

# Lenticular Images



**Which Inkjet Printers?  
Which Lenticular Software?**



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## Lenticular Images

Which Inkjet Printers?  
Which Lenticular Software?

### Abstract

To produce large lenticular prints nowadays is relatively easy. This report outlines your basic needs: lenticular software, the lens material to put on your print, and a printer capable of high resolution.

In addition to digital printing of lenticular images, some advanced artists do lenticular-like and hologram-like imagery. This you can see at ArtExpo in New York and probably ArtExpo at other cities, such as Las Vegas.

At the January 2004 Graphics of the Americas trade show we saw what for us was a totally new and different form of lenticular print, a 3-D photo that had dimensional perspective and depth due to the specialized original photography, unique software, all in addition to the application of a lenticular lens on top of the print. We describe this later in this FLAAR Fast Facts. We have subsequently seen this same 3-D product at several European trade shows.

### What can a lenticular sign do

A lenticular sign is an optical illusion image which actually consists of alternating vertical slices of several different scenes. Each set of slices is covered by a set of lenses at an angle so when the viewer is in one position, you see only the image that those lenses allow you to see. When you walk left or right, you will see through other sets of lenses so another image pops into view.

- You can show 3-dimensional depth to separate objects in space.
- You can flip from one image to another completely different one.
- Morphing allows you to merge from one image into another.
- Animation - you can take one image and go through a sequence of events or movements.
- Zoom - you can take a featured product and enlarge the view of it with progressive images.



*Lenticular-like sign processed with HumanEyes software at Graphics of the Americas 2004.*

## Software for producing Lenticular Images

To achieve a lenticular design you need the lens and the software. FlipSigns from Kutuzov provides the software (for Windows 95 and NT).

Other companies that are moving in to supply the growing need for lenticular software are 3D Magic, 3DZ, Macic Interlacer Pro, and FlashBand Generator Pro are available, distributed by Simco Products, [www.simcopfd.com](http://www.simcopfd.com).

A commercial website, [www.lenticular-software.com/index.shtml](http://www.lenticular-software.com/index.shtml) lists the following lenticular software; Microlens we found in another resource (Duane Fast 2006). Since companies come and go and rise and fall, check before you ally with a specific process. Software companies exist one year but are nowhere to be found two years later, so do not be surprised if a software mentioned here is no longer available. But some of the companies itemized here are major players, so they are still around.

- 3D Mix
- 3DZ
- Flip!
- HumanEyes
- Imagiam
- Lenticulator
- Microlens Technology
- Photo Illusion
- Promagic

That page is a link from LPC-Europe.com

To make it easier for photolabs and other print providers to create motion graphics, Durst Dice America<sup>1</sup> announced DDA Vista, a bundle of lenticular imaging software, tutorials, and screens. The Windows NT program interlaces separate images and creates a TIFF file for output to high-resolution photographic or inkjet images. Vista Lenticular Sheets are available in 20 and 40 lines per inch and in a variety of sheet sizes. According to the company, the software and screens are designed for sharp, crisp flips and 3D effects output on laser photo devices such as the Durst Lambda.

If your shop is Mac-based, you'll run into a slight stumbling block if you decide to branch into lenticular imaging. At present, lenticular imaging software is available primarily for Microsoft Windows. If we find any good lenticular software for a Macintosh we will update this report.

ScanvecAmiable offers Impacto, a PC-based software for creating 3D images. This works together with FotoMOTION. The price



Screen views of HumanEyes artwork seconds before being printed for a lenticular-like sample, at DRUPA 2004

<sup>1</sup> Durst UV printers are now sold directly by Durst, and are no longer handled by Dice (which was the software part).



suggests that Impacto is not cheap software for the beginner. For further information fax (949) 498-4441, or telephone (949) 498-4441 (so seems to be a phone/fax number).

Most RIPs should be able to handle the printing. But like everything else in digital imaging, experiment first. Don't wait until you have an impending deadline to begin your first big lenticular job.

### 3-D Software combined with Lenticular Effects

There are many different kinds of lenticular image. The best known are those where the image changes as you move past the image (as the angle of view changes). But you can also achieve 3-dimensional effects, with a single image. The lens of the lenticular printing are what creates the extreme depth of field by creating dramatic planes of focus.

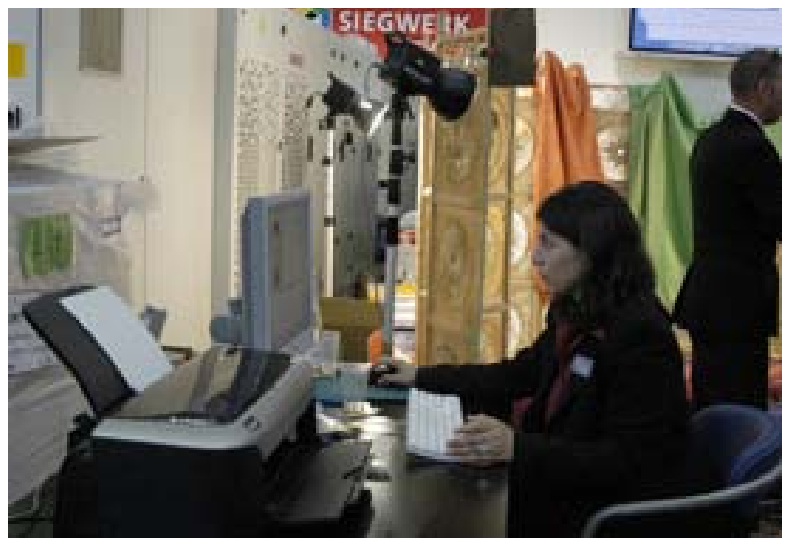
HumanEyes is a company that makes a special software so the lenticular photo has true depth. So instead of seeing different images as you walk from one side to another, you see different depths of the same image without having to move.

I first saw HumanEyes effects at Graphics of the Americas '04, in the HP booth. At DRUPA 2004 HumanEyes was again at the HP booth but they had a larger booth in a distant hall, as guest of KBA, in Hall 16. In May 2007 it was possible to visit the world headquarters of HumanEyes in Israel. They are on the campus of a leading university.

You take 70 different photographs, moving the camera from right to left on a pivot arm atop a tripod. You can use any normal digital camera. No special tripod head is required, and the different photographs apparently don't have to be precisely the same distance one from another. I did not ask what was the difference between using a pivot arm and simply turning the camera xyz-degrees directly from the center point of the tripod. But I gather the arc is needed by the software.

You then feed the images into the software, set a few parameters, and the software does all the rest.

If the setting is properly staged, and if you can design the 3-D effect beforehand, the resulting images can be quite impressive. What I would want to see is what quirks (jumps in the image) are apparent, and how they can be avoided (if at all).



*DRUPA 2004. The top of these three photos shows the special attachment for a tripod that is used to take about 72 photos (sweeping from one side to another of the scene). The tripod and the camera are perfectly normal. The 72 shots are simply clicked off; there are no set positions (this was the system about three years ago).*

The product is impressive, as is the price, \$25,000 (in that year; the price has dropped since obviously not many companies would pay \$25K for lenticular software). However this includes on-site training by a certified Training Specialist. The trainers I met at DRUPA 2004 were very capable.

Since Human Eyes usually exhibits inside the booth of other companies, it is not always easy to find them at trade shows. During 2005 I saw their products probably at least twice, once in Europe, once in the US. The Gandinnovations booth at GraphExpo 2006 had some samples of HumanEyes 3D/lenticular concepts.

However I rarely see the results in the real world, but then I don't spend hours wandering around malls or shopping centers either. But I do walk through lots of airports in the course of a year, and I have not noticed any 3D signage of this nature.

At Graphics of the Americas trade show in 2007 the booth of HumanEyes had more sophisticated images than I have noticed before. They are now doing multi-dimensional landscapes, for example. This is closer to the kind of photography that I do.

### 3-Dimensional Imaging in China

I went to the Shanghai '07 trade show in order to study the current generation of UV-cured inkjet printers being manufactured in China. Much to my surprise I saw about three or four booths with 3-dimensional lenticular signage. Frankly the three-dimensionality was better than I have seen anywhere else. Elsewhere the 3-D images are fuzzy and although dramatic, are too fake or simply too weak in resolution (even when strong in dimensionality).

These Chinese images had high apparent resolution and impressive three-dimensional effects. The first company whose products impressed me was Shanghai Pual Software Tech Co., Ltd, [www.ogalite.com](http://www.ogalite.com).

The second company whose booth stopped me in my tracks was of Guangzhou Union-Universe Digital Technology. My notes read "excellent."

Since my entire day was spent taking notes on the UV and solvent printers there was not much chance to learn more details, for example, what kind of software is being used. If the software were merely pirated you would expect the same low apparent resolution and fake appearances that you get with high-priced software and solutions in Europe and the US. But in the two booths where I stopped to take a look, the results were better than anything I see at trade shows in the US or Europe.

So if you are a fan of lenticular effects, especially the non-flip kind that is dedicated primarily to three-dimensional effects, you now know where to find it. The Shanghai show is every summer, four days. Being in Shanghai is quite an experience and I highly recommend a visit to this annual event.



