The State of the Art

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This article was originally published in October, 2004. An update, written in April, 2006, outlines some significant technology changes.

In 1989, my partner, Graham Nash, purchased an IRIS 3047 graphics printer. We had been searching for a way to create quality output from digital files for several years. We investigated many methods and experienced many disappointments. The IRIS was a standout compared to anything else available at the time. It excelled at resolution, color fidelity and, perhaps most exciting to us, its ability to print on various substrates. One important factor in the original decision to pursue digital was that many of the more-interesting photographic papers were disappearing. It seemed that every time we went to our local photographic supply store, we'd hear, "You know, we've only got four boxes of XYZ paper left. It's been discontinued." We ended up with a refrigerator full of discontinued paper and film.

The standard papers that the IRIS printed on were appropriate for proofing purposes, but left a lot to be desired for fine-art photography output. We wanted to try thick, watercolor paper. From the factory, the IRIS 3047 would not easily accept the heavier papers. We were so sure of the printer's capabilities that we voided the warranty on our \$126,000 IRIS by hacksawing off the nozzles (I can still feel the adrenaline!) and repositioning them so that the printer would accept thicker substrates.

Nash was insistent that we work out major bugs prior to offering our printing services to the public. We used the year and a half prior to our public opening to perfect our color and our black and white, to experiment with a variety of papers, and to print our first show, which included 35 large format (30-by-40 inches) black-and-white images scanned from 35mm contact sheets. The images were shown in New York, Los Angeles, and Tokyo. The public's reaction to the show convinced us of two things: that the digital format was here to stay and that we still had a lot of convincing to do. It wasn't enough to create an aesthetically pleasing print. We realized that we had many issues to confront before the process would be widely accepted. We opened our doors to the public in July of 1991 and by February of 1992, after dealing with museums, galleries and the general public, we had compiled a Nash Editions mission statement and a list of areas of concern:

Mission statement

To provide digital services and digital prints to the fine art community with an emphasis on photography. Our focus will be art whose original expression will be digital, as opposed to reproductions of existing artwork.

Areas of concern

- 1. Resistance from competing, older technologies
- 2. High cost of the tools
- 3. Ease of reproduction
- 4. Permanence and associated issues
- 5. Aesthetic and technophobia

We confronted most of these issues on a daily basis. I well remember displaying some digital prints at a gathering of photo dealers in Los Angeles in 1992 and being accosted—and literally spit on—by an elderly photographer who accused Nash Editions of using computers to "destroy photography." Thankfully, much has changed.



The purpose of this paper is to examine how digital tools and digital output are being accepted in the fine-art world, and to look at what has changed and what is in the process of changing. In accomplishing this purpose, I'd like to draw a distinction between work that uses digital tools to produce traditional forms of art and work that uses the digital format as a medium to create new types of art. The focus of this white paper is on the former.

I plan to use the areas of concern, as outlined in 1992, to discuss the progress that digital has made in the fine-art arena.

With the emergence of digital technology in the late 1980s, the art world was confronted with new tools and processes that, like photography a century and a half earlier, created great controversy. At that time, painters, as well as lithographers and printers, were concerned about this new technology that threatened to supplant their livelihood and threaten their artistic sensibilities. In 1862, a group of French artists founded the Société des Aquafortistes to defend the interests of the artist against the incursion of photography. Well-known painters, such as Ingres, Flandrin, and Henriquel-Dupont, signed a petition against the assimilation of photography to art (Lemagny, Jean-Claude, *A History of Photography*, New York, NY: Cambridge University Press, 1987). The debate continued well into the 20th Century. Many of the same misconceptions and fears expressed by the 19th Century art world toward photography are today being expressed toward digital. It's ironic that photography, itself born out of controversy and revolution, has provided some of the digital revolution's staunchest critics.

Resistance from competing, older technologies

The early 1990s marked a period of conflict between digital printmaking and existing fine-art printing technologies. The resistance was organized and very public. It wasn't hard to understand the threat that on-demand, high-quality color presented to the traditional fine-art printmaking world. Prior to the advent of digital, high-quality color output was extremely expensive. The perprint cost was not as high as digital but, to benefit, one had to print many hundreds or thousands. The upfront costs of traditional fine-art printing precluded many artists from printing small editions. Digital was the answer. For a relatively small initial fee, the artist could print images as they sold. It was no longer necessary to tie up large amounts of capital in print inventory.

