoning, Color Management to COlor Controls - Automatic then choose Save Settings to save these settings for later selection from the regular print dialog.

ink and prints quite a bit faster. When you have a lot of very fine detail, or subtle gradation changes, 1440 dpi will give better results but it takes longer to print and uses more ink. The printout is the same with the above settings if I leave the image in Lab mode or if I do a profile to profile conversion from Lab to ColorMatch RGB or Lab to Adobe RGB before I print the file. The issue that seems to effect the printout quality with these settings most is what Space, is set to. Leaving it set to ColorMatch RGB gives the best results.

print dialog. I find that you get a more vibrant range of colors and more pleasing contrast when Space in the Print dialog, is set to ColorMatch RGB. I have tried these same settings with the only difference being that Space is set to Adobe RGB and this tends to make the file less contrasty and the colors too flat. With all my Epson prints, I set the dpi of my files to 360, using Image/ImageSize in Photoshop. This is an even multiple of the 720 and 1440 dpi settings you end up using in the printer dialogs. For the absolute best results from these new Epson printers, use 1440 dpi in the printer dialogs as the printers output dpi. You may find though, that for many images the 720 dpi setting works quite well and the 720 dpi setting uses less

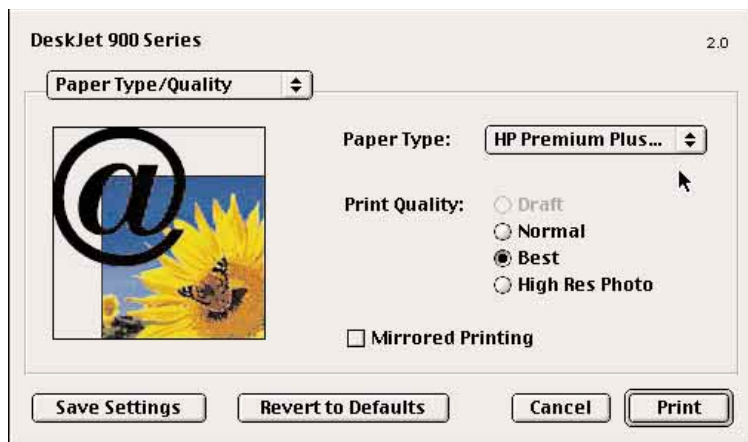
#### The HP Deskjet 970Cse, 1220C, PhotoSmart P1000 and P1100 (\*show photos of 970c and Photosmart 1100\*)

The HP Deskjet 970Cse (\$399), 1220C (\$499) and PhotoSmart P1000 (\$499) and P1100 (\$399), which can also produce photo quality prints, share a new software technology which allow them to print at 2400x1200 dpi. The hardware technology in these machines is similar to that of the previous Deskjet 1120C and 895C HP models but the newer software technology allows the higher printing resolutions when using the new HP Premium Plus Photo Papers. The 970Cse and 1220C, having IEEE 1284 and USB interfaces, work with both the Mac and Windows platforms but the PhotoSmart P1000 and P1100 only work with Windows. I was told by an HP marketing representative that Mac drivers for the Photosmart printers would be available in the fall. The main difference between the P1000 and P1100 is that the P1100 prints a little faster, does automatic one pass two sided printing and is network compable if you purchase the optional HP JetDirect print server. These HP printers are very quiet, sometimes I don't even notice that printing has started...or even finished and already completed my page. A really great feature is that you can tell the 970Cse and P1100 to print both sides of a page. A special page flipper unit at the back of the printer flips the page while printing. This allows you, in one pass, to print a two sided document and have it ready to staple in the printer's output tray. This is way cool for those of us, like my wife Wendy Crumpler, who are writing books and have to print out entire chapters to send to our editors!