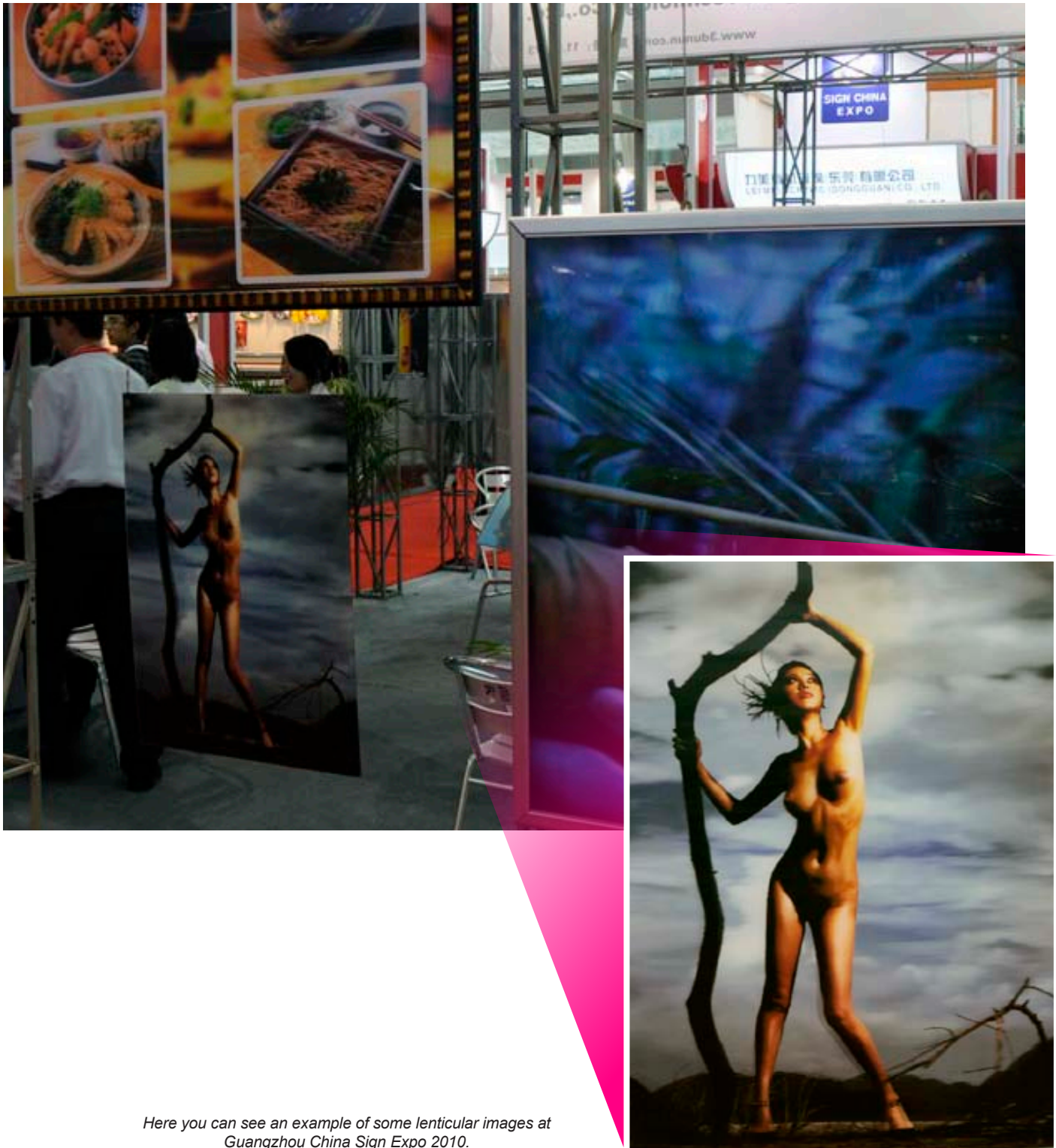
Guangzhou Union-Universe Digital Technology booth, Shanghai 2007.



Samples of the 3-Dimensional printing, Guangzhou Union-Universe Digital Technology, Shanghai 2007.



At the Guangzhou 2010 sign China expo there were several booths featuring 3D lenticular workflow. In general the output is excellent. Rarely is there an immediate headache from a Chinese lenticular. In most cases the Chinese products are as good, or better than, those of Human Eyes from Israel. The benefit of Human Eyes is that they are a known international company with significant experience in 3D lenticular. There is no Chinese brand name that is recognized outside China. Nonetheless, Chinese software and workflow for lenticular are excellent (at least what you see in the trade show booths).



Here you can see an example of some lenticular images at Guangzhou China Sign Expo 2010.

### What wide format printer should you use?

With a 300 dpi printer you can do four images; with a 600 dpi printer you can produce up to eight images. Thus the new 1200 dpi Canon imagePROGRAF wide format printer would have many advantages for multiple images.

To produce your base images you can also use an Epson, HP5000ps or newer HP 5500ps, Mimaki, Roland Hi-Fi, ColorSpan, or the above cited Canon. The absolute best lenticular image quality would be produced by a Durst Lambda or LightJet (Cymbolic Sciences, formerly GretagImaging and now part of Oce). Do not use old printers; their resolution is not high enough.

Most RIPs should be able to handle the printing.

The dpi of Epson piezo heads (Epson 10000 generation) is 360 if you are interested in their actual dpi. The true dpi of Epson model 9000 printheads is reportedly 180 dpi. They use software and multiple passes to reach the higher figures.

HP offers 600 dpi and is more than adequate for lenticular as are all Epson 10000 printhead machines (Mutoh Falcon II, Roland Pro II, Mimaki JV4).

Oce CymbolicSciences Lightjet is 4000 dpi apparent resolution. 300 or 400 dpi is how that particular system calculates it. Remember, it prints with RGB laser light on photo paper, not with dots of ink anyway.

You might be interested in knowing that your RIP feeds only 150 dpi into the inkjet printer, at most 250. Your RIP translates the 150 dpi of RGB into output dpi in CMYK (do not feed your printer a file in CMYK). Unless you have a LightJet or Lambda; in that case your RIP needs the full 300 dpi.



Oce SymbolicSciences Lightjet at PMA 2004.

2880 dpi is all mumbo-jumbo to attempt to influence your favoring the highest number. It is crucial to remember that your files are not in dpi anyway, they are in pixels. Your camera, scanner, etc do not record in DPI, they record in ppi.

Hope these figures help you.

If you need more help understanding dpi and pixel count, you might want to look at the digital photography reports by Nicholas Hellmuth (on [www.digital-photography.org](http://www.digital-photography.org) and on [www.wide-format-printers.NET](http://www.wide-format-printers.NET)).

If you need more help in RIPs you should obtain the complete FLAAR Report-Series on RIPs, on [www.wide-format-printers.NET](http://www.wide-format-printers.NET) A RIP software we recommend is Caldera.



HP5500ps at ISA 2006.



Roland Pro II at Dubai 2006. This eco-solvent printer uses Epson piezo heads which can produce up to 360 dpi.



### What inkjet media to select

You will need the proper media to produce your lenticular images, if they are small, paper may be adequate, but if you intend to produce larger prints and you want to avoid shrinking, expansion or stretching, you will probably need film. It is stated that polyester film works best (if your media shrinks it detracts from the effect).

### Lens material

You need to overlay a sheet of angled lens material on top of your print. The lines per inch (lpi) lens pattern of the material conditions the viewing angle.

Lenses come in several materials. You have to know whether your lenticular panel will be in the sun or safely inside. Some lens material will yellow with prolonged exposure to the sun. An acrylic lens may last the longest.

You mount the image behind a thick plastic lens. The ridges on the lens project the effect from the bands of the image itself. If you affix the lens with temporary adhesive you can reuse the lens.

### Laminator

You will probably need a laminator to affix the lens to the inkjet media. This should be a cold laminator since heat would cause a multitude of problems.

### Printing directly onto the lens material

In most cases you print onto regular paper and apply a lens material on top. Obviously your image has to be already divided up by software so that the lens activates the various images. But you can also print directly onto the lens. At large format sizes you can do this with any of the better UV-curable ink printers. Inca (Sericol) was the first UV-curable ink manufacturer to feature lenticular applications.



Media samples presented by HumanEyes at Graphics of the Americas 2004.



*Lenstar booth, ISA 2003.*

Now NUR (HP Scitex), Gandinnovations, Inca, Durst and other UV printer manufacturers try to state that they can handle printing directly onto a lens. But it would be essential to find an actual printshop that uses this technology successfully, before blindly plunging in. White ink and spot varnish are popular innovations for UV printing, but they rarely actually function in real life the same way that you see them at a trade show.

For business-card sizes (2 x 3 inches) you can print directly onto the lens material with a Panasonic P-M1000 Motion Printer. This is a dye sublimation process.

You can print lenticular images at home with any 600 or 720 dpi printer; 1200 or 1440 dpi is even better. Starter 2 software is able to merge images as low as 300 dpi.

At FLAAR we study principally wide-format inkjet printers. But KBA has a printer (not an inkjet) that can print directly onto lenses. One description is on the web page <http://members.whattheythink.com/news/newslink.cfm?id=25470>

### Outsourcing your lenticular signs

If you wish to have a professional company produce your initial lenticular graphics until you learn how to do it yourself, then one leader in the field is Big3D, [www.big3d.com](http://www.big3d.com).

If you are in Europe, and wish lenticular prints, contact the folks [www.imaba.nl](http://www.imaba.nl).



