

CONSERVATION. STATE OF THE ART

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Conservator of Photographs

This text is based on the review of nine articles dealing with the conservation of photographs throughout the thirty years of Image and Research Conferences. Accordingly, these nine texts, personally written by leading photograph conservators, are the common thread that serves as the basis for this essay, which will endeavour to present the most significant changes that have taken place since photograph conservation first appeared on the scene up until the present day.

Back in 2010, at the 10th annual Conference, James Reilly pointed out that photographic conservation had changed drastically, in comparison to the preceding 15-20 years, due to the transition from the chemically based analogue images to digital technologies.

Today, 10 years later, we find ourselves in the same situation; contemplating the co-existence of contemporary photography's temporary copies made from digital image archives and the prints or realities of the increasingly distant past of analogue photography.

As Reilly points out, despite the end of the analogue image and the certainty that the world of photography is changing irreversibly, due largely to technological progress, these kinds of collections continue to reach the institutions in the form of donations or acquisitions. The good news is that we have increasingly more reasons for conserving photographic specimens produced by means of the old chemical-based analogue systems. They are now viewed as something

strange and unusual that evokes nostalgia- invaluable objects which serve as an irreplaceable testimony of our own history.

The origin of Photo Conservation

We could say that the concern for the conservation of photographic processes began with the birth of the photograph, when the pioneering photographers witnessed the irretrievable loss of the first representations of reality ever obtained. That very moment marked the beginning of the race toward achieving image permanence

We all identify 1839 as the year Photography was born. Louis Jacques Mandé Daguerre publicly presented the first photographic process in history, thanks to the research carried out by Nicéphore Niépce: the daguerreotype. That same year, William Henry Fox Talbot unveiled his photogenic drawings (which he had been doing since 1835) thus introducing paper photographs.

Talbot was the first to develop and use image stabilization techniques using salt solutions, potassium iodide and potassium bromide and sodium chloride. But, despite the efforts of Talbot and many other researchers, image stability would not be possible until 1839. This was due to the invaluable contribution made by Sir John Herschel with his discovery of the agent that would make fixing the images possible – sodium thiosulfate.

Nevertheless, the issue that had supposedly been resolved by Herschel once again became the subject of debate years later in Great Britain. In November of 1855, different specialists came together for the meeting of the Fading Committee. Among these were chemists and photographers, united by a common concern and working towards a common goal: finding the solution to the different kinds of deterioration that compromise the stability of photographs over time, such as staining and fading of silver salt print images.

After carrying out different ageing tests, the committee concluded that the fading and staining of the images was due to: the incomplete

washing of the photographs, the use of an exhausted fixer solution, or one containing an excess of sulphur, hygroscopic pastes used for mounting the photographic prints and the humidity and sulphur present in the contaminated London air. By five votes to two, the committee also recommended that the prints undergo gold toning in order to improve permanence¹.

It is interesting to note that the sulphur derived from the fixer solution residue and the atmospheric contamination can destroy the photographs and, that, conversely, sulphur applied during the final phase of processing can also protect them.

Fernanda Valverde explained this in her Chemistry of Photography classes, at the ENCRyM², where, magically, you suddenly understood everything: The photographs are sulphur toned, which converts the metallic silver into silver sulphide - the maximum expression of balance and chemical stability- and protects them from oxidizing agents. The attraction between silver and sulphur-based compounds is due to the fact that that the silver ion reaches its maximum chemical stability when binding to sulphur. Upon forming silver sulphide, the metal attains its natural electronic balance. Sulphur-toned photographs are highly recommended for photographic collections which require storage for long periods of time in uncontrolled storage conditions or for those subject to long exhibition periods³.

As noted by Ian and Angela, the United States is the nation that has demonstrated the most interest in photography and its conservation and did not need to be convinced of the cultural and historical importance of its photographic heritage. Pau Maynés affirms that Eugene Ostroff⁴ was the first to study photographic materials from a conservation perspective.

Something that contributed to photography being revered as artistic expression in that nation was the arrival of the first photography collections at museums at the beginning of the 20th century, and the numerous works published on history and photography during the 1950s and 1960s.

Historically speaking, the United States, France and Canada, are the countries to have most actively manifested a firm photographic tradition and where scientific research in the field of photograph conservation began.

