Digital Printouts and Hardcopies – What is (and isn't) a Photographic Print Today?

Martin C. Jürgens

An increasing number of documents, graphics, and photographic images are being generated digitally today. Many of these documents are printed onto paper or other substrates with digital printers, and these prints constitute a major part of our current and future technical, social, and cultural heritage. As such, they have and will continue to be acquired by museums, private collections of art and photography, but also by archives. Conservators, curators, museum registrars, collection mangers, archivists, and related professionals are responsible for the acquisition and conservation, perhaps even the exhibition of digital prints.

Digital printing is being used extensively in organizations that rely on paper documents, such as businesses, governments, public administration, hospitals, advertising agencies, and many other sectors. Digitally printed security documents, journals, office documents, forms, letters, tickets, labels, and perhaps even advertising posters and product packaging will find their way into archives.

In photography, technological changes have been particularly fast and fundamental: Over the past 15 years, many amateur and professional photographers have switched from film-based imaging to digital cameras and printers. The large market of consumer imaging has had a great influence on printing technologies for photographic images.

In art, any type of printing may be found, often as mixed media or experimental application. Museums have been collecting digital artwork and computer graphics for decades now. Especially for prints of photographic images that are not on traditional photographic materials, the initial skepticism of some curators about digital prints has been understandable. Since material aspects usually do not play a role in discriminating one work against another, however, prints are being acquired by museums and collections independent of the technique that was used to create them.

For all of these objects, it is only with an understanding of the materials and processes that we can devise appropriate strategies pertaining to acquisition, handling, storage, exhibition, and conservation treatment. For this, the prints need to be first examined and identified.

Computers, Copiers, and Art

Artists have followed the evolution of digital machines and photocopying devices from the start, but early attempts at connecting the technicalities of the computer world and the world of art received mixed reviews from critics, ranging from simple indifference to outright contempt. Artists were often hindered in using computers: the devices were rare, very expensive, and mostly accessible to governmental technicians, academics, scientists, space travel organizations, and the military. Early computers were also large and immobile and required programmers to manipulate them. Thus, artists needed technical assistants (essentially translators), a fact that necessarily would have impeded a personal and direct approach to their own work.

In the 1970s and 1980s, personal computers were introduced, and with them came software that was increasingly easier to use. The number of artists using computers grew steadily, and a recognizable community was producing what was collectively termed *computer art*. The use of commercially available software also resulted in a shift in the artists' personae: one no longer had to be a mathematician or programmer to create graphics. In addition, newcomers had less fear that the computer would impose control over their creativity, an argument that critics had long used against computer art. Another criticism—that much of the computer art looked alike—was surely a result of the limited number of computers and programs available throughout the 1960s and until the mid-1970s.

The efforts of programmers, technicians, scientists, and (later) animators for television graphics, video games, and animated movies advanced the graphic capabilities of computer hardware and software. At the same time, however, these efforts contributed to the confusion

and criticism often associated with computer art. Today, however, the trend is often to hide the involvement of computer manipulations in a work; this tendency is best exemplified by the field of contemporary photography, in which, following heated debates on digital manipulation in the 1990s, the question is less often addressed today. While many artists are fascinated with the concepts of mathematics and calculation in working with a computer, the machine's capability of producing random events and chaos have been equally compelling. Performance art, video, Internet, film, and conceptual art have all been influenced by computer art.

The late 1970s saw the start of the *copy art* movement, in which photocopiers were used (or perhaps misused) for the creation of artworks that were anything but simple copies. Artists exploited the fact that these machines, designed to make faithful copies of original documents, possessed their own aesthetic, distinct from that of the original source image. Through experimental manipulations, unique prints were being made on devices originally intended to create identical multiples. Although not termed *digital prints* at the time, photocopies and laser prints technically fall under the umbrella term *electrophotography*, which is considered today to be a digital print process.

Copy art tends to be a dirty process—fixing a jammed photocopier exposes you to finely powdered toner dust. The opposite was the case for the various paint software packages introduced in the 1980s, which were thus named because they simulated actual painting: paintbrushes or airbrushes of various sizes could be chosen, colors could be picked, and the creation of a brushstroke could be correlated directly to the movement of an input device, such as a mouse. However, since digital printers of the mid-1980s were not capable of rendering highly saturated color images on paper, images generated in Paintbox (or similar software) were often simply photographed from the screen, a process that resulted in a distinctly technical appearance.