*Drytac JetMounter laminator at ISA 2007.*



**If you want True 3-D Signage, Consider Vacuum Extrusion**

If you want a sign that is really three-dimensional, you can do this with an Oce Arizona T220 and an extruding machine (a company in South Africa makes one what works with this Oce printer). You need the special ink from Oce.

Thermo-formable UV ink became available in 2006 and another heat-formable UV-cured ink became available in 2007 (via Gandinnovations, UV-cured flatbed printer). There is a separate FLAAR Report on UV-cured inks because that topic is obviously not lenticular. But with heat-formable inks, you can create actual 3-dimensional objects.

Or, with a 3D rapid prototyper, such as ZCorporation or Objet Geometries, you can also create true 3-dimensional images. We have a separate FLAAR Report on 3D printers.



The Gandinnovations booth at ISA 2007.



3d Prototyping report already available at [www.wide-format-printers.net](http://www.wide-format-printers.net)



ZCorporation samples at RAPID seminar, 2007.





*Thermo-formable material created with an extrusion vacuum, using Flexform stretchable UV ink, at Gandinnovations booth, ISA 2007.*

### For further Information

### Suggested Contacts

We do not yet have any of these products, though we do have several printers such as Canon 8200, ColorSpan Mach 12, HP DesignJet 5000, HP 5500 and Mimaki JV4 which are capable of the necessary resolution. Nowadays printshops would tend to use a UV-curable flatbed printer.

New Vision Technology - ProMagic's Magic Interlacer Pro 100 has proven to be a professional lenticular interlacing software.

Kutuzov, Inc. - Manufacturer of Flip! lenticular software.

Lenstar, [www.lenstar.org](http://www.lenstar.org)

Enzyme - Manufacturer of LenzFX a lenticular software.

If you need a consultant, consider Philippe Eisfeld, [www.living-image.de](http://www.living-image.de). I have met him at trade shows, and know his brother (who owns PosterJet RIP company).

Lenticular products come and go. Many of the products listed here may no longer exist. In fact not one of the products in our 2001-2003 list was in the 2008 list of Duane Fast.

And, none of the products that I found at FESPA Digital trade show 2008 or DRUPA 2008 were in the most recent list of Fast (whose list is predominantly for USA).

[www.dplenticular.com](http://www.dplenticular.com)

There is no one industry standard; no dominant industry leader (though we will be on the lookout for one at the upcoming 2010 trade shows). Just realize that exhibits of lenticular software are rare even at sign shows. Before you buy any expensive product, be sure you have seen this product actually function in someone else's sign shop.

### For further reading:

Trade magazines often carry informative articles about lenticular graphics. One that caught my eye is in the Fall 1999 issue of Digital Fine Art magazine, pp. 44ff, by Dorothy Simpson Krause, a leading artist in this field ([www.digitalfineart.com](http://www.digitalfineart.com)).

Another brief but meaty article was in The Big Picture magazine (ST Publications, [www.bigpicture.net](http://www.bigpicture.net)), Nov/Dec 1999, p. 36.

SIP, a German trade magazine, had two articles on lenticular signage during 2005, both by Philippe Eisfeld, 3D-DesignService, [www.living-image.de](http://www.living-image.de).

### Specific Articles

Since most of our time is away from the office inspecting printers around the world, we don't realistically have a way to keep a list of all the new articles that come out, so this meager list is clearly not intended to be up to date. Trade magazines have articles on lenticular about every second year.

#### **FAST, Duane**

2006 Adding Bling to your P.O.P. Digital Graphics Magazine, July 2006, pp. 22-27.

#### **FAST, Duane**

2008 Flipped for Lenticulars. Digital Graphics Magazine, August 2008, pp. 92 -95.

#### **NICKEL-KAILING, Gail**

2004 Lenticular Imaging. Wide Format Imaging magazine, August 2004, p. 24.

### Sources and Resources on the Internet

Web sites come and go, so some of these links may go into cyberspace and never return with an actual page.

[www.3dz.co.uk/services.html](http://www.3dz.co.uk/services.html)

This company can do lenticular designs and concepts for you. Their portfolio is impressive.

[www.ahearn.com/MicroLens1.htm](http://www.ahearn.com/MicroLens1.htm) (list of lenticular lenses that this company sells)

[www.applied-image.com/Consumables/MainWhatsNew.htm](http://www.applied-image.com/Consumables/MainWhatsNew.htm) (advertising, but you can always learn something when the ad is descriptive)

[//astronomy.swin.edu.au/pbourke/stereographics/lenticular/](http://astronomy.swin.edu.au/pbourke/stereographics/lenticular/)

Excellent illustrations show technical details of how your eyes interact with the lenticular lenses.

[www.berezin.com/3d/Glossary.htm](http://www.berezin.com/3d/Glossary.htm)

Glossary.

[www.big3d.com](http://www.big3d.com)

[www.dotkrause.com/process/promisedlandlenticular/promisedlenticular.html](http://www.dotkrause.com/process/promisedlandlenticular/promisedlenticular.html)

Digital artist Dorothy Krause shows her lenticular images.

[www.dplenticular.com](http://www.dplenticular.com)

I found their brochure at either FESPA Digital '08 or DRUPA '08.

[www.flipsigns.com](http://www.flipsigns.com)

[www.FutureDisplay.com](http://www.FutureDisplay.com)

I found this at a European trade show in 2008.

[www.holographic.co.uk/](http://www.holographic.co.uk/)

The problem is that lenticular business cards made be interpreted by some people as tacky.

[www.humaneyes.com/faq5.html](http://www.humaneyes.com/faq5.html) (brief FAQ on laminating lenticular prints)

[www.jpost.com/Editions/2001/07/23/Digital/DIFeatures.31024.html](http://www.jpost.com/Editions/2001/07/23/Digital/DIFeatures.31024.html)

Newspaper article on the HumanEyes system.

[www.lenstar.org/history/ref.htm](http://www.lenstar.org/history/ref.htm)

This site has an extensive bibliography, albeit quite technical and scholarly.

[www.lenticularsoftware.com](http://www.lenticularsoftware.com)

[www.lpc-europe.com/lenticular\\_news.shtml](http://www.lpc-europe.com/lenticular_news.shtml)

Lenticular Plastics Company.

[www.microlens.com/Pages/Glossary.html](http://www.microlens.com/Pages/Glossary.html) (short but useful lenticular glossary)

[www.microlens.com/Pages/FAQ.html](http://www.microlens.com/Pages/FAQ.html) (FAQ page of lenticular lens manufacturer)

[www.orasee.com/new/main.php3](http://www.orasee.com/new/main.php3) (commercial site, but informative)

Oz ([www.oz.cl](http://www.oz.cl)) is the distributor of HumanEyes for Latin America.

[www.raster.com.pl](http://www.raster.com.pl) and [www.raster-export.com](http://www.raster-export.com)

I found their brochure at either FESPA Digital '08 or DRUPA '08. They offer a complete range of all the kinds of lenticular signage.

[www.rit.edu/~andpph/web-04.html](http://www.rit.edu/~andpph/web-04.html)

Lists several dozen 3D photography sites.

[www.silver-holographic.com](http://www.silver-holographic.com)

[www.stereographer.com/glossary.html](http://www.stereographer.com/glossary.html)

A glossary of 3D terms.

[www.stereoscopy.com](http://www.stereoscopy.com)

Explains the difference between various forms of actual and simulated 3-D viewing.

<http://members.whattheythink.com/allsearch/article.cfm?id=26219>

PR release on Gandinnovations showing samples of HumanEyes 3D/lenticular results at GraphExpo 2006.



### Advisory: some lenticular images can cause nausea

One airport walkway featured almost two dozen lenticular signs in a row. Most of the passengers were seasick by the time they got to the end.

Too much of a good thing can destroy the effect of a lenticular sign. Many people find overuse of lenticular views irritating to the eye.

At Japan Shop 2010 two lenticular images in the booth of Coburn Japan were weak color (inadequate color saturation). One caused a headache the minute I looked at it. Their booth was a good ad for all the reasons why to avoid lenticular!

Nonetheless, in an appropriate situation, a spectacular lenticular view may be precisely what is called for.

Just keep in mind that this report does not warranty any product for any quality or performance or fitness for any specific task, since we do not know the situation in which you intend to use the hardware or software. Nor is there any warranty or guarantee that the output of these products will produce salable goods, since we do not know what kind of ink or media you intend to use, nor the needs of your clients.

Fuji 3D may spell the end for traditional expensive lenticular systems

### Follow up

We hope you enjoyed this report. We tried to send it to you quickly. You may notice that we have been going to a lot of trade shows and conferences in order to keep up with the latest hardware, software, and technology.

Since the FLAAR Reports are designed and produced by our graphic design staff in Guatemala, it is not practical for us to provide follow-up information from that far away. Dr Hellmuth is usually on an airplane heading to another site-visit case study in a sign shop or preparing for a factory visit to learn from watching the printers actually being constructed. So to answer your questions, if it appeared from our reading your questions that one of our sponsors could provide some documentation, we will forward your contact information to them. If we had the funding we would do the follow up with our own staff, but consulting costs are at a professional level. So we estimate you would rather have a follow-up from a place with absolutely no cost and no obligation whatsoever.

### Copyright notice

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### Most recently updated May 2010.

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**As soon as you have your UV-flatbed printer, your printshop will desire to have a cutter or trimmer.**

First you need to trim. Simple cutting of the edges of your board so the edges are neat and clean. Then of course some clients will ask if you can do contour-cutting. This means you can offer additional services and earn additional income.