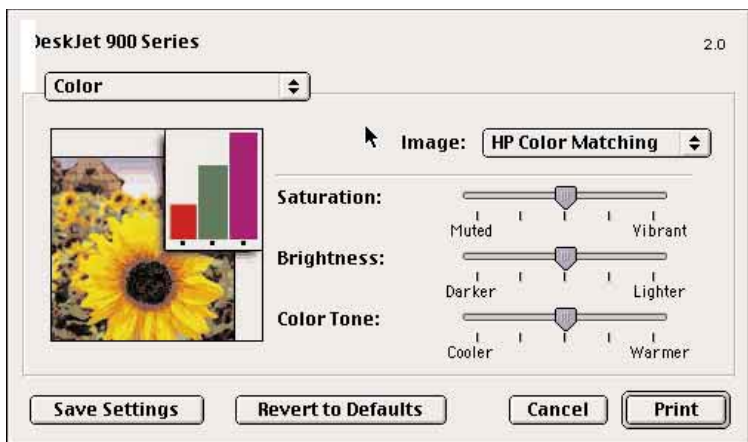
To get the best photographic quality from these HP printers, HP recommends their new Premium Plus Photo Paper and Premium Plus Photo Paper Matte. The color permanence of the HP prints on the new HP Premium Plus Photo Paper Glossy is 4-5 years according the the information published at Wilhelm Imaging's web site, [www.wilhelm-research.com](http://www.wilhelm-research.com). The permanence information in this article relating to Epson, Lyson, as well as other inks and papers also comes from the Wilhelm Imaging site which is the industry standard for discovering the color permanence of traditional and digital photographic papers. Wilhelm Imaging also mentions that the HP Premium Plus Photo Paper Glossy is not recommended for long term home use or professional applications due to having poor humidity fastness. The HP matte paper is not rated at Wilhlem's site. There are some other signs that these HP desktop printers may not meet the needs of photographers as well as the new Epson models do. Besides the lack of Mac drivers on their PhotoSmart models and the Wilhelm concern about humidity fastness, HP was unable to tell me how to turn off the color management for their 970Cse or P1100 models. One

needs to do this to make custom ICC profiles for a printer. I'm making ICC profiles for all the printers being tested so I can compare their color gamuts as part of my next article on calibration. Knowing the color gamut of a printer/ink/paper combination is another way to compare it to other printers, inks and papers and also decide if it will be a good proofing device for other output, like for the Lightjet 5000.

Do these new HP printers, with their 2400 dpi output, produce higher quality prints than the new Epson printers, which are still at 1440 dpi. The answer to this question in a nutshell is no. The HP printers themselves, using their lower resolution Best setting, usually do just as good a job as with their 2400 dpi setting, even better with some photographs. The dots appear a bit bigger with the Best setting but they seem to blend together better on some images than with the 2400 dpi setting. The Epson printers, both the 1200 and the 1270, as well as the smaller 870 and 875DC models, still produce the highest quality photographic prints. The prints from the HP printers are also quite beautiful; the difference between the two is that the Epson prints, especially on the Epson Premium Glossy Photo Paper, look and are photographic quality with every image I've tested. The HP prints, using their highest quality Premium Plus Photo Paper, are photographic quality for many images but not for all. Images that have large solid color areas or subtle gradations sometimes allow you to see the grid pattern of the digital printer and are also sometimes unable to make subtle color transitions as smoothly as you might want. From a two feet away from the print many people would not notice the difference on most images but when you hold the print about 3 inches from your eye, this is where differences often show up. These differences may be due to the 4 color HP process versus the 6 color process used with the Epson printers. Some of the older Epson printers, like the 3000, with an Epson 4 color process, can also have problems printing large flat color areas and subtle gradients smoothly. The HP prints have a strong chemical smell, especially when fresh off the



In the print dialog set the Paper Type to the paper you are using and set the Print Quality to either Best or High Res Photo, which gives you 2400 dpi. I found that Best was less likely to show the grid pattern of the printer dots than the 2400 dpi setting although the 2400 setting has smaller dots.