Photographic Imaging

Vastly improved software, such as Adobe Photoshop (introduced in 1991), and new input techniques, such as desktop scanners, helped digital photography and digital imaging surge in the 1990s. Among the visual arts, photography has undergone the greatest technical evolution over the past fifteen years. Most amateur and professional photographers have already switched from film-based applications to digital cameras and printers. Indeed, a new generation of photographers is growing up who will never have loaded film into a camera; the concept of a negative is dated.

Although the initial use of computers in artistic production tended to create its own aesthetics, today's digital systems are often considered tools that have no apparent impact on the end result. However, a more careful look shows this view to be simplistic. Digital imaging techniques such as sharpening and file formats such as JPG often create artifacts within the image that can be detected by the connoisseur. In addition, since digital retouching is carried out frequently, the age-old task of retouching by hand to remove unwanted specks on prints has almost become obsolete. As a result, prints of digital files often possess an almost uncanny technical perfection, untouched by any marks such as those created by manual spotting with a brush.

The developments of image editing software throughout the 1990s along with the increasing sales of ever-improving digital cameras made digital imaging viable and affordable for the consumer and completely changed the dynamics and the players in the photographic industry. Traditional photographic companies began investing in digital printing, and companies that had focused on technology and communications suddenly found themselves in the center of a technological revolution in photography and imaging. Today, many cellular phones contain a digital camera, and the number of images taken is increasing exponentially. The consumer market is the largest in terms of images taken and quantity of cameras and printers sold. Although many of these consumer images are viewed only on monitors, some are also printed out, usually as small 10 x 15 cm prints.

Inkjet printing has captured a large portion of the photographic printing market. Inkjet printers, first developed in the 1940s and 1950s, evolved for practical use alongside

computer technologies from the 1960s onward. In the 1970s two technologies emerged as the most promising: continuous inkjet and piezoelectric drop-on-demand (DOD) inkjet.[1]

The continuous inkjet process, practically first used in a voltage signal recorder invented in 1963, involved the selective electrostatic charging and subsequent deflection of ink droplets in midflight. The droplets hit the paper surface and formed tiny dots. This mechanism is found in all subsequent continuous inkjet printers, among them the famous IRIS Graphics printer. This device was originally developed for creating proofs for the printing industry, but because of its capability of printing in high resolution on a great number of different materials, it was adopted by photographers in the early 1990s. Printing a color image of high quality with inkjet on a fine art, watercolor-type paper was a novelty, and it soon became a profitable business.

Prints made on IRIS printers may be found in many museum collections. It is important to identify them as IRIS prints, since they were made with inks that contain dyes (as opposed to prints from other, more modern inkjet printers that may contain pigments) and are therefore quite sensitive to light, atmospheric humidity, and water. For this reason, special consideration must be given to IRIS prints during transport and exhibition. Among inkjet prints, IRIS prints are quite unique in that dot placement follows a regular pattern that may be either linear or resemble an offset rosette halftone screen.

Large drop-on-demand inkjet printers of the 1970s were able to print only black-and-white images—a capability that, for text applications, was sufficient. Hewlett-Packard launched its ThinkJet printer in 1984, which was innovative in that it used disposable cartridges that contained the printheads, a milestone in the ensuing rapid spread of inkjet printers. The DeskJet printer, introduced in 1987/88, made the desktop printing of office documents reliable and set a standard for single-sheet paper feed mechanisms. New competitors in the market introduced new printers at a rapid pace: every couple of years in the late 1980s and at ever-shorter intervals from the 1990s onward. Printing in color became a major area of research. The jump from office-application printing to large-format printing was made in 1992, with the Encad NovaJet wide-format color printer. This series of printers used four colors and roll-fed paper to produce large images, creating a class of its own—wide- or large-format inkjet—that today serves the important advertising and fine-art printing market sectors. Drop-on-demand inkjet prints can usually be identified, when viewed under magnification, by their irregularly placed dots.

In the early 1990s, the printing industry recognized that it would need to produce prints that resemble traditional photographic prints if shares were to be gained in the profitable amateur photographic market. Inkjet, specifically, promised to be the key technology for printing photographic images, if the image quality and the substrate, or media, could be improved. The characteristics of inkjet media had to match those of traditional photographic papers in order for it to be accepted by the general public. Photographic image quality would be "achieved in a digital print when you either can't tell the difference or you prefer the digital

[1] The characteristics of the processes described in the following may be viewed at the Digital Sample Book website: www.digitalsamplebook.org, on which close-up views and cross-sections of historic photographic papers and digital media can be compared to each other in different lighting setups.

print".[2] The new media had to *look* like photographic paper (meaning accurate and pleasing tone and color reproduction, high dynamic range, low grain, high resolution, uniform gloss and texture), *feel* like photographic paper (stiffness, weight, plastic backing) and *act* like photographic paper (fade resistance, sleevability, stackability, handleability).