The Importance of Identification in Photograph Conservation

In the Introduction of his book, “Care and Identification of 19th-Century Photographic Prints”, indisputable reference guide for all photographic conservators, James Reilly includes the following paragraph which I have included below:

“In order to preserve prints, we need to understand them as physical objects and learn how to use them in ways that do not contribute to their destruction. Photographic preservation is a relatively new field of study, and there is much left to discover about the proper care and storage of 19th century print materials. Nineteenth century print processes are too complex and varied to allow for blanket pronouncements about the causes or remedies of deterioration. Each of the major processes needs to be subjected to scientific investigation, from which specific preservation recommendations can be derived” (Reilly, 1986).

It is doubtless that the identification of photographs has to be the first link in the chain and is crucial to be able to continue with the following steps aimed at their conservation taking into account their material condition and their needs.

Nevertheless, nothing is ever as easy as it seems; Luis Pavão points out that there is no infallible identification rule that is applicable to all cases. Identification requires knowledge of the history of photographic techniques, and of the nature of the different processes and most importantly, it requires training. Acquiring the necessary visual experience requires viewing countless photographs and countless types of photographs.⁵

Furthermore, as suggested by Ian and Angela Moor, I, would also insist upon the need to approach photographic processes through their execution, as a way to understand them and later be able to identify them: “It is only through a close working knowledge of their production processes and chemistries can you begin to understand and assimilate what a particular photographer did at any point in time historically in the production of his work.”

We should think of the duplication of historical photographic processes as particularly useful and interesting for studying the most vulnerable processes. The objective of this would be to find solutions to problems of instability inherent in these photographs.

By the same token, Anne Cartier-Bresson also proposes reproduction as a way of preserving affected and vulnerable originals, with a view to limiting their consultation and exhibition. She proposes two options: countertypes (prints on the most appropriate contemporary medium) and facsimiles (identical prints made using the same method as the original).

That said, Cartier-Bresson questions the ease of re-printing contemporary works from an original negative, warning us that degradations in vintage objects may be considered age-related patina, while in contemporary processes, as a recently produced work, they would be difficult to admit. For this reason, some artists prefer to make another print from the original negative, when possible. However, it is not the same object, but instead, a new

image produced on a new support on a new date. According to Anne, this fact disrupts the historical correlation between the use of a certain procedure and the date the work was produced.

Ian and Angela Moor note that the experience of carrying out the photographic processes not only helps identify the historical processes and their variants, but also the underlying defects and causes of degradation. This lays the foundation for developing and determining the specific treatments for the materials.

According to Ángel Fuentes, understanding the mechanisms of photographic deterioration is key to properly safeguarding the photographs, since it can mark the limits and possibilities of their cultural exploitation, determine the selection of direct protective materials, the preservation mechanisms and even the development of emergency plans.

Ian and Angela Moor advise that all preventive or interventive treatment must take into account the impact that they will have on all component materials. This is because the stability and integrity of the image information will in turn be dependent upon the stability of all the component materials and the physical and chemical relationships that exist between them.

Similarly, Ángel Fuentes points out that “in any photographic procedure, the deterioration of a part of its structure compromises the permanence of the entire artefact. Because of this, understanding the deterioration that is common to each structural element is of the utmost importance, especially when the factors responsible for the specimen lacking the perfection of the original tend to be associated”.

Bertrand Lavédrine explains that, due to the large numbers of techniques and variations, identification errors are often made. He explains different analytical methods that we can carry out in a laboratory, without having to take samples, which will allow us to act

in a non-destructive manner to accurately determine the components of a photograph⁶.

Martin Jürgens also talks about the complexity involved in identifying digital processes: “As with analogue photography, artists 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.”

Given the complicated task of identifying the digital printing processes acquired by the institutions, regardless of the technique used to create them, the need has arisen to ask the artist to fill out a form which explains the techniques and materials used in his or her work⁷.

Jürgens also adds that process identification is the prerequisite to all decisions regarding preservation, and that it is important to prioritize the conservation of the most unstable processes or those sensitive to a specific environmental factor. The appropriate environmental conditions of the archive, the packaging materials and exhibition parameters will differ and be determined by the physical conditions and stability or permanence risk of the different photographic processes.