Unless you have made a custom ColorSync profile for your printer, leave the Color setting at HP Color Matching. It was not obvious how to print a test target to make a custom ICC profile for this printer since the manual, and the folks at HP, couldn't tell me how to turn off the color management when printing. This needs to be done when making a profile.

printer. According to the HP marketing representative I talked to "The chemical smell of the printouts is due to the wet ink and should fade as the ink dries. The inks have been rigorously tested by HP and are definitely non-toxic". Both the new Epson and HP printers make beautiful prints but these HP printers, in my opinion, are not always there when it comes to looking as good as a high quality photograph. The new Epson 1270, 875DC and 870 printers, with the new Epson papers and inks have reached that lofty position.

To make the best looking prints on these HP printers without creating a custom profile, here are the settings I have found work. In the 970Cse Mac Print dialog, under Paper Type and Quality, set the Paper Type to either HP Premium Plus Photo Paper, Glossy or HP Premium Plus Photo Paper, Matte. If you set the Quality to the Best setting, the print will come out much faster than with the High Res Photo setting. The High Res Photo setting, 2400 dpi from the printer, takes longer to print and usually doesn't look much better. The High Res Photo setting does have slightly smaller dots, which you may prefer for fine detail, but I'm not sure the smaller dots always blend as well as the dots produced with the Best setting. I printed files whose dpi was set to, 300, 360 and even 600 and didn't notice a big dif-

ference in the printed results. The Color setting seemed to work the best when set to HP Color Matching.

### The Fujix Pictography 3000 and 4000 Printers

Although considerably more expensive, the Fujix Pictography 3000 and 4000 printers print directly onto photographic paper. That paper is processed within the printer using a special almost dry technique that only requires about 1mm of distilled water per print. The prints from these printers look exactly like high quality photographs on photo paper. They actually are, they're just exposed using a digital process. Another nice thing about Fujix printers is that they are self calibrating. Each printer comes with a built-in scanner on the top which is set up to scan a standard test sheet that prints every time the printer's ink and paper cartridges are changed. After scanning this test sheet, the printer self adjusts to make itself consistent with the last set of inks and paper. I believe this printer has a wider color gamut than the Epson printers, the HP printers and the Lightjet 5,000. I'll confirm this in my next calibration article but, assuming it is so, that makes the Fujix great to use for making proofs, or smaller brother photographic prints, for that larger very color permanent Lightjet. The smaller 3000 model of the Fujix printers costs about \$7,695 and will make prints with image area up to 8.58 x 11.77 inches. The larger 4000 model costs about \$20,600 and will make 12 x 18 inch image area prints. There are glossy, matte and transparency papers available for this printer but you must print on their papers since the emulsion is on the paper, as with real photographic paper. The Fujix printers may be better than the Epsoms for making proofs of Lightjet prints, since they also print on photographic paper and actually have a larger color gamut than the lightjet. The Fujix printers will also print high quality photographs faster than the Epson or HP printers. I just haven't had an extra \$7,695 to \$20,600 to shell out on a Fujix yet but I'd sure like one! Maybe their prices will come down now that these new Epson printers have higher quality and more color permanence.

### The Lightjet 5000

One of my favorite digital printers for producing art is the Symbolic Sciences Lightjet 5,000. It's laser exposes 50 inch wide rolls of photographic paper at up to 400 dpi. There are different companies that make photographic paper for this printer but the one many art photographers use is Fuji Crystal Archive Matte or Glossy. These papers have been tested by Wilhelm Imaging to have a color permanence of 60 years. That is significantly more permanent than the popular Ilfachrome (Cibachrome) process, 29 years, and also more permanent than traditional type C prints from color negatives. This makes lightjet 5000 prints on Crystal Archive paper a great choice for photographers and artists, who like the look of photographic paper, and want to frame and sell their artwork. The only problem with the Lightjet is that it costs over \$200,000. For most of us, these prints need to be sent out to a service bureau. What I have been doing is using the Epson 1200 to make proofs of my prints then sending them off to the Lightjet once I'm happy with those proofs. With the new Epson 1270, inks and Premium Glossy/Matte Photo Paper, I can now sell the Epson prints directly. For larger prints, or for buyers who want to spend more and get 60 years of color permance, instead of 9-26, I'll probably continue to use the Lightjet. It seems to be the current standard in the photographic industry for creating color permanent photographic prints.