The best way to learn about trimmers is to ask a distributor who has more than one brand. This way they do not push their house brand and denigrate brands that they do not carry. Also, you want a real person that actually has experience. Otherwise you get a "box pusher" who is simply an Internet sales person, who does not know trimmer from dimmer.

The person we suggest is **Mike Lind** because his company, **Reprographic Designs**, handles all leading brands: KeenCut, Neolt, Meteor Metoschnitt, RotaTrim, etc. You can contact him at 1 281 492 2714 or [malind@msn.com](mailto:malind@msn.com).

His company is also the Master Distributor for Cruse reprographic scanners in the US and adjacent countries.

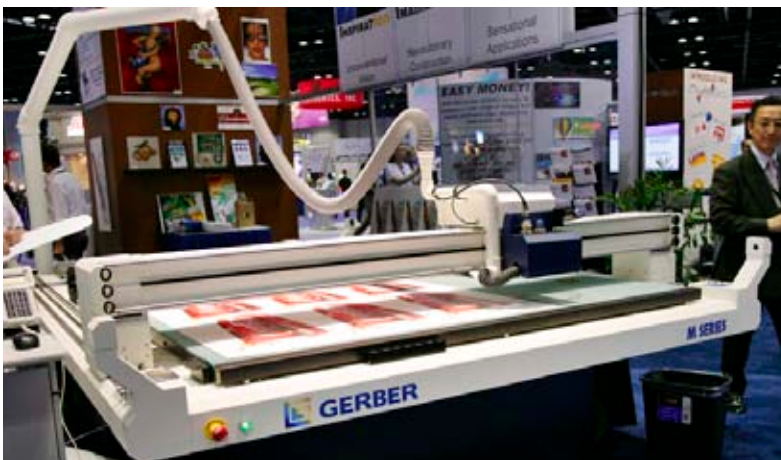
**XY Cutter Options**

In a period of economic recession printshops will tend to ask about options that are priced lower than high-end prices. Thus we suggest two possible solutions at mid-range and/or entry-level price: Gerber M class cutters or DYSS. I have inspected two huge factory complexes of Gerber Scientific in 2008 (especially their cutters for fabrics) and will be visiting their facilities again in 2009.

**To contact Gerber:**

Phone (US): 800-222-7446, email: [cservice@gspinc.com](mailto:cservice@gspinc.com)  
 Fax: 800-227-6228 or 860-648-8064  
 Phone (Intl): 860-648-8028, email: [gspinternational@gspinc.com](mailto:gspinternational@gspinc.com)

When you acquire a UV-curable wide-format printer you will eventually learn that an XY flatbed cutter is a useful accessory for thick rigid materials. The advantage of having an XY cutter is that you are selling not just the print, but a finished work. To stay ahead of the competing printshops in your city it helps to offer your clients a solution for every step of the printing workflow.



*We have seen Gerber cutters at work during major trade shows, both in Europe and in the US. Gerber has dealers all across the US and Canada, and in Europe is served by Spandex.*

DYSS is a thriving company that has exhibited its UV printers and XY cutter both in Europe (FESPA, VISCOM, etc) and in the US (SGIA and ISA). Since mid-2007 FLAAR has evaluated XY cutters and CNC routers at trade shows and by visiting factories such as Zund in Europe and Multi-Cam in the US.

On our next trip to Korea we hope to visit the factory of DYSS. On previous trips to Korea I have already inspected the factory of D.G.I. (twice), IP&I, Dilli, Keundo, and Yuhan-Kimberly (the Korean branch of Kimberly-Clark; Yuhan-Kimberly develops inkjet inks for textiles as well as wide-format inkjet printers). During these inspections I have learned that the quality of machinery made in Korea is equal to, and in some cases better than, UV printers made in Japan and the US).

Planet Digital is the Master Distributor for DYSS XY flatbed cutters and DYSS UV-curable inkjet printers. So in a single source you can learn about both the production stage of the workflow and the finishing stage of the workflow.

**Bryan Stringer**, CEO, Planet Digital,  
 Email: [Info@Planetdigital.eu](mailto:Info@Planetdigital.eu)  
 TEL : +44 (0)1963 220900 FAX : +44 (0)1963 220861

This contact information telephone and fax number is for all of Europe, Middle East, and Africa. If you are in the US, you should utilize the e-mail address for contact.



*DYSS X7 cutter at VISCOM Italy 2008.*

### Reality Check

Being a university professor for many years does not mean we know everything. But intellectual curiosity often leads us to enter areas that are new to us. So we do not shirk from entering areas where we are obviously not yet expert. In your years of wide format printing experience have encountered results different than ours, please let us know at [ReaderService@FLAAR.org](mailto:ReaderService@FLAAR.org). We do not mind eating crow, though so far it is primarily a different philosophy we practice, because since we are not dependent on sales commissions we can openly list the glitches and defects of those printers that have an occasional problem.

FLAAR and most universities have corporate sponsors but FLAAR web sites do not accept advertising, so we don't have to kowtow to resellers or manufacturers. We respect their experience and opinion, but we prefer to utilize our own common sense, our in-house experiences, the results from site-visit case studies, and comments from the more than 53,000 of our many readers who have shared their experiences with us via e-mail (the Survey Forms).

### Licensing Information

If you wish to distribute this report to other people within your company, please obtain a site licensing agreement for multiple copies from FLAAR by contacting [ReaderService@FLAAR.org](mailto:ReaderService@FLAAR.org). Substantial discounts are available for licensing to distribute within your company; we call this a subscription. The advantage of a subscription license is that you can opt for automatic updates. You may have noticed that FLAAR reports tend to be updated as additional information becomes available.

In some instances a license would be available to distribute outside your company, including in other languages.

**To distribute this report without subscription/license violates federal copyright law.** To avoid such violations for you, and your company, you can easily order additional copies from [www.wide-format-printers.NET](http://www.wide-format-printers.NET).

### Update Policy

Starting in 2008, updates on UV-curable wide-format inkjet printers are available for all individuals and companies which have a subscription, or to companies who are research project sponsors. If you are a Subscriber or manager in a company that is a research sponsor, you can obtain the next update by writing [ReaderService@FLAAR.org](mailto:ReaderService@FLAAR.org). If you are neither a Subscriber or a research sponsor, simply order the newest version via the e-commerce system on [www.wide-format-printers.NET](http://www.wide-format-printers.NET). Please realize that because we have so many publications and many are updated so frequently that we have no realistic way to notify any reader of when just one particular report is actually updated.

There is a free PDF that describes the UV-curable inkjet printer Subscription system. Subscriptions are available only for UV-related wide-format printer publications.

FLAAR Reports on UV-curable roll-to-roll, flatbed, hybrid, and combo printers are updated when new information is available. We tend to update the reports on new printers, on printers that readers ask about the most, and on printers where access is facilitated (such as factory visits, demo-room visits, etc).

Reports on obsolete printers, discontinued printers, or printers that not enough people ask about, tend not to be updated.

FLAAR still publishes individual reports on solvent printers, and on giclee printers, but subscriptions on these are not yet available; these FLAAR Reports on solvent, eco-solvent, and water-based wide format printers have to be purchased one by one.

### Please Note

This report has not been licensed to any printer manufacturer, distributor, dealer, sales rep, RIP company, media, or ink company to distribute. So, **if you obtained this from any company, you have a pirated copy.**

**If you have received a translation, this translation is not authorized unless posted on a FLAAR web site, and may be in violation of copyright (plus if we have not approved the translation it may make claims that were not our intention).**

Also, since this report is frequently updated, if you got your version from somewhere else, it may be an obsolete edition. FLAAR reports are being updated all year long, and our comment on that product may have been revised positively or negatively as we learned more about the product from end users.

If you receive any FLAAR Report from a sales rep, in addition to being violation of copyright, it is useful to know if there is a more recent version on the FLAAR web site, because every month new UV printers are being launched. So what was good technology one month, may be replaced by a much better printer elsewhere the next month.

To obtain a legitimate copy, which you know is the complete report with nothing erased or changed, and hence a report with all the original description of pros and cons, please obtain your original and full report straight from [www.FLAAR.org](http://www.FLAAR.org).

**Your only assurance that you have a complete and authentic evaluation which describes all aspects of the product under consideration, benefits as well as deficiencies, is to obtain these reports directly from FLAAR, via [www.wide-format-printers.NET](http://www.wide-format-printers.NET).**

### Citing and Crediting

A license from FLAAR is required to use any material whatsoever from our reports in any commercial advertisement or PR Release.

If you intend to quote any portion of a FLAAR review in a PowerPoint presentation, if this is in reference to any product that your company sells or promotes, then it would be appropriate to ask us first. FLAAR reports are being updated every month sometimes, and our comment on that product may have been revised as we learned more about the product from end users. Also, we noticed that one company cited the single favorable comment we made on one nice aspect of their printer, but neglected to cite the rest of the review which pointed out the features of the printer which did not do so well. For them to correct this error after the fact is rather embarrassing. So it is safer to ask-before-you-quote a FLAAR review on your product.

The material in this report is not only copyright, it is also based on years of research. Therefore if you cite or quote a pertinent section, please provide a proper credit, which would be minimally "Nicholas



Hellmuth, year, [www.FLAAR.org](http://www.FLAAR.org).” If the quote is more than a few words then academic tradition would expect that a footnote or entry in your bibliography would reference the complete title. Publisher would be [www.FLAAR.org](http://www.FLAAR.org).