However, the urgent need to condition the materials with a lower stability index is not always an easy task. As Ángel Fuentes warns, it can be like re-organizing Noah’s Ark; it demands a rigorous selection (and thus a previous identification and classification) of the materials in our archive.

History and conservation of photographic processes

This section features a summary of the history and specific conservation measures proposed by Bertran Lavédrine, Ángel

Fuentes, Luis Nadeau and Martin Jürgens for the different photographic processes that each has studied.

It is important to keep in mind the dates these texts were written, as some recommendations on storage conditions or conservation materials may have changed over the years.

First, Lavédrine (1992) explains the history and conservation conditions required for glass plate photographs.

Fuentes (2000), in his text on the conservation of colour photographs, will introduce us to the history, stability and care required by the chromogenic processes.

Nadeau (2002) comments on the photomechanical prints or “illustrations,” as he calls them and discusses the history and conservation conditions, advancing that they will not differ much from those required by graphic arts or other paper-based documents.

As for digital prints, Jürgens (2008) sheds light on these kinds of photographs, which could be treated like complex paper objects, though keeping in mind the different types and their sensitivity to the different environmental influences.

Glass plate photography

Lavédrine discusses glass plate photography, glass being the most used medium for both negatives and positives, from 1850 until a decade later.

After the calotypes, or first negatives, created by Talbot on paper (1840-1865), and with a view to achieving sharper prints with greater image definition, the first glass plate negative processes emerged: albumen plates⁸ (1847-1860), wet plate collodion (1851-1885), dry plate collodion (1855 to 1885) and the silver gelatine dry plate (1878-1940).

Among the positive photo processes carried out on glass⁹ we find: ambrotypes (1854-1880), magic lantern and stereoscopic views, interferential colour photographs (1891-1895), colour slides (end of 19th century), screen-plate filter slides (1894-1939).

According to Lavédrine, photography collections of this kind in existence today, constitute one of the most important photographic archive groups, both for the number and the quality of the images conserved.

Conservation of glass plate photographic processes

Glass plate photos, like any photograph, should be handled with gloves to avoid leaving traces of perspiration on them.

If they are dusty, they may be gently cleaned using a soft brush, as long as the image shows no signs of peeling.

If there are no retouching marks, the glass side may be cleaned with a microfiber cloth moistened with water and alcohol. Collodion plates require incredibly careful handling since organic solvents may dissolve the image layer.

The following environmental conditions are recommended for storage:

The space where the photographs are kept must be adapted with air filters to eliminate airborne mineral and organic particulates that may settle on the images and destroy them.

The relative humidity should be set at about 35%, with a 3% variation range. Excess humidity will lead to the development of microorganisms, sulfurization of the image and corrosion of certain types of glass, whereas extremely low relative humidity (less than 25%) provokes severe tensions that may likewise cause lifting in the gelatine layer.

The temperature should not exceed 21°C with a variation of 2°C. However, for some of the more delicate processes, such as collodion plates, a slightly lower temperature is recommended: 16 to 18°C.

Prolonged exposure of the negatives on glass plates (especially collodion plates and autochrome plates) should be avoided; they should be exposed for short periods of time only if necessary. Avoid UV and visible radiation that can provoke surface heating which will dry out the gelatine layer, causing peeling and craquelure cracking patterns.

Four-flap paper envelopes are recommended as direct protection for glass supports¹⁰. The paper should be permanent, either cotton fibres or paper pulp with an alpha-cellulose percentage above 87%, and should not contain chemical impurities, such as the Sulphur-derivatives present in lignin or peroxides. In order to limit acidification, paper with an alkaline reserve of 2% or 3% and a pH of around 8 can be used.

Do not use crystal paper or glassine, as there is no guarantee that it is a permanent material and when subjected to conditions of high relative humidity, it may cause yellowing of the images.

Glass plates are to be stored vertically on their long edges, inside cardboard, metallic or plastic boxes that are not airtight, in order to encourage ventilation.

Lavédrine also discusses intervention techniques for glass plates that are broken or present flaking emulsion, creasing, passe-partout, adhesions or delamination.

Colour Photography

Every photographic record is a complex artefact. Its minimum structure requires the presence of a primary support and a final

image. All colour procedures have been carried out on more complex morphologies, and some, like the negatives carried out on plastic bases or dye diffusion materials, are a good example of the structural and technical complexity inherent in many of the processes.