Glossy, resin-coated (RC) papers, until then known as typical supports for photographic papers, were introduced for inkjet applications. The importance of the *look* and *feel* can be observed in the terminology of the sales strategies of the late 1990s: *photo-quality*, *photo-realistic*, *photosmart*, and *photo reproduction quality*. The definitions vary from manufacturer to manufacturer, but the terms are always used to suggest pleasing colors, high resolution, and a more or less continuous tone image quality. Media on an RC paper with a glossy or luster coating was soon typically called *photo paper*, *photobase*, or *photomedia*. The print, in logical consequence, was simply called a *photo*.

Soon, however, a major deficit in the new inkjet prints became apparent: inks were fading too fast and coatings were simply not stable enough to withstand the physical demands of amateur use. Hanging a print on the side of a refrigerator is still a pretty good test for survival amid harsh conditions: the print is subjected to handling (fingerprints, dirt, abrasion), fluctuating humidity and temperature (steam from cooking), volatile organic solvents (vapors from cleaning liquids), vibration, and prolonged light exposure.

As the inkjet market grew and as the number of manufacturers and resellers increased, so did the quest for print permanence. The common chromogenic color print, never a shining example of color stability itself, became the new benchmark for image permanence that inkjet prints had to live up to. With the introduction of pigment based inkjet inks for drop-on-demand printers in the late 1990s, a trade-off between the high color saturation but poorer light stability of dye-based inks and the high stability but duller colors of pigment-based inks was inevitable. Some artists chose the former over the latter, however, stating that the aesthetics of the print was more important than its permanence.[3] Today, pigment-based inks are able to match dye-based inks in gamut, while some dye-based inks can match pigment-based inks in stability.

With the use of advanced dyes, pigments, and complex surface coatings, some contemporary inkjet systems have overtaken photographic materials with regard to image stability under light exposure as well as long-term dark storage. Accelerated aging tests are the most common methods of evaluating these prints; because of their complexity, however, only few standards on the testing procedures have yet been published by the International Organization for Standardization (ISO), and the results are often open to discussion.

In addition to inkjet, other processes are used for outputting photographic images. A very popular process involves digital exposure: photographic paper is exposed to a computer-controlled set of lasers or an array of light-emitting diodes (LEDs); the paper is then processed conventionally. In principle, this output process goes back to the early 20th century, and it has recently become very popular in both amateur (small format – high volume) and professional (large format – low volume) applications. Digital exposure is

---

[2] Smouse, Evan. "Optimal Design of Desktop Photo Printing Systems," *IS&T's 1998 Image Processing, Image Quality, Image Capture, Systems Conference* (The Society for Imaging Science and Technology, 1998), pp. 91-95.

[3] David Hockney quoted in: Holbert, Mac R. "The History of Nash Editions," *Nash Editions: Photography and the Art of Digital Printing* (Berkeley, CA: Peachpit, 2007), pp. 11-61.

sometimes called a hybrid printing process, since it combines both the advantages of digital imaging as well as the use of traditional, light-sensitive photographic materials such as papers and film.

The resulting object is a true photograph that differs from analog photographs only in that it has not been exposed directly from a negative or transparency. When examined under magnification, digitally exposed photographs often show a diffuse linear grid within the continuous tone image, a result of the pixel-by-pixel and line-by-line exposure mechanism. Characteristic for color photographic materials is a photographic grain made of minute yellow, magenta, and cyan dye clouds.

Dye diffusion thermal transfer (D2T2, also called dye sublimation) printing is relatively fast, has a near photographic image quality, and uses media such as RC paper that gives it the photographic *look* and *feel*. It does not necessitate liquid chemicals for printing. Instead, heat from a thermal array is applied pixel-by-pixel to a donor ribbon that has dyes embedded on one side. The heated dyes become mobile and diffuse into the receptor coating of the media, where they form a continuous tone image. These prints may be identified by their diffuse grid and lack of photographic grain. In addition, the surface often shows a slight relief or differential gloss between printed and unprinted areas.