The traditional printmakers did have one great argument against digital output: the fugitive nature of digital prints. There were numerous articles, organized mailings, and handouts at art shows condemning digital output. Although this resistance did prevent some fine artists from experimenting, the impact of this campaign was mainly felt in the decorative art market. By the mid 1990s, when more permanent ink sets became available, some of these same critics purchased IRIS printers and began offering fine-art digital printing to their clients. They appreciated the advantages that digital offered and were eager to join in. In 1991, fine-art digital printmaking was less than a one-million-dollars-a-year industry.

In 2001, analysts predicted "...a 27-percent per year growth over the next four years, for the digital art reproduction business. Total retail sales of fine art output is expected to top \$1.4 billion by the end of 2005. Driven by advanced media and more durable, pigmented inks, this rapidly growing market opportunity presents an outstanding climate for digital service providers to expand both services and profits." (White, Paul R., *Fine Art Media and Printing*, December 2001). While most traditional technologies slowly embraced digital, photography continued to question digital's role in the future of photographic printmaking. Solving the permanence problem was not enough. There were still economic, aesthetic, and ethical questions to debate.

High cost of the tools

Early on, digital tools were criticized because of their expense. Digital art was "elitist" because the tools were out of the economic reach of most artists. Our first IRIS printer cost \$126,000 in 1989. Today, the Epson Stylus Pro 9600s that have replaced our IRIS printers cost \$4,995. In 1993, a fully configured Apple® Quadra 800 with third-party acceleration cost \$10,000. Today, a CPU with 30 times the processing speed, 160 times the hard disk storage, and 32 times the memory can be purchased for \$1299.

Scanners and advanced calibration equipment have experienced similar price drops. A high-quality, high-end home digital darkroom can now be put together for less than \$5000. (Ironically, the digital revolution has created a glut of used darkroom equipment. It's now possible to build an outrageous, traditional darkroom for a couple of thousand dollars.) The control this gives the photographer, especially in color images, is unprecedented. The advent of inexpensive, relatively high-resolution digital cameras has virtually eliminated the expense of film and processing. I personally haven't shot a frame of film in over five years. After my first month with a digital camera, I realized how much the cost of film and processing had interfered with my taking pictures. Digital has freed the eye from the economic constraints of film technology. (Yeah, I know that more pictures doesn't mean better pictures.) In a little over ten years, the price of admission to the digital revolution has dropped by more than 1000%. The technology is now priced within the reach of just about everyone.

Ease of reproduction

Unauthorized use of an image has been a concern of artists ever since the first methods of duplication were invented. Traditionalists always point to the advantages of a physical plate that can sustain only a certain number of prints before wear and tear renders it unusable. This, and the fact that you can physically destroy the original, created a false sense of security and preciousness regarding many limited-edition prints. The glut of unauthorized lithographs from artists like Picasso, Dali, and others illustrates that unscrupulous individuals can always find a way to circumvent the rules of the game.

These concerns have been amplified with the onset of the digital format because of a basic lack of knowledge regarding resolution and pixel size. Early on, clients were reluctant to send digital files to galleries, fearing that the files could be used to create unauthorized fine-art prints. But these same clients had no such fears when sending 35mm slides of their work. They didn't understand that the slide held much more usable information than a tiny JPEG. The perception was that with a click of a button, the image could be transferred, copied, or printed. The information in the slide seemed less accessible.

I remember my friend and client Pedro Meyer relating the story of the misappropriation of one of his images by a political campaign somewhere in Latin America. His image was used on billboards to promote a candidate and a cause that was in conflict with Pedro's own views. Many assumed that because Pedro was a digital artist, this was a case where a digital image easily fell into the wrong hands, and they pointed to it as yet another reason that digital was dangerous. To make a long story short, Pedro did get to the bottom of the misappropriation, and it turned out that the image had been stolen off a gallery wall by photographing it with a film camera. Ultimately, just about any technology is susceptible to misuse. The best defense is to work with reputable businesses and individuals.