According to Angel Fuentes, to understand colour photography, we must consider that there are two distinctive pillars: additive colour synthesis, and subtractive colour synthesis. In the first, chromatic reproduction is obtained through the mixture of the three primary colours in the correct proportion, and in the second, light passes through two or more transparent coloured layers (yellow, magenta and cyan). Each of these absorbs the corresponding values of blue, green and red within the visible spectrum.

We must go back to the end of the 19th century for (omitted words) of colour photographic processes carried out by way of additive synthesis: direct vision processes (chromogram), mosaic screen processes (holly plates, autochromes, omnicoLOUR...), triple projection processes (Maxwell, Prokudin-Gorsky) and Lippmann's interferential process.

We regard 1935 as the year of the popularization of colour photography, when Eastman Kodak put Kodachrome on the market. Modern colour distinguishes itself by using silver in the film as a fixing agent for the final image, which is composed primarily of dyes. This means that after processing, the film or copy does not contain silver

A not unfounded sensation abounds that the greatest problem with colour photography is the instability of the dyes when exhibited or stored in the dark. This is because most colour processing is done with organic dyes and their stability is critical in the presence or absence of light, as well as with heat and relative humidity.

Many of these colour prints develop stains over time, due to the colour couplers present in the emulsion and not exposed. A colour

imbalance occurs due to instability of the cyan dye in darkness, which tends to fade, and the images acquire a dominant yellow or reddish hue.

Colour processing with a final image composed of pigments presents a lower index of deterioration and a longer life expectancy. This kind of photograph (Ultra Stable, Polaroid Permanent, Color Print, Ever Color Pigment, 3-and-4-layer carbon, Fresson Quadrachrome process or the Tri-Color carbro) are highly resistant to fading.

Conversely, there are other colour procedures, which appear at the end of the nineteenth century, that use a final image of dyes that, despite this, have high permanence: the dye destruction processes (silver dye bleach process) and the Ilfochrome, formerly called the Cibachrome. The dyes are introduced into each one of the three emulsion layers during the production process and are then destroyed during development in proportion to the silver present. Later, the silver is also eliminated and after fixing, the resulting prints are comprised of high stability dyes.

Dye transfer procedures (the dye imbibition process) began to be used in 1870. It uses at least 3 positive hues: yellow, cyan and magenta, which are obtained from separation negatives that absorb the dyes in proportion to the image. These are then transferred to the primary support (which can be any material that has been previously preconditioned with a layer of gelatine) from the copy in order to create the positive image

Dye diffusion procedures are characteristic of instant colour photography. They appeared in the 1960s and have continued to this day. There are two types: one features a two-sheet transfer whose layers must be separated after film exposure and development. The unexposed dyes migrate towards the final support, forming the positive image (Polacolor 1 and 2) and the other is an integral unit where the image is developed upon exposure to light and the

unexposed dyes migrate towards the surface of the copy (Polaroid SX-70 and PR-10).

Conservation of colour photographs

Photographic materials, and especially the colour originals, whose final image is comprised of chromogenic dyes, are extremely sensitive to variations between relative humidity and temperature. They require special storage conditions, as they can suffer deterioration both when exposed to light and when stored in the dark.

Climate control in storage and archive rooms is one of the cornerstones in safeguarding any form of cultural heritage. In the case of photographic heritage, it is of paramount importance - especially if it is in colour.

The relationship between relative humidity, temperature and life expectancy is indisputable; a material that at 24°C could lose 10% of its most unstable dye in one year, multiplies its life expectancy by 1,000 when frozen at -26°C.

However, due to the high cost of freezing the collections, only a few organizations find such an investment ultimately worth the benefits: the cinematographic industry, national agencies, and some artists whose originals fetch a high price in the art market. It requires special materials for direct protection as well as installations whose maintenance requires budgets that are unattainable from most archives.

There are alternatives, such as no-frost refrigerators kept at a temperature of between 1°C and 4°C with an RH close to 30% and using affordable bags to group together and protect the refrigerated materials. It is vital to monitor the RH and T^a values inside the refrigerator in order to guarantee conservation.

The processes with a higher index of permanence, like the pigmentation processes, dye destruction, dye transfer, and prints and transparencies with a low fading and staining index in darkness, can be preserved outside the refrigerator. However, this is contingent upon maintaining the proper climatic parameters inside the storage room (25% RH and a T^a of between 18°C and 20°C, without oscillations of more than 5%).