The first D2T2 printer, the Sony Mavigraph, was presented to the public in 1982, but its market introduction was only in 1986. In 1987 a number of other companies, among them Eastman Kodak Co, introduced printers of their own. D2T2 has found widespread use for applications that require continuous tone images in small formats, such as in photo booths, video printers, and for ID cards. It has become particularly popular in kiosk printers, and home D2T2 printing has grown with the increasing use of consumer-type digital cameras since the mid 1990s. The operating cost is lower than that of photographic printing, and D2T2 systems are almost maintenance-free. Further applications include proofing, photographic studios, and medical imaging.

Fuji Photo Film Company's photothermographic transfer process includes a digital exposure to a negative donor paper, a thermal development of the latent image, and a dye diffusion step, similar to that used in instant photography. Fuji gave its process the proprietary name Pictrography™, and no other companies have developed and marketed similar printers. The first model, the Pictrography 1000, was introduced to the Japanese market in June 1987. Pictrography's main advantages over wet chemistry photography are speedy processing and ease of use. This and the high, photographic-like quality of the prints have made it popular in proofing applications, photographic studios, aerial photography, and retail stores. It is generally used as a low volume device, so it will not be found in mass production amateur printing.

Under the microscope, the diffuse linear grid within the continuous tone of Pictrography prints look very much like that of dye diffusion thermal transfer prints; Pictrography will always have a uniform surface sheen, however. These prints also lack the photographic grain that is typical of digitally exposed papers.

The thermal autochrome (TA) process requires only heat to generate an image within the media. Microencapsulated half-dyes are exposed to a range of temperatures, then activated by developing agents within the binder of the special surface coating. Each of the color channels (yellow, magenta, and cyan) is imaged, then each layer is fixed with high-energy light. TA prints look very much like D2T2 prints, since they have a continuous tone, a diffuse grid pattern, and may show a slight surface relief and differential gloss.

The first TA printer, the Fujix Fotojoy NC-1, was introduced by Fujifilm Co. to the market in 1994. The TA system is primarily geared towards small format photographic quality printing as an alternative to photographic materials. The printers are small devices that are used in kiosks or at photographic retail stores, and they have been marketed for amateur home printing as well. Fujifilm has used the brand name Printpix® to market a number of TA printers over the years. No water or chemicals are needed in the image forming and fixing process, and there are no expensive consumables that must be discarded after use. However, perhaps due to its initial low lightfastness, TA did not achieve great popularity (at least not in the western world). The process was in use until around 2007.

Other thermal processes are also available, including direct thermal and thermal transfer; these techniques are less commonly used for printing photographic images, however, and vary in image quality and aesthetic characteristics. Artists in particular, of course, have been experimenting with many new printing techniques, often mixing processes and media, and their work will often end up in a museum or private collection.

Terminology and Conservation

Because digital prints constitute a major part of our current and future social and cultural heritage, it is important to understand their structure, materials, and long-term stability issues. The first step is the identification of processes, which is a prerequisite for all decisions on preservation. For example, if the substrate of a print can be identified as one prone to rapid deterioration, then different archival environments, housing, or exhibition parameters might be chosen by the conservator than if the print were on a very stable material. Practical recommendations for storage and exhibition have been compiled for many processes[4] and will also be part of a larger, upcoming publication.[5] The use of synthetic dyes and pigments in most processes has led to the understanding that, in general, digital prints will benefit from a cool or cold and relatively dry environment for long-term storage. It is commonly agreed upon that most digital prints should basically be handled as complex paper objects; their individual sensitivities to heat, light, abrasion, and moisture may vary, however.

With a technology that is evolving as rapidly as digital printing, it is easy to lose track of the many processes and of the many variables contained in each process. For this reason, it is helpful to establish a categorized hierarchy of processes, structures, and materials. This approach also relieves conservators of the otherwise continuous necessity of updating their knowledge whenever a new printer appears on the market. It also avoids proprietary terms and simplifies decisions regarding exhibition and long-term preservation issues. In order to facilitate communication between conservators and manufacturers, the terminology used by the industry has been widely adopted.

Some terms have not been easily accepted, however, for example the use of *media* as a generic term for anything that is being printed on. There has also been much discussion about the industry's current use of the term *photograph* for any print that looks or feels like a traditional black-and-white or color photograph.

In view of the fact that we are currently in the middle of a great shift in the technological aspects of imaging, the categorization of processes should therefore not be regarded as set in stone. Adam Lowe has pointed out that a shift in a formerly relatively clear taxonomy has taken place since digital systems have become all-invasive in printing technologies:

---

[4] See, for example: Adelstein, Peter Z. *IPI Media Storage Quick Reference* (Rochester, NY: Image Permanence Institute, 2004).