Today, we are all more familiar with digital images and files. We better understand their limitations as well as their advantages. As a result, many galleries are using digital technology to safely and effectively market art. Out of the dozen or so gallery owners I questioned, all but one acknowledged the ease and immediacy of sending JPEG images of an artist's work to potential clients. Most owners characterized the digital format as revolutionary. Artists also have a new comfort level with digital and are integrating digital tools and output into their work on an unprecedented level. The ease of reproduction is now generally seen as an advantage and not a flaw.

Permanence and associated issues

Permanence is perhaps the easiest bias to overcome. Art is not about permanence; art is about aesthetics and vision. A digital print must not be judged on permanence alone. When viewing art, few people include the permanence of the image into their appreciation. Artists rarely pause to consider permanence when inspiration strikes. In 1994, David Hockney commented in a catalog of inkjet prints created at Nash Editions, "…colour is fugitive in life, like it is in pictures, indeed colour is the most fugitive element in all pictures, a great deal more than line. Dimming the light alters color. It does not alter line."

In the beginning, all purely digital printing techniques produced fugitive prints. My partner and I set a print outside in bright sunlight for several hours with a newspaper covering half of it. When we examined the print two hours later, there was distinct fading in the half that was exposed. We had been aware that the inks we were experimenting with were fugitive, but we had no idea that they were that light-sensitive.

In 1993, we purchased a UV fade chamber and began experimenting with different paper-ink combinations and UV postcoatings. By this time, many other printmakers had adopted the IRIS graphics printer, which increased pressure on IRIS and third-party ink manufacturers to develop more permanent alternatives. Henry Wilhelm of Wilhelm Imaging Research began to provide objective data to both the end-user and the manufacturers.

In 1994, Lyson introduced their Fine Art ink set and, over the next few years, several manufacturers, including IRIS, introduced more permanent ink sets of their own. Creating greater ink permanence was a step forward, but unfortunately many of the new ink sets were severely limited in their color gamut. Bright reds and saturated blues were missing. Printmakers were forced to strike a balance between color gamut and permanence. In many cases, they were compelled to choose less-permanent inks to provide better overall color.

By 2000, these problems had largely been solved, and color IRIS prints had eclipsed the "Holy Grail" of photographic output, Fuji Crystal Archive prints. On several papers, the IRIS prints exhibited a display life of 75 years, well above the 60-year display life of Fuji Crystal Archive. Although not as photographic, several other large-format graphic printers, such as the Encad, HP, Roland, and Colorspan, had also developed more permanent solutions, some with display life in excess of 200 years. (Henry Wilhelm, *With New Pigmented Inks, Dye-Based Inks, and Inkjet Papers, An Unprecedented New Era Has Begun in Color Photography*, January 2000).

Just as the permanence problems with the IRIS seemed to be solved, a new generation of highend printers hit the market. These printers from Epson were capable of producing extraordinary, high-resolution images. Although they showed a good color gamut, the original dye-based ink sets were disappointing in terms of permanence. Epson quickly focused on the permanence problem and, within three years, had developed a wide-gamut pigmented ink set that had a display life of up to 85 years. (Henry Wilhelm, *Epson Stylus Pro 9600 – Print Permanence Ratings*, November 2003 www.wilhelm-research.com/pdf/WIR_Ep9600_2003_07_26.pdf).

Overcoming the permanence issue removed an important obstacle to the acceptance of digital output. This acceptance is best demonstrated by a review in the *New York Times* on March 25, 2001. (Vicki Goldberg, "Making Each Photographed Detail More Real Than Reality," *New York Times*, March 25, 2001). The Times' most respected art critic stated clearly that permanence was no longer an acceptable argument against fine-art digital prints. While this development was significant for those curators involved in the care of fine art, it did little to assuage the die-hard digital opponents.

Aesthetics and technophobia

Aesthetics and technophobia are difficult subjects to argue in any arena. There is little logic attached to them. It's all perception. Both aesthetics and technophobia have provided significant resistance to the acceptance of digital tools and digital prints.