If you intend to quote any portion of a FLAAR review in a PowerPoint presentation, if this is in reference to any product that your company sells or promotes, then it would be appropriate to license the report or otherwise notify us in advance. FLAAR reports are being updated every week sometimes, and our comment on that product may have been revised as we learned more about the product from end users. Also, we noticed that one company cited the single favorable comment we made on one nice aspect of their printer, but neglected to cite the rest of the review which pointed out the features of the printer which did not do so well. For them to correct this error after the fact is rather embarrassing. So it is safer to ask-before-you-quote a FLAAR review on your product.

### Legal notice

Inclusion in this study by itself in no way endorses any printer, media, ink, RIP or other digital imaging hardware or software. Equally, exclusion from this study in no way is intended to discredit any printer.

### Advisory

We do our best to obtain information which we consider reliable. But with hundreds of makes and models of printers, and sometimes when information about them is sparse, or conflicting, we can only work with what we have available. Thus you should be sure to rely also on your own research, especially asking around. Find another trustworthy end-user of the same make and model you need to know about. Do not make a decision solely on the basis of a FLAAR report because your situation may be totally different than ours. Or we may not have known about, and hence not written about, one aspect or another which is crucial before you reach your decision.

The sources and resources we may list are those we happen to have read. There may be other web pages or resources that we missed. For those pages we do list, we have no realistic way to verify the veracity of all their content. Use your own common sense plus a grain of salt for those pages which are really just PR releases or outright ads.

We are quite content with the majority of the specific printers, RIPs, media, and inks we have in the FLAAR facilities. We would obviously never ask for hardware, software, or consumables that we knew in advance would not be good. However even for us, a product which looks good at a trade show, sounds good in the ad literature, and works fine for the first few weeks, may subsequently turn out to be a lemon.

Or the product may indeed have a glitch but one that is so benign for us, or maybe we have long ago gotten used to it and have a work-around. And not all glitches manifest themselves in all situations, so our evaluator may not have been sufficiently affected that he or she made an issue of any particular situation. Yet such a glitch that we don't emphasize may turn out to be adverse for your different or special application needs.

Equally often, what at first might be blamed on a bad product, often turns out to be a need of more operator experience and training. More often than not, after learning more about the product it becomes possible to produce what it was intended to produce. For this reason it is crucial for the FLAAR team and their university colleagues to interact

with the manufacturer's training center and technicians, so we know more about a hardware or software. Our evaluations go through a process of acquiring documentation from a wide range of resources and these naturally include the manufacturer itself. Obviously we take their viewpoints with a grain of salt but often we learn tips that are worthy of being passed along.

FLAAR has no way of testing 400+ specifications of any printer, much less the over 101 different UV printers from more than 46 manufacturers. Same with hundreds of solvent printers and dozens of water-based printers. We observe as best we can, but we cannot take each printer apart to inspect each feature. And for UV printers, these are too expensive to move into our own facilities for long-range testing, so we do as best as is possible under the circumstances. And when a deficiency does become apparent, usually from word-of-mouth or from an end-user, it may take time to get this written up and issued in a new release.

Another reason why it is essential for you to ask other printshop owners and printer operators about how Brand X and Y function in the real world is that issues may exist but it may take months for these issues to be well enough known for us to know the details. Although often we know of the issues early, and work to get this information into the PDFs, access to information varies depending on brand and model. Plus with over 300 publications, the waiting time to update a specific report may be several months. Plus, once a printer is considered obsolete, it is not realistic to update it due to the costs involved.

For these reasons, every FLAAR Report tries to have its publication date on the front outside cover (if we updated everything instantly the cost would be at commercial rates and it would not be possible to cover these expenses). At the end of most FLAAR Reports there is additionally a list of how many times that report has been updated. A report with lots of updates means that we are updating that subject based on availability of new information. If there is no update that is a pretty good indication that report has not been updated! With 101 models of UV printers, several hundred solvent printers, and scores of water-based printers, we tend to give priority to getting new reports out on printers about which not much info at all is available elsewhere. So we are pretty good about reporting on advances in LED curing. But glitches in a common water-based printer will take longer to work its way through our system into an update, especially if the glitch occurs only in certain circumstances, for example, on one type of media. With several hundred media types, we may not yet have utilized the problem media. While on the subject of doing your own research, be sure to ask both the printer operator and printshop owner or manager: you will generally get two slightly different stories. A printer operator may be aware of more glitches of the printer than the owner.

If a printer is no longer a prime model then there is less interest in that printer, so unless a special budget were available to update old reports, it is not realistic to update old reports. As always, it is essential for you to visit printshops that have the printers on your short-list and see how they function in the real world.

But even when we like a product and recommend it, we still can't guarantee or certify any make or model nor its profitability in use because we don't know the conditions under which a printer system might be utilized in someone else's facility. For ink and media, especially after-market third-party ink and media, it is essential that you test it first, under your conditions. We have no way to assure that any ink or media will be acceptable for your specific needs in your specific print shop. As a result, products are described "as is" and without warranties as to performance or merchantability, or of fitness

for a particular purpose. Any such statements in our reports or on our web sites or in discussions do not constitute warranties and shall not be relied on by the buyer in deciding whether to purchase and/or use products we discuss because of the diversity of conditions, materials and/or equipment under which these products may be used. Thus please recognize that no warranty of fitness or profitability for a particular purpose is offered.

The user is advised to test products thoroughly before relying on them. We do not have any special means of analyzing chemical contents or flammability of inks, media, or laminates, nor how these need to be controlled by local laws in your community. There may well be hazardous chemicals, or outgassing that we are not aware of. Be aware that some inks have severe health hazards associated with them. Some are hazardous to breathe; others are hazardous if you get them on your skin. For example, some chemicals such as cyclohexanone do not sound like chemicals you want to breathe every day. Be sure to obtain, read, and understand the MSDS sheets for the inks, media, and laminates that you intend to use. Both solvent, eco-solvent, and UV-curable inks are substances whose full range of health and environmental hazards are not yet fully revealed. It is essential you use common sense and in general be realistic about the hazards involved, especially those which are not listed or which have not yet been described. FLAAR is not able to list all hazards since we are not necessarily aware of the chemical components of the products we discuss. Our reports are on usability, not on health hazards.

Most inks are clearly not intended to be consumed. Obviously these tend to be solvent inks and UV-curable inks. Yet other inks are edible, seriously, they are printed on birthday cakes. Indeed Sensient is a leader in a new era of edible inks. Therefore the user must assume the entire risk of ascertaining information on the chemical contents and flammability regulations relative to inks, media or laminates as well as using any described hardware, software, accessory, service, technique or products.

We have no idea of your client's expectations. What students on our campus will accept may not be the same as your Fortune 500 clients. In many cases we have not ourselves used the products but are basing our discussion on having seen them at a trade show, during visiting a print shop, or having been informed about a product via e-mail or other communication.

### Results you see at trade shows may not be realistic

Be aware that trade show results may not be realistic. Trade shows are idealized situations, with full-time tech support to keep things running. The images at a trade show may be tweaked. Other images may be "faked" in the sense of slyly putting on primer without telling the people who inspect the prints. Most UV inks don't stick to all materials; many materials need to be treated.

Or the UV prints may be top-coated so that you can't do a realistic scratch test.

Booth personnel have many standard tricks that they use to make their output look gorgeous. In about half the cases you will not likely obtain these results in real life: in most cases they are printing uni-directional, which may be twice as slow as bi-directional.

Trade show examples tend to be on the absolutely best media. When you attempt to save money and use economy media you will quickly notice that you do not get anywhere near the same results as you saw in the manufacturer's trade show booth, or pictured in their

glossy advertisement. Five years ago we noticed Epson was laminating prints to show glossy output because their pigmented inks could not print on actual glossy media. The same equipment, inks, media, and software may not work as well in your facility as we, or you, see it at a trade show. All the more reason to test before you buy; and keep testing before you make your final payment. Your ultimate protection is to use a gold American Express credit card so you can have leverage when you ask for your money back if the product fails.

Images printed at trade show may be in uni-directional mode: so you may not realize the printer has bi-directional (curing) banding defects until you unpack it in your printshop. Bi-directional curing banding is also known as the lawnmower effect. Many printers have this defect; sometimes certain modes can get rid of it, but are so slow that they are not productive.

You absolutely need to do print samples with your own images and the kind provided by your clients. Do not rely on the stock photos provided by the printer, ink, media, or RIP manufacturer or reseller. They may be using special images which they know in advance will look fabulous on their printer. Equally well, if you send your sample images to the dealer, don't be surprised if they come back looking awful. That is because many dealers won't make a serious effort to tweak their machine for your kind of image. They may use fast speed just to get the job done (this will result in low quality). Check with other people in your area, or in the same kind of print business that you do. Don't rely on references from the reseller or manufacturer (you will get their pet locations which may be unrealistically gushy): find someone on your own.

### Factors influencing output

Heat, humidity, static, dust, experience level of your workers (whether they are new or have prior years experience): these are all factors that will differ in your place of business as compared with test results or demo room results.

Actually you may have people with even more experience than we do, since we deliberately use students to approximate newbies. FLAAR is devoted to assisting newcomers learn about digital imaging hardware and software. This is why Nicholas Hellmuth is considered the "Johnny Appleseed" of wide format inkjet printers.