[5] Jürgens, Martin C. *The Digital Print: Identification and Conservation* [expected title] (Los Angeles, CA: Getty Conservation Institute, 2009)

individual, clear-cut processes have given way to "hybrid and enmeshed" technologies that do not always fit into our previous categories.[6] This is not a new phenomenon: the traditional use of the term *photograph*, for example, has never been extremely strict: it has always included processes in which the final print was not light-sensitive at some point and has not experienced chemical processing[7] (as in the dye transfer and Polaroid peel-apart processes, for example).

Inkjet prints on a glossy coated RC base that have the look and feel of photographic prints are still, from a material point of view, ink on a substrate. In this sense, non-photographic digital prints of originally photographic images are analogous to photomechanical prints made from photographic originals. The everyday use of the term *photograph* or *photo* for prints of images with a photographic quality (regardless of the printing technology), a trend that has become popular in the printing industry and amateur market through the growing use of digital cameras, is therefore, at least in the conservation community, debatable.

It has been pointed out that the definition of an object should not depend on its content, but, as the new generation of photographers who have never used film progresses into adulthood, and as we will need to be able to communicate with our offspring (not to mention with the imaging industry), time will tell which terms become accepted and which do not. Although it is desirable to be able to communicate with amateurs and manufacturers in a common language, it is equally important to the conservation community to use an accurate language that relates primarily to the materials involved and thus to their preservation. It will be important for conservators, curators, and archivists to actively engage in this discussion.

An accurate, common terminology also plays an important role in the internal registration systems of museums. Not only does this standardization allow for efficient searching within the museum collection, but, in the case of loans, it also facilitates communication among curators, registrars, and conservators of different museums.

A consistent set of terms would also be beneficial for gallery labeling, which are part of an institution's mission to educate the public. In shows of digital prints especially, in which there is yet no historically grown set of technical terms to use, a great variety of different terms may be found. These terms are often proprietary, such as Laserchrome® or Lambda® (both terms used to describe a digital exposure to photographic paper). Most probably a reflex against the ephemeral nature of early inkjet prints, the term "pigment print" is popular, since it implies the permanence of the object thanks to the use of a pigment-based ink versus a dye-based one. "Pigment print" and "carbon print" are both commonly found as labels for inkjet prints made with pigment-based ink, but their use can be confusing: in German, for example, "Pigmentdruck" is the term used for the English "carbon print", both

---

[6] Lowe, Adam "From Imprint to Printout: Surface and Digital Printing," *Care of Photographic, Moving Image, & Sound Collections. Conference Papers* (Institute of Paper Conservation, 1999), pp. 66-71.

[7] ISO 18913:2003 defines *photographic layer* as a "radiation-sensitive coating that yields an image after exposure to radiant flux […] Exposure is usually followed by processing to generate the image" (ISO. *International Standard 18913:2003. Imaging Materials - Permanence – Vocabulary*, p. 10).

terms which have historically been used for prints made with bichromate transfer processes.

Since the era of fine art digital printing has been so brief, the prints have usually been produced only a short while before their acquisition. This situation provides the unique opportunity to secure detailed information for posterity on the brand names and other details related to the print's production. The collecting institution, but also the artist and/or printmaker should be aware of the benefits of this procedure.

The manufacturers of digital printers and consumables have also been interested in the documentation of production details since it would help in improving their reputations. As the digital fine art printing market surged in the 1990s, IRIS Graphics Inc. became aware of uncertainty among customers of IRIS products due to the great variety of inks and papers, as well as rumors and differing test results. In consequence, the company urged printmakers to produce a disclosure for every print sold with detailed information on the inks, paper, coatings or other finishes, date of print, place of print, name of artist, title, size of edition, edition number, summarized results of light fading tests, and recommendations for framing and display. The International Association of Fine Art Digital Printmakers (IAFADP) was also keen on implementing this agenda in order to raise the standards of the prints being made and to avoid the use of poor inks that would give IRIS printing a bad name.

In the past years, many museums and private collectors have been acquiring digital prints for their collections, and the lack of technical information available for the prints has made it very difficult for conservators and curators to agree upon mounting methods, framing, and light levels in exhibits. For this reason, conservators have been working on a document that can be used for collecting this information. The document will take the form of an artist's questionnaire, and should, in the ideal case, be filled out by the artist, perhaps with the help of his or her printmaker, prior to the acquisition of the work of art. The institution's conservator should critically evaluate the document before accepting it. The document not only lists the processes and materials used (for example "dye-based ink on paper") in a vocabulary of simple categories, but also records the brand names, product batch numbers, and contextual information.