The aesthetic arguments against digital run the gamut from "There's a lack of tactile interaction" to "The hand of the artist is absent" to "There's a missing organic element to the process" to "It's too much about the technology; the computer does all the work." These arguments may have had a scent of truth in digital's infancy when there was an exaggerated emphasis on the tools. Much of the early digital art was more about what the tools could do, as opposed to what the artist could do with the tools. There was a legitimate concern over who or what was creating the art.

Another area of concern for traditionalists is the concept of truth and photography. Some critics feel that photography as an art form depends upon the veracity of the "decisive moment." Any attempt to alter what the lens sees is viewed as sacrilegious. The digital darkroom allows for unprecedented control so that even the image itself now can be altered and manipulated to suit the vision of the artist at the controls.

What many traditionalists refuse to acknowledge is that manipulation has been an integral part of the process since the beginning of photography. Manipulation has been used to extend the limits of the technology. Prior to the development of panchromatic films, skies were difficult to record when shooting landscapes. As a result, many photographers resorted to completely replacing a sky with one from another shot that read better. Ansel Adams produced close to 1000 copies of his hallmark image *Moonrise Over Hernandez*. He was constantly revisiting the "truth" of that image, and there are many significant variations that bear this point out. Fine-art photography has always been about what's behind the camera, not what's in front of it. The very act of framing an image is manipulation. How a photographer chooses to utilize the tools is an artistic choice, not an ethical one.

Originally, digital output was meant to emulate traditional photographic output. In 1992, I was approached by a curator from a prestigious photographic museum who proposed that Nash Editions produce a show composed of different types of traditional output and corresponding IRIS prints that attempted to emulate it. I explained, as diplomatically as possible, that my company wasn't trying to create images that replaced traditional photographic images. As a matter of fact, we loved traditional prints. Silver, platinum, palladium, gum bichromate, Woodburytypes, Dauguerreotypes—all of them had a unique beauty. We just wanted to extend the range of possibilities. It was obvious to us from the beginning that the IRIS prints had their own distinct look and feel. We printed on everything from watercolor paper to rice paper, from galvanized steel to wood veneer. Images were no longer slaves to a handful of paper choices. Images could now be enhanced with surface and texture. They no longer sat on the surface but rather became an integral part of the print object.

This dramatic shift in print aesthetics has been difficult for the traditional photography world to assimilate. Nothing is harder to overcome than the way we have learned to see. If the standard is having to look and feel like a traditionally produced photograph, then anything that doesn't meet that criteria is perceived as inferior. Many critics of digital prints simply can't see beyond or around what they've set as the standard. One way to minimize this bias is to remove as many of the visual queues that reveal the digital origins of the image. At clients' openings in the early days, the topic of conversation was often about how the prints were created and not about the art. For that reason, I always recommended that clients matte their prints to present them in a traditional manner and perhaps avoid the emphasis on process.

Technophobia has played an important role in resistance to the digital format. Much of this resistance stems from the individual's fear of change, not technology. When you have spent 30 to 40 years mastering your craft, it's not hard to imagine that radical change of the model would be upsetting.

The digital format's incursion into photography was not like the introduction of a new color film. Rather, it challenged the very roots of techniques and processes that had remained relatively unchanged for decades. The tools changed dramatically, and for many people, this change posed an insurmountable problem. The learning curve can be steep, and many found that the traditional tools were all they needed to pursue their artistic vision, and they opted not to adopt the new technology. Others have adopted a wait-and-see attitude. The technology is getting easier to deal with. New software tools enable novice users to perform advanced functions with ease, and modern operating systems shield the end-user from the complexities that were prevalent just a few years ago. As the tools become more intuitive, many of the fence-sitters will become converts.