Therefore this report does not warranty any product for any quality, performance or fitness for any specific task, since we do not know the situation in which you intend to use the hardware or software. Nor is there any warranty or guarantee that the output of these products will produce salable goods, since we do not know what kind of ink or media you intend to use, nor the needs of your clients. A further reason that no one can realistically speak for all aspects of any one hardware or software is that each of these products may require additional hardware or software to reach its full potential.

For example, you will most likely need a color management system which implies color measurement tools and software. To handle ICC color profiles, you may need ICC color profile generation software and a spectrophotometer since often the stock pre-packaged ICC color profiles which come with the ink, media, printers and/or RIPs may not work in your situation. Not all RIPs handle color management equally, or may work better for some printer-ink-media combinations than for others.

Be aware that some RIPs can only accept ICC color profiles: you quickly find out the hard way that you can't tweak these profiles nor

generate new ones. So be sure to get a RIP which can handle all aspects of color management. Many RIPs come in different levels. You may buy one level and be disappointed that the RIP won't do everything. That's because those features you may be lacking are available only in the next level higher of that RIP, often at considerable extra cost. Same thing in the progression of Chevy through Pontiac to Cadillac, or the new Suburbans. A Chevy Suburban simply does not have all the bells and whistles of the Cadillac Escalade version of this SUV.

Don't blame us... besides, that's why we are warning you. This is why we have a Survey Form, so we can learn when you find products that are inadequate. We let the manufacturers know when end users complain about their products so that the manufacturers can resolve the situation when they next redesign the system.

Most newer printer models tend to overcome deficiencies of earlier models. It is possible that our comparative comments point out a glitch in a particular printer that has been taken care of through an improvement in firmware or even an entirely new printer model. So if we point out a deficiency in a particular printer brand, the model you may buy may not exhibit this headache, or your kind of printing may not trigger the problem. Or you may find a work-around.

Just remember that every machine has quirks, even the ones we like. It is possible that the particular kind of images, resolution, inks, media, or other factors in your facility are sufficiently different than in ours that a printer which works just fine for us may be totally unsatisfactory for you and your clients. However it may be that the specific kind of printing you need to do may never occasion that shortcoming. Or, it may be that your printer was manufactured on a Monday and has defects that are atypical, show up more in the kind of media you use which we may not use as often or at all during our evaluations. Equally possibly a printer that was a disaster for someone else may work flawlessly for you and be a real money maker for your company.

So if we inspect a printer in a printshop (a site-visit case study), and that owner/operator is content with their printer and we mention this; don't expect that you will automatically get the same results in your own printshop.

In some cases a product may work better on a Macintosh than on a PC. RIP software may function well with one operating system yet have bugs and crash on the same platform but with a different operating system. Thus be sure to test a printer under your own specific work conditions before you buy.

And if a printer, RIP, media, or ink does not function, return it with no ands, ifs or buts. Your best defense is to show an advertising claim that the printer simply can't achieve. Such advertising claims are in violation of federal regulations, and the printer companies know they are liable for misleading the public.

But before you make a federal case, just be sure that many of the issues are not user error or unfamiliarity. It may be that training or an additional accessory can make the printer do what you need it to accomplish. Of course if the printer ads did not warn you that you had to purchase the additional pricey accessory, that is a whole other issue. Our reviews do not cover accessories since they are endless, as is the range of training, or lack thereof, among users.

The major causes of printer breakdown and failure is lack of maintenance, poor maintenance, spotty maintenance, or trying to jerry-rig some part of the printer. The equally common cause of printer breakdown is improper use, generally due from lack of training or experience. Another factor is whether you utilize your printer all day

every day. Most solvent and UV printers work best if used frequently. If you are not going to use your printer for two or three days, you have to put flush into the system and prepare it for hibernation (even if for only four or five days). Then you have to flush the ink system all over again.

Also realize that the surface of inkjet prints are fragile and generally require lamination to survive much usage. Lamination comes in many kinds, and it is worth finding a reliable lamination company and receiving training on their products.

Also realize that no hybrid or combo UV printer can feed all kinds of rigid materials precisely. Some materials feed well; others feed poorly; others will skew.

Although we have found several makes and models to work very well in our facilities, how well they work in your facilities may also depend on your local dealer. Some dealers are excellent; others just sell you a box and can't provide much service after the sale. Indeed some low-bid internet sales sources may have no technical backup whatsoever. If you pay low-bid price, you can't realistically expect special maintenance services or tech support later on from any other dealer (they will tell you to return to where you paid for the product). This is why we make an effort to find out which dealers are recommendable. Obviously there are many other dealers who are also good, but we do not always know them. To protect yourself further, always pay with a level of credit card which allows you to refuse payment if you have end up with a lemon. A Gold American Express card allows you to refuse payment even months after the sale. This card may also extend your warranty agreement in some cases (check first).

Most of the readers of the FLAAR Reports look to see what printers we use in our own facilities. Readers realize that we will have selected the printers that we like based on years of experience and research. Indeed we have met people at trade shows who told us they use the FLAAR web site reports as the shopping list for their corporate purchases.

Yes, it is rather self-evident that we would never ask a manufacturer to send a product which we knew in advance from our studies was no good. But there are a few other printers which are great but we simply do not have them in our facilities yet.

So if a printer is not made available by its manufacturer, then there is no way we can afford to have all these makes and models in our facility. Thus to learn about models which we do not feature, be sure to ask around in other print shops, with IT people in other corporations, at your local university or community college. Go to trade shows... but don't use only the booth...ask questions of people in the elevator, in line at the restaurant, anywhere to escape the smothering hype you get in the booth.

Realize that a FLAAR Report on a printer is not by itself a recommendation of that printer. In your local temperature, in your local humidity, with the dust that is in your local air, with your local operator, and with disorientation of the insides of a printer during rough shipment and installation, we have no knowledge of what conditions you will face in your own printshop. We tend to inspect a printer first in the manufacturing plant demo room: no disjointed parts from any shipment since this printer has not been lifted by cranes and run over a rough pot-holed highway or kept in smelting heat or freezing cold during shipment.

Taking into consideration we do not know the conditions in which you may be using your hardware, software, or consumables, neither the author nor FLAAR nor either university is liable for liability, loss or dam-



age caused either directly or indirectly by the suggestions in this report nor by hardware, software, or techniques described herein because.

**Availability of spare parts may be a significant issue**

Chinese printers tend to switch suppliers for spare parts every month or so. So getting spare parts for a Chinese printer will be a challenge even if the distributor or manufacturer actually respond to your e-mails at all. Fortunately some companies do have a fair record of response; Teckwin is one (based on a case of two problematical hybrid UV printers in Guatemala). The distributor said that Teckwin sent a second printer at their own expense and sent tech support personnel at their expense also. But unfortunately both the hybrid UV printers are still abandoned in the warehouse of the distributor; they were still there in January 2009. But Teckwin has the highest rating of any Chinese company for interest in quality control and realization that it is not good PR to abandon a client or reseller or distributor all together.

Recently we have heard many reports of issues of getting parts from manufacturers in other countries (not Asia). So just because your printer is made in an industrialized country, if you are in the US and the manufacturer is X-thousand kilometers or miles away, the wait may be many days, or weeks.

**Lack of Tech Support Personnel is increasing**

The recession resulted in tech support issues: some manufacturers may need to skimp on quality control during a recession, or switch to cheaper parts suppliers. Plus they are not hiring enough tech support during a recession. So the bigger and more successful the company, in some cases the worse these particular problems may be.

**Any new compiled printer may take a few months to break in**

Any new printer, no matter who the manufacturer, or how good is the engineering and electronics, will tend to have teething issues. Until the firmware is updated, you may be a beta tester. This does not mean the printer should be avoided, just realize that you may have some downtime and a few headaches. Of course the worst case scenario for this was the half-million dollar Luscher JetPrint: so being "Made in Switzerland" was not much help.

**Counterfeit parts are a problem with many printers made in China**

Several years ago many UV printers made in China and some made elsewhere in Asia had counterfeit parts. No evaluation has the funding available to check parts inside any printer to see if they are from the European, Japanese, or American manufacturer, or if they are a clever counterfeits.

**Be realistic and aware that not all materials can be printed on equally well**

Many materials don't feed well through hybrid (pinch roller on grit roller systems) or combo UV systems (with transport belts). Banding, both from poor feeding, and from bi-directional (lawnmower effect) are common on many UV-curable inkjet printers.

It is typical for some enthusiastic vendors to claim verbally that their printer can print on anything and everything. But once you unpack the printer and set it up, you find that it requires primer on some materials; on other materials it adheres for a few weeks but then falls off.

And on most hybrid and many combo printers, some heavy, thick, or smooth-surfaced materials skew badly. Since the claim that the printer will print on everything is usually verbal, it is tough to prove this aspect of misleading advertising to a jury.

Not all inks can print on all materials. And at a trade show, many of the materials you see so nicely printed on, the manufacturer may be adding a primer at night or early in the morning: before you see the machine printing on this material.

We feel that the pros and cons of each product speak more than adequately for themselves. Just position the ad claims on the left: put the actual performance results on the right. The unscrupulous hype for some printers is fairly evident rather quickly.

**Be sure to check all FLAAR resources**

Please realize that with over 200 different FLAAR Reports on UV printers, you need to be sure to check the more obscure ones too. If a printer has a printhead issue, the nitty gritty of this may be in the FLAAR Report on printheads. The report on the model is a general introduction; if we discussed the intimate details of printheads then some readers might fall asleep. And obviously do not limit yourself to the free reports. The technical details may be in the reports that have a price to them. Our readers have said they prefer to have the general basics, and to park the real technical material in other reports that people can buy if they really want that level of information.