We must give priority to the materials with a lower stability index, such as Ektacolor and Fujicolor prints prior to 1984, Agfacolor prints and Agfachrome prior to 1989, Ektachrome copies prior to 1991, among others (this requires the identification of the materials that we have in the archive).

Direct contact protective materials

Below, we will examine the materials recommended for the different types of photographic materials:

Glass plate negatives and positives

3 or 4 leaf envelopes in archival quality paper, with no alkaline reserve, manufactured with a percentage of no less than 87% alpha-cellulose, free of lignin residues, alums or rosin sizing agents. If consultation of the originals is necessary and the climate control is properly adapted to the recommended parameters, they may also be kept in uncoated polyester and polypropylene or low-density polyethylene sleeves.

The plates will be stored in the envelopes and inside the conservation boxes vertically, on the shortest edge. For formats larger than 18x24 cm horizontal storage is recommended^{[11](#)}.

Slides and negatives on plastic supports

Archival storage pages made of uncoated polypropylene or polyester and low-density polyethylene.

If they are segmented, they can be kept inside archival pages, and if they are in un-cut rolls, we recommend segmenting them to the size of the archival pages.

During the classification process on light tables and with back-lit slide viewers, light exposure of the chromogenic negatives and transparencies must be monitored and limited in order to reduce the risk of fading and alterations in colour.

Photographic prints

Colour prints require the same materials as black and white prints and we recommend transparent polyester, polyethylene and polypropylene sleeves, though, before choosing these materials we must consider the atmospheric conditions of the archive storage room.

The larger format prints will require a secondary cardboard support within the sleeve itself.

Large format author originals may be mounted in mat frames and stored in flat cases.

Conservation storage boxes made of purified alpha-cellulose pulp, acid and lignin free, PAT¹² certified and with a 3% alkaline reserve.

Photomechanical processes

Luis Nadeau introduces us to the history and conservation of the photomechanical processes, by making a distinction between the first processes; from the first photograph up until the Woodburytype,

and the modern processes; from heliogravure (1895) up to the offset process (1875).

The oldest conserved photo today¹³, was taken by Nicéphore Niepce, in 1827, with a camera oscura, but this was an experimental process, and, because the processing steps were extremely slow, it could not be marketed. Nevertheless, this procedure or “heliograph” produced using bitumen of Judaea, was key for the reproduction of photographs using oil-based inks.

Nadeau makes two classifications of the photomechanical processes based on the time period of creation; he discusses the first photomechanical processes and the modern photomechanical processes.

The early procedures

In 1840 the first daguerreotype reproductions etched with nitric acid were produced.

In 1852, Talbot’s photo glyph process, which would lead to the modern heliogravure.

In 1853 the first practical photolithography process was carried out in Paris by Lerebours, Lemercier, Barreswil and Davanne, using a layer of bitumen on a lithographic stone.

In 1855, the Poitevin procedure appeared, which introduced improvements in photolithography and in the collotype.

The Woodburytype was patented by the Englishman Bentley Woodbury in 1864. According to Nadeau, Woodburytype is the most photographic of these photomechanical processes, since it produced images similar to the best carbon prints. It was widely used for high-end works up until 1900.

The Woodburytype process was greatly simplified in the year 1879, with the introduction of the stannotype, which used an electrotyping

method instead of the hydraulic press.

In 1891 another improvement called the Woodbury gravure process was introduced, which permitted the transfer of images directly to the pages of a book.

The modern processes

Meisenbach's Autotype was marketed in 1882.

Duncan C. Dallas presented his Dallastint process in 1886.

In 1887, Charles Petit, introduced halftone engraving, images with continuous patterns or halftone printing with a typographic press.

In 1895, Klark Klic presented the modern heliogravure or rotogravure.

From 1872 to 1970 Charles Gillot used the Phototypogravure or Phototypography, which became the most popular medium for reproducing drawings or photographs.

The offset process, also known as rotocalcography was introduced by Alfred and Charles Harris in 1906 and was used starting in 1970 for printing most of the books on the market. Heliogravure was used to print the illustrations in high-end works, while the text was printed in offset.

The conservation of photomechanical processes

As advanced by Nadeau, the conservation of the photomechanical