Today digital tools are omnipresent. The Internet, e-mail, and digital cameras have made us all more comfortable with the idea that the computer is just another tool. Word processors have replaced typewriters, and film cameras are being supplanted by digital. Most technological advancements are initially hijacked by artists who are looking for new ways of expressing themselves with greater acuity. Whatever tools artists choose ultimately must be accepted if the art they help render is compelling. There is a glut of inferior digital art and output, but it's the fault of the operators, not the tools. I often hear the disparaging remark that "any idiot with a digital camera, a copy of Adobe* Photoshop*, and a printer can be a photographer." All one needs to do to expose the shallowness of this statement is to replace the words "digital camera, a copy of Photoshop, and a printer" with the words "camera, a roll of film, and a darkroom." Great tools are never a replacement for a keen vision.

In 1990, digital work was found only in a handful of museums and galleries. Today digital prints are present in the collections of most major museums and are exhibited in hundreds of galleries. In 2004, the venerable Getty Museum made their first major digital print acquisitions when they acquired thirteen 30-inch by 30-inch Epson prints on watercolor paper by Los Angeles fine-art photographer Robert Weingarten (www.weingartenphotography.com/).



© Robert Weingarten Sample images of Robert Weingarten's Epson prints on watercolor paper

Digital tools are here to stay. The perception of the art that they help to produce is changing. It took photography a good 70 years to be regarded as "art." In that context, digital has come a long way in 15 years.

Update: April 1, 2006

In the year and a half since the original article was written, there have been significant changes not only with the technology but also with the emergence of an unprecedented acceptance of digitally expressed art. More permanent, wider-gamut inks, less expensive, more productive printers and computers, and a vast selection of new substrates has encouraged an unprecedented number of artists and photographers to enter the digital realm.

Advances in technology

The price for a capable digital system continues to drop. (Prices based on identical items.)

1Gb memory module	2004	\$ 266.00	
250Gb hard drive	2004	\$ 369.99	
iMac G5 Computer, 1.8GHz	2004	\$1899.99	
1Gb memory module	2006	\$ 95.00	
250Gb hard drive	2006	\$ 114.99	
iMac G5 Computer, 2.1GHz	2006	\$1499.99	
Cost of equipment 2004		\$2535.98	
Cost of equipment 2006		\$ 1739.98	A 31% drop in two years

Intel Apples–Apple's decision in late 2005 to switch processors from the Power PC chip to an Intel chip began to make an impact in early 2006. Although the new computers are currently hampered by the lack of optimized Universal Binary software, they do promise to significantly improve every aspect of digital imaging.

Epson R2400, 4800, 7800, and 9800–In May 2005, Epson announced the release of new printers and a new ink technology. The K3 ink set features a three-level black ink system–black, light black and light-light black. This system allows for superior wide-gamut color printing and, in conjunction with Epson proprietary screening, reduces the effects of bronzing and metamerism, while creating prints with greater longevity and scratch resistance. The built in Advanced B&W mode is an impressive addition to the driver, which allows for superior neutral and toned black-and-white prints.

Canon PIXMA Pro9500–In February 2006, Canon announced the PIXMA Pro9500 an A3+ professional quality inkjet printer. It features a ten-nozzle print head and a newly formulated pigmented "Lucia" ink set that contains both a matte black and a photo black. These wide-gamut inks deliver high quality, durable color as well as enhanced monochrome output. This printer represents Canon's first serious attempt to challenge Epson's domination of the professional market.

HP Photosmart Pro B9180–February 2006, also saw HP's new entry into the professional market. The B9180 features an eight-nozzle print head that uses pigment-based HP Vivera inks. With impressive speed and image quality, HP's newest entry offers wide-gamut color and both matte black and photo black ink. An enhanced monochromatic mode allows one to create neutral black-and-white prints on both matte and RC papers. Image permanence is impressive with several papers offering lifetimes of over 200 years.

NEC 2180UX-WG LED/LCD Monitor—This display features a new way to provide backlight, using light emitting diodes, or LEDs, to evenly light the screen. This technology allows for unprecedented color precision. Although its entry price of \$6500.00 limits this monitor to the extreme high-end market, it is the harbinger of less expensive monitors to come. With this greater precision comes the promise of more accurate soft proofing and less paper and ink usage.