So it may be best to ask for personal consulting. The details of the problems with the ColorSpan 5400uv series are rather complex: namely the center row of the Ricoh printheads. This would require an expensive graphic designer and consultants to show the details. And the design of the printhead would probably be altered by the time we did any of this anyway. So it is essential to talk with people: with other end-users, and with FLAAR in person on a consulting basis.

**Acknowledgements**

With 19 employees the funding has to come from somewhere, so we do welcome project sponsorship, research grants, contributions that facilitate our educational programs, scholarships for co-op interns and graduate students, and comparable project-oriented funding from manufacturers. The benefit for the end-user is a principle called academic freedom, in this case,

- The freedom of a professor or student to speak out relative to the pros and cons of any equipment brought to them to benchmark.
- The freedom to design the research project without outside meddling from the manufacturer.

Fortunately, our budget is lean and cost effective as you would expect for a non-profit research institute. As long as we are not desperate for money we can avoid the temptation to accept payment for reprinting corporate PR hype. So the funding is used for practical research. We do not accept (nor believe) and certainly do not regurgitate corporate PR. For example, how many manufacturer's PR photos of their products have you seen in our reports or on our web sites?

Besides, it does not take any money to see which printers and RIPs function as advertised and which don't. We saw one hyped printer grind to a halt, malfunction, or otherwise publicly display its incapacibilities at several trade shows in a row. At each of those same trade shows another brand had over 30 of their printers in booths in virtually every hall, each one producing museum quality exhibits. Not our fault when we report what we see over and over and over again. One of our readers wrote us recently, "Nicholas, last month you recom-

mended the ..... as one of several possible printers for our needs; we bought this. It was the best capital expenditure we have made in the last several years. Just wanted to tell you how much we appreciate your evaluations....”

FLAAR is a non-profit educational and research organization dedicated for over 36 years to professional photography in the arts, tropical flora and fauna, architectural history, and landscape panorama photography.

Our digital imaging phase is a result of substantial funding in 1996 from the Japanese Ministry of Public Education for a study of scanning and digital image storage options. This grant was via Japan's National Museum of Ethnology, Osaka, Japan. That same year FLAAR also received a grant of \$100,000 from an American foundation to do a feasibility study of digital imaging in general and the scanning of photographic archives in particular.

The FLAAR web sites began initially as the report on the results of these studies of scanners. Once we had the digital images we began to experiment with digital printers. People began to comment that our reports were unique and very helpful. So by 1999 we had entire sections on large format printers.

FLAAR has existed since 1969, long before inkjet printers existed. Indeed we were writing about digital imaging before HP even had a color inkjet system available. In 2000 FLAAR received an educational grant from Hewlett-Packard large format division, Barcelona, Spain, for training, for equipment, and to improve the design and navigation on the main web sites of the FLAAR Network. This grant ran its natural course, and like all grants, reached its finishing point, in this case late 2005.

In some cases the sponsorship process begins when we hear end-users talking about a product they have found to be better than other brands. We keep our ears open, and when we spot an especially good product, this is the company we seek sponsorship from. It would not be wise of us to seek sponsorship from a company with a sub-standard or otherwise potentially defective printer. So we usually know which printers are considered by end-users to be among the better brands before we seek sponsorship. After all, out of the by now one million readers, we have heard plenty about every single printer out there.

We thank MacDermid ColorSpan (now part of HP), Hewlett-Packard, Parrot Digigraphic, Color DNA, Canon, Gandinnovations, and other companies for providing funding for technology training for the FLAAR staff and our colleagues at Bowling Green State University in past years and for funds to allow us to attend all major international trade shows, which are ideal locations for us to gather information. We thank Caldera, EskoArtwork, EFI Rastek, EFI and VUTEK, OTF (Obeikan), Drytac, DigiFab, Barbieri electronic, Seiko II, Parrot Digigraphic, AT Inks, Sepiax inks, Dilli, Grapo, and WP Digital for providing funds so that we can make more of our publications free to end-users. During 2000-2001 we had grants to cover all the costs of our publications, and all FLAAR Reports were free in those early years. As that early grant naturally expired after a few years, we had to begin charging for some of our reports to cover costs. Now (in 2010), we are seeking corporate sponsorship so we can gradually make another 20% of our publications free to our readers.

Since 2006 we do a major part of our evaluations at a factory and headquarters demo room. Since the university does not fund any of these trips, it is traditional for the manufacturer to fund a research sponsorship. In the US this is how most university projects are initiated for decades now, and it is increasing. In fact there is a university in Austria that is not an “edu” but is a “GmbH”, funded by the chamber of commerce of that part of Austria. In other words, a university

as an educational institution, but functioning in the real world as an actual business. This is a sensible model, especially when FLAAR staff need to be on the road over a quarter of a million miles per year (roughly over 400,000 km per year total for the staff). Obviously this travel is hosted since unless money falls from heaven there most realistic way to obtain funding to get to the demo rooms for training is direct from the source.

It has been helpful when companies make it possible for us to fly to their headquarters so we can inspect their manufacturing facilities, demo rooms, and especially when the companies make their research, engineering and ink chemistry staff available for discussions. When I received my education at Harvard I was taught to have a desire to learn new things. This has guided my entire life and is what led me into wide-format digital imaging technology: it is constantly getting better and there is a lot to learn every month. Thus I actively seek access to improving my understanding of wide format printer technology so that we can better provide information to the approximately quarter-million+ readers of our solvent and UV printer web site ([www.large-format-printers.org](http://www.large-format-printers.org)) and the over half a million who read either our wide-format-printers.org site or our roughly half million combined who read our digital-photography.org and [www.FineArtGicleePrinters.org](http://www.FineArtGicleePrinters.org) sites.

Barbieri electronic (color management), Caldera (RIP), ColorSpan, DEC, Durst, EFI, EskoArtwork, Gerber, Grapo, IP&I, Mimaki USA, Mutoh, Obeikan, Dilli, Drytac, GCC, NUR, Oco, Shiraz (RIP), Sky AirShip, Sun, Teckwin, VUTEK, WP Digital, Xerox, Yuhan-Kimberly, Zund have each brought FLAAR staff to their headquarters and printer factories. AT Inks, Bordeaux, InkWin, Sepiax and Sunflower ink have brought us to inspect their ink manufacturing facilities and demo rooms. Notice that we interact with a wide range of companies: it is more helpful to our readers when we interact with many different companies rather than just one.

We have visited the world headquarters and demo rooms of HP in Barcelona and received informative and helpful technology briefings from HP about every two years. We are under NDA as to the subjects discussed but it is important that we be open where we have visited. Mimaki Europe has had FLAAR as their guest in Europe to introduce their flatbed UV printer, as have other UV-curable manufacturers, again, under NDA as to the details since often we are present at meetings where unreleased products are discussed. Xaar has hosted an informative visit to their world headquarters in the UK. You don't get this level of access from a trade magazine writer, and I can assure you, we are provided much more detailed information and documentation in our visits than would be provided to a magazine author or editor. Companies have learned that it's a lot better to let us know up front and in advance the issues and glitches with their printers, since they now know we will find out sooner or later on our own. They actually tell us they realize we will find out on our own anyway.

Contributions, grant, sponsorships, and project funds from these companies are also used to improve the design and appearance of the web sites of the FLAAR Information Network. We thank Canon, ColorSpan, HP, ITNH, and Mimaki for providing wide format printers, inks, and media to the universities where FLAAR does research on wide format digital imaging. We thank Epson America for providing an Epson 7500 printer many years ago, and Parrot Digigraphic for providing access to their digital equipment, also for providing three different models of Epson inkjet printers to our facilities on loan at BGSU (5500, 7600, 7800). We thank Mimaki USA for providing a JV4 and then a Mimaki TX-1600s textile printer and Improved Technologies (ITNH) providing their Ixia model of the Iris 3047 giclee printer.

We thank 3P Inkjet Textiles and HP for providing inkjet textiles so we could learn about the different results on the various textiles. IJ Technologies, 3P Inkjet Textiles, ColorSpan, Encad, HP, Nan Ya Pepa,

Oracal, Tara and other companies have provided inkjet media so we can try it out and see how it works (or not as the case may be; several inkjet media failed miserably, one from Taiwan, the other evidently from Germany!). We thank Aurelon, Canon, ColorGate, ColorSpan, ErgoSoft, HP, PerfectProof, PosterJet, Onyx, Ilford, CSE ColorBurst, ScanvecAmiable, Wasatch and many other RIP companies for providing their hardware and software RIPs.

We thank Dell Computers for providing awesome workstations for testing RIP software and content creation with Adobe Photoshop and other programs. We also appreciate the substantial amount of software provided by Adobe. As with other product loaned or provided courtesy of ProVar LLC (especially the 23" monitors which makes it so much easier to work on multiple documents side by side).

We thank Betterlight, Calumet Photographic, Global Graphics, Westcott, Global Imaging Inc. Phase One, and Bogen Imaging for helping to equip our archaeological photo studios at the university and its archaeology museum in Guatemala. Heidelberg, Scitex, CreoScitex (now Kodak) and Cruse, both in Germany, have kindly provided scanners for our staff to evaluate.