Both the Fuji Pictography printers and the Lightjet use RGB information to directly expose the color sensitive dyes within their photographic papers. Therefore, RGB files work best with these printers. The Epson and HP inkjet printers actually use CMYK inks, CMYK+c'+m' for the Epson six color cartridge. The Epson and HP software is optimized to take RGB files then convert them automatically to CMYK when printing so don't do the CMYK conversion in Photoshop before printing. These printers also do better when given RGB files.

### Adobe PressReady for Postscript Inkjet Output

Another issue to consider when evaluating these printers is the availability of Adobe PressReady. Adobe PressReady, \$249, is a new product that can give inkjet printers, level 3 software Postscript support.

PressReady also makes your inkjet text look better, more accurate kerning, text size, etc. For Wendy and I as authors, especially with Wendy's upcoming "Photoshop, Painter, Illustrator Side-by-Side" book, postscript output is important. It has a lot of graphic illustrations that require postscript and accurate kerning. Another thing that Adobe PressReady gives you is the possibility to get better soft proofs from your desktop inkjet printer if you are trying to use it as a proofing device for an actual printing press. Adobe PressReady does not work with all inkjet printers. For PressReady to function on a particular printer, a special driver needs to be created for that printer. Pressready ships with some drivers included then Adobe posts new drivers for free download on their web site in the PressReady area at <http://www.adobe.com/products/pressready/printers.html>. There is a PressReady driver available for the Epson 1200 and there will soon be one for the 1270. Drivers are also available for the HP Deskjet 895C, 1120C and 2000C as well as the Epson 800, 850, 900, 1520 and 3000. If you are a photographer making mostly photographic prints, then postscript output may not be that important to you.

### Conclusions

I prefer to have my own printer and be able to make prints directly within my digital darkroom. These Epson and HP printers in the under \$500 price range allow one to work in that self contained environment without spending a lot of money up front. If you are just getting into digital imaging, I would suggest that you try one of these printers first as you learn the process. Using your own digital printer allows you the digital equivalence of having your own traditional darkroom. You color correct your image within Photoshop then make a print when you feel you have it right. After looking at that first print, you tweak the color, crop and sharpness a bit then make a 2nd print. This is an iterative process where you can tweak, make a print and tweak again until you get a final print you are happy with. Sending prints out to a Lightjet 5000 or Iris service bureau makes the entire process more complicated and adds a much larger margin for error. You have to wait several days or longer to get your print so the creative iterative process that happens all within one working session gets interrupted. The service bureau has many different employees that deal with your images, their paper, their printer and also their film processor. I have yet to find a Lightjet service bureau that is always consistent with color especially when printing images that are close to neutral in color. The labs usually blame the difficulty on controlling the temperature and replenishment of the film processor for the Fuji Crystal Archive paper. On the flip side, I have found the Epson printers and Inks fairly consistent when you always use the same paper, type of ink and print dialog settings. Buying a lot of ink cartridges from the same production batch can help assure that consistency.

If your main goal is producing 13" wide or smaller prints in your own digital darkroom that you can sell as photographs, then the Epson 1270 printer is a great choice at \$499. With the available Adobe PressReady driver, ability to hook up to the Mac and PC, optional roll paper attachment and network access this is a very versatile printer. For a printer to make 8.5" wide and smaller prints or if you have a digital camera and want to use your printer for family photos, then get the Epson 870 or 875DC (DC for digital camera). At \$299, the Epson 870 is a great deal but you'll have to access your digital camera files through your computer. For \$399 you can access digital files directly through the printer with the Epson 875DC or the HP PhotoSmart P1000. If your main focus is having a printer that you can use for business projects, on plain and photographic paper, that prints very quietly and also prints one pass on both sides of the page, you should check out the HP 970Cse or PhotoSmart 1100. For printers that expose an image onto a more traditional photographic paper then process that image with a photographic emulsion process, the Fujix Pictography 3000/4000 at \$7695/\$20600 may be affordable for an in-house printer and the Lightjet 5000 is certainly the premium choice with its 60 year color permanent Fuji Crystal Archive paper.