Calibration and Profiling Hardware and Software—The last 18 months have seen the release of inexpensive entry-level hardware and software packages:

- X-Rite/Monaco Systems introduced the Pulse ColorElite System that provides a fully functional color management and calibration path for less than \$1400.00.
- GretagMacbeth announced the "Huey," an \$89.00 monitor calibration device. For the first time, hardware-based monitor calibration is available for under \$100.00.

Substrates–New substrates continue to be released. Digital printmakers now have hundreds of high-quality RC and fine art matte papers available to them. Manufacturers are starting to acknowledge that the biggest issue with inkjet papers is the fragile nature of the inkjet receptive post coatings, and have begun to investigate methods to "toughen" the coated surfaces of the paper to prevent, or at least reduce, surface scuffing.

A paper that successfully emulates an air-dried black-and-white silver print continues to elude paper manufacturers.

Traditional Processes–In 2005, several major photo manufacturers announced changes that greatly affected the traditional photographic community.

September 2004–Ilford went into receivership as sales of black-and-white paper and chemistry drop almost 30% in one year. A management buyout in the UK creates Ilford Photo, which will continue to manufacture dry chemistry products as well as a limited line of black-and-white papers.

May 2005-Hit hard by the digital revolution, AgfaPhoto filed for bankruptcy.

June 2005–Eastman Kodak announced they were discontinuing the manufacturing of black-and-white photo paper after posting a first-quarter loss of \$142 million.

January 2006–Nikon announces they are discontinuing most film cameras as they realize more than 95% of their overall camera sales in the digital arena.

Digitally produced art in the fine art arena

Andreas Gursky, Thomas Ruff, Lorreta Lux, Thomas Struth, Michel Rovner, Gerhard Richter, and Richard Prince are only a few of the high-profile, high-priced artists that made a significant contribution to new acquisitions by major American museums in the past 18 months. Topping that list is Richard Prince, who set a record in late 2005 when his digitally-produced untitled cowboy photo sold at a Christie's auction for \$1,248,000, at that point the highest price ever paid for a photographic image! (http://www.artcritical.com/appel/BAPrinceRecord.htm)

On an anecdotal level, Nash Editions represents several clients who have each realized more than \$100,000 in print sales over the past 18 months. Also, in February 2006, Nash Editions completed negotiations with Kim Weston, Edward Weston's grandson, to produce digital editions of 20 hand painted black-and-white photographs. Kim has experimented with digitally-produced prints over the past few years but this project marks his first foray into digital printmaking for fine art commercial use. For a black-and-white traditionalist like Kim to use digital tools is indicative of broader changes taking place in the fine art arena worldwide.

The emphasis on process seems to be receding. Galleries and museums are becoming more comfortable with digitally produced art and their clientele seems to have found a new comfort level as they learn more about these new tools. When a piece of art is discussed on its artistic merits alone instead of the process used to create it, digital tools will have been truly accepted.



R. Mac Holbert

R . Mac Holbert is the co-founder of Nash Editions. Widely regarded as the world's first digital printmaking studio, Nash Editions has established an international reputation for fine-art photographic digital output. Conceived in 1989, and opening its doors in 1991, Nash Editions celebrates its thirteenth anniversary this year.

Prior to Nash Editions, Mr. Holbert worked in the music industry, where he was Tour Manager for such musical groups as Crosby, Stills & Nash; Poco; Peter, Paul & Mary; and Carole King. He has long been active in the environmental movement, helping to produce benefits for the Cousteau Society, Greenpeace, The Algalita Foundation, and others.

Mr. Holbert has printed several seminal, digital fine-art shows that have been exhibited all over the United States including Metamorphoses: Photography in the Electronic Age for the Aperture Foundation in 1994, Nagasaki Journey: The Photographs of Yosuke Yamahata in 1995, Nash Editions at the Butler Museum of American Art in 1996, Digital Frontiers: Photography's Future at Nash Editions for the George Eastman House in 1998, and America In Detail: Photographs by Stephen Wilkes for Epson America in 1991. Most recently, Mr. Holbert has collaborated with photographer Robert Weingarten for a simultaneous exhibition of 6:30a.m. and Another America: Robert Weingarten's Testimonial to the Amish at the Museum of Photographic Arts in San Diego, CA.

http://www.nasheditions.com