We really liked some of the results whereas some of the other products were a bit disappointing. Providing samples does not influence the evaluations because the evaluators are students, professors, and staff of Bowling Green State University. These personnel are not hired by any inkjet printer company; they were universities employees (as was also true for Nicholas Hellmuth). The testing person for the HP ColorPro (desktop printer) said he frankly preferred his Epson printer. When we saw the rest results we did not include this Hewlett-Packard ColorPro printer on our list of recommended printers, but we love our HP DesignJet 5000ps so much we now have two of them, one at each university.

Sometimes we hear horror stories about a printer. The only way we can tell whether this is the fault of the printer design, or lack of training of the operator, is to have the printer ourselves in-house. Of course some printer manufacturers don't understand the reasons we need to have each make and model; they are used to loaning their demo units for a week or so. That is obviously inadequate for a serious review.

Some of the media provided to us failed miserably. Three printers failed to meet common sense usability and printability standards as well (HP 1055, one older desktop model (HP Color Pro GA), and one Epson). Yet we know other users who had better results; maybe ours came down the assembly line on a Monday or Friday afternoon, when workers were not attentive. One costly color management software package was judged "incapable" by two reviewers (one from the university; second was an outside user who had made the mistake of buying this package).

So it's obvious that providing products or even a grant is no shield from having your products fail a FLAAR evaluation. The reason is clear: the end user is our judge. The entire FLAAR service program is to assist the people who need to use digital imaging hardware and software. If a product functions we find out and promulgate the good news. If a product is a failure, or more likely, needs some improvement in the next generation, we let people know. If a product is hyped by what an informed user would recognize as potentially false and misleading nonsense, then we point out the pathetic discrepancies very clearly.

This is what you should expect from an institute which is headed by a professor.

Actually, most of our reviews are based on comments by end users. We use their tips to check out pros and cons of virtually every product we discuss. You can't fool a print shop owner whose printer simply fails to function as advertised. And equally, a sign shop owner who earns a million dollars a year from a single printer brand makes an impact on us as well. We have multiple owners of ColorSpan printers tell us that this printer is their real money earner for example. We know other print shops where their primary income is from Encad printers. Kinkos has settled on the HP 5000 as its main money maker production machine, and so on.

Yet we have documentation of several print shop companies whose business was ruined by specific brands that failed repeatedly. It is noteworthy that it is always the same brand or printer at both locations: one due to banding and printheads then simply no longer printing one color; the other brand due to pokiness of the printer simply not being competitively fast enough. Same with RIPs, we have consistent statements of people using one RIP, and only realizing how weak it was when they tried another brand which they found substantially better. Thus we note that companies which experiment with more than one brand of product tend to realize more quickly which brand is best. This is where FLAAR is in an ideal situation: we have nine RIPs and 25 printers. Hence it is logical that we have figured out which are best for our situation.

Grant funding, sponsorship, demonstration equipment, and training are supplied from all sides of the spectrum of printer equipment and software engineering companies. Thus, there is no incentive to favor one faction over another. We receive support from three manufacturers of thermal printheads (Canon, ColorSpan and HP) and also have multiple printers from three manufacturers of piezo printers (Epson, Seiko, Mutoh, and Mimaki). This is because piezo has definite advantage for some applications; thermal printheads have advantages in different applications. Our reviews have universal appeal precisely because we feature all competing printhead technologies. Every printer, RIPs, inks, or media we have reviewed have good points in addition to weaknesses. Both X-Rite and competitor GretagMacbeth provided spectrophotometers. Again, when all sides assist this program there is no incentive to favor one by trashing the other. Printer manufacturer ad campaigns are their own worst enemy. If a printer did not make false and misleading claims, then we would have nothing to fill our reviews with refuting the utter nonsense that is foisted on the buying public.

It is not our fault if some printers are more user friendly, print on more media than other brands. It is not our fault that the competing printers are ink guzzlers, are slow beyond belief, and tend to band or drop out colors all together. We don't need to be paid by the printer companies whose products work so nicely in both our universities on a daily basis. The printers which failed did so in front of our own eyes and in the print shops of people we check with. And actually we do try to find some redeeming feature in the slow, ink gulping brands: they do have a better dithering pattern; they can take thick media that absolutely won't feed through an HP. So we do work hard at finding the beneficial features even of printers are otherwise get the most critique from our readers. Over one million people will read the FLAAR Information Network in the next 12 months; 480,000 people will be exposed to our reports on wide format printers from combined total of our three sites on these themes. You can be assured that we hear plenty of comments from our readers about which printers function, and which printers fail to achieve what their advertising hype so loudly claims.

An evaluation is a professional service, and at FLAAR is based on more than 11 years of experience. An evaluation of a printer, an ink,



a software, laminator, cutter or whatever part of the digital printing workflow is intended to provide feedback to all sides. The manufacturers appreciate learning from FLAAR what features of their printers need improvement. In probably half the manufacturers FLAAR has dealt with, people inside the company did not, themselves, want to tell their boss that their pet printer was a dog. So printer, software, and component manufacturers have learned that investing in a FLAAR evaluation of their product provides them with useful return on investment. Of course if a printer manufacturer wants only a slick Success Story, or what we call a "suck up review" that simply panders to the manufacturer, obviously FLAAR is not a good place to dare to ask for such a review. In several instances it was FLAAR Reports that allowed a company to either improve their printer, or drop it and start from scratch and design a new and better one.

And naturally end-users like the opportunity to learn about various printers from a single source that covers the entire range from UV through latex through all flavors of solvent.

We have also learned that distributors often prefer to accept for distribution a printer or other product on which a FLAAR Report already exists.

We turn down offers of funding every year. These offers come from PO Box enterprises or products with no clearly visible point of manufacture. Usually the company making the offer presumes they can buy advertising space just by paying money. But that is not what our readers want, so we politely do not accept such offers of money.

Contributions, grants, sponsorships, and funding for surveys, studies and research is, however, open to a company who has an accepted standing in the industry. It is helpful if the company has a visible presence at leading trade shows and can provide references from both end users and from within the industry. Where possible we prefer to visit the company in person or at least check them out at a trade show. Obviously the product needs to have a proven track record too. Competing companies are equally encouraged to support the FLAAR system. We feel that readers deserve to have access to competing information. Competition is the cornerstone of American individualism and technological advancement.

FLAAR also covers its costs of maintaining the immense system of 8 web sites in three languages and its facilities in part by serving as a consultant such as assisting inkjet manufacturers learn more about the pros and cons of their own printers as well as how to improve their next generation of printers. It is especially useful to all concerned when manufacturers learn of trends (what applications are popular and for what reasons). For example, manufacturers need to know whether to continue designing software for Mac users, or concentrate software for PC users. So the survey form that you fill out is helpful to gather statistics. You benefit from this in two ways: first, you get the FLAAR reports in exchange for your survey form. Second, your comments bring (hopefully) change and improvement in the next generation of printers. When we do survey statistics, then the names, addresses, and telephone numbers are removed completely. A survey wants only aggregate numbers, not individuals. However, if you ask about a specific brand of printer, and do not opt out, we forward your request to a pertinent sponsor so you can obtain follow-up from that brand, since we ourselves do not have enough personnel to respond to each reader by telephone. But we do not provide your personal information to outsiders and our survey form has an opt out check-off box which we honor.

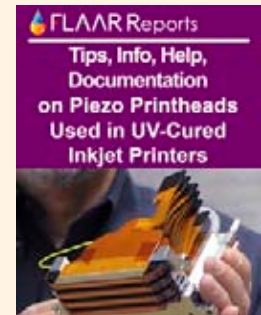
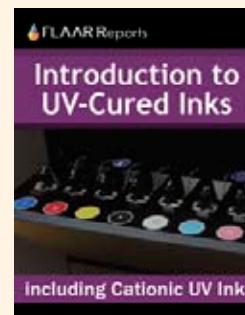
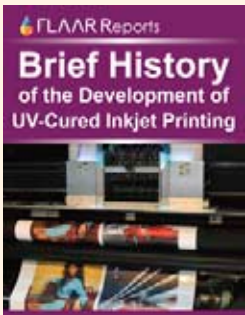
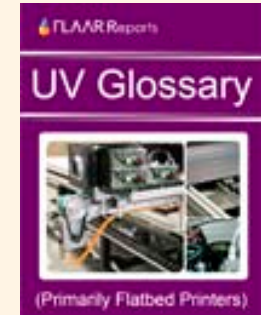
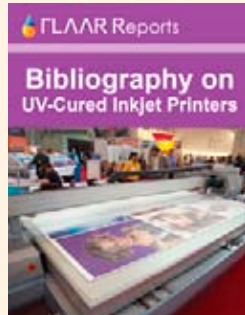
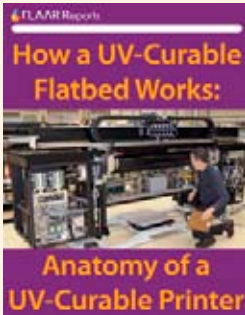
FLAAR also serves as consultants to Fortune 500 companies as well as smaller companies and individuals who seek help on which printers to consider when they need digital imaging hardware and software.

A modest portion of our income comes from our readers who purchase the FLAAR series. All income helps continue our tradition of independent evaluations and reviews of inkjet printers, RIPs, media, and inks.

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Comments on UV Inkjet Printers at Major Trade Shows 2009-2010



UV Printers Manufactured in China, Korea and Taiwan