If you need to print photographs that are wider than 13" and want an in-house inkjet, look into the Epson 9000. This printer can print up to 44" wide and you use 6 color inks with a variety of papers. The Epson 9000 costs about \$9,000 but with it you can make really large, commercial and art quality prints. HP also makes some larger format printers, the DesignJet 2500 and 3500. Using HP pigmented UV inks on certain papers with these bigger printers give you a color permanence of over 100 years. I have not yet tested these larger Epson and HP

printers or some of the other alternative inks. I plan to test them soon!

I've been working with digital imaging and digital prints for over 10 years now and things continue to get more exciting all the time. The quality of the digital prints you can make today is several orders of magnitude better than what was available 10 years ago and at a fraction of the cost. Now is a good time to get involved in this process as things will only get better and cheaper too. To get the latest and best information on the color permanence of digital prints made with various types of digital printers, inksets and papers, go to [www.wilhelm-research.com](http://www.wilhelm-research.com) which is the website for Henry Wilhelm and Wilhelm Imaging Research. I will be adding the results of my further work and tests with digital printers, inks and papers to [www.maxart.com](http://www.maxart.com) as I work on my upcoming book: *Making the Digital Print*. In my next article for *Communication Arts*, I will discuss workflows as well as software and hardware products for calibrating the above printers and others. The calibration products we will cover may include Monaco EZ Color Monaco Proof, Praxisoft Wiziwig and Wiziwig Delux, ColorBlind Matchbox, ProveIt and ColorMatic for making profiles, the X-Rite DPP-41 spectrophotometer, Color Vision PhotoCal and Optical for hardware monitor calibration and, at the high end, Greytac Macbeth's ProfileMaker 3.0 software and their Spectrolino spectrophotometer with the Spectroscan is x y table, Color Savvy Systems Color Control Station and SMPKit Software as well as Lino's Print Open, ScanOpen and ViewOpen.

Companies Mentioned in this article:

Epson America, Inc.  
3840 Kilroy Airport Way  
Long Beach, CA 90806-2469  
1-800-GO-EPSON (1-800-463-7766)  
[www.epson.com](http://www.epson.com)

Hewlett Packard Corporation  
1-800-552-8500  
[www.hp.com](http://www.hp.com)  
[www.photosmart.com](http://www.photosmart.com)

Fuji Photo Film, USA  
555 Taxter RD  
Elmsford, NY 10523  
800-800-FUJI

For sales info on the above printers:  
Keeble & Shuchat Photography,  
650-327-8511 or [www.kspphoto.com](http://www.kspphoto.com)

Symbolic Sciences (for the Lightjet 5000)  
665 West Stuart Rd  
Bellingham, WA 98226  
360-756-4000

There are several labs in the San Francisco bay area that have Lightjet 5000 printers including: Calypso Imaging in Santa Clara (408-727-2318, [www.calypsoinc.com](http://www.calypsoinc.com)), Palmers in Mountain View (800-735-1950), and Robyn Color in San Francisco (415-777-0580). There is also a lightjet lab in Phoenix Az at (602-629-1000, email: [cmyk@digitalcmyk.com](mailto:cmyk@digitalcmyk.com), web: [www.digitalcmyk.com](http://www.digitalcmyk.com)) that has been highly recommended.

Consultants who will calibrte your system for you or answer questions about calibration:

Bruce Bayne of Alder Technology  
13500 SW 72nd Ave, Suite 200  
Tigard, OR 97223  
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3rd Party Inks for Epson & Other Printers:

Lyson Inc  
801 Landmeier Rd  
Elk GRove Village, IL 60007  
847-690-1060

MIS Associates  
282 Kirksway Ct.  
Lake Orion, MI 48362  
800-445-8296  
missupply.com