As much detail as possible is requested, since the more information one has on a print, the more informed will be the decisions pertaining to the print's ultimate exhibition, storage, and possible treatment. With an established system based on accurate and common terminology, museums will occupy a more authoritative position in relation to the artists from whom they are currently buying digital prints.

Outlook

The great acceleration and proliferation in applications and technology of digital printing in the 1990's appears today, a decade later, to have stabilized at a level where less resources are being spent on developing innovative break-through technologies. Instead, it is expected that current systems will be further modified and perfected for individual applications. Experts in the field agree that major changes on the (short-term) horizon are unlikely.

In recent decades, three trends may be observed in the conservation community: the erosion of traditional boundaries between the individual specialized fields, in view of the complexities of contemporary art; the growing inclusion of scientists and professionals from the industry in conservation research; and the ease of communication and collaboration among international conservators in research and teaching, thanks to modern technology. Archives were among the first to realize that the nature of the documents entering their vaults was changing. In the museum world, the conservation specialty for contemporary art and modern media developed (although with a certain delay) parallel to the evolution of digital applications. Conservators, curators, museum registrars, and related professionals are still grappling with issues associated with the acquisition, preservation, and conservation of digital prints. Museum personnel are, for the most part, used to dealing with artists' techniques that are not subject to continuous change; it is precisely this characteristic of the digital world, however, that has delayed the conservation field from tackling the preservation issues of digital prints.

A number of collaborative projects have been carried out that cross the boundaries between the conservation specialties, particularly between the fields of photography, painting, the graphic arts, and contemporary installation art. For example, a recent German thesis project on discolored Scanachrome inkjet prints on canvas was supervised by both a paintings and a photograph conservator. Similarly, by including the research and development departments of major manufacturers of digital printing materials, conservation research projects have benefited greatly. Ilford Imaging Switzerland, for example, is currently involved in research at the Hochschule der Künste in Bern, Switzerland, that is examining stability issues of photographs and inkjet prints mounted to acrylic sheets (a finishing technique widely employed by contemporary photographers). Also of great advantage was the ready acceptance of the importance of print stability by manufacturers in their quest for improving their products.

Being able to identify specific digital printing processes is a very valuable skill in conservation practice. To assist professionals to simplify and improve this skill, a guide to identification has been developed.[8] This tool allows the user to follow a yes/no decision tree that is illustrated with photomicrographs of the various print processes—the comparison of magnified screen patterns, for example, is helpful in identification. The use of a flowchart-type guide, however, may give its user a false sense of security, since there are many exceptions to the necessarily simplified guidelines that this format allows. Therefore, it is important to build an in-depth understanding of the printing processes and materials before undertaking treatment of digital prints. Various methods of scrutiny—including the preparation of cross sections, different lighting techniques, and microscopic examination—have proven to be very helpful in the characterization process.

Over the past five years, consciousness has been raised in archives and museums regarding digital prints. A large number of seminars and lectures on the topic have benefitted over 400 conservation professionals, archivists, and artists since 2001. Feedback during the seminars has been very helpful in determining the actual needs of the conservation field. The Andrew W. Mellon Foundation has been commendably enthusiastic in supporting these seminars.

Many conservators, with the help of sample collections, have been able to develop their own connoisseurship in the examination and evaluation of prints. A commercially available sample collection of digital prints was put together for the Andrew W. Mellon Foundation funded Collaborative Workshop in Photograph Conservation "Contemporary Photography: Digital Prints" that was held at the Museum of Modern Art San Francisco in 2006. It proved to be so successful that more sets were produced for sale in 2007 and 2008.[9] As interest in seminars and publications on the topic grows, it is hoped that we will develop a wider and more profound understanding of both the challenges that digital prints pose and the best ways to address those challenges.

Martin Jürgens, Photograph Conservator MA

Martin Jürgens is currently a photograph conservator in private practice in Hamburg, Germany. His areas of research and teaching include, next to historic and contemporary photography, the materials, chemistry, and preservation of digital prints.

Address:

---

[8] Jürgens, 2009 [as above]

[9] available through: http://aic.stanford.edu/sg/pmg/index.html

Margaretenstr. 29a
20357 Hamburg
Germany
Tel: +49 40 28004785
Email: post@martinjuergens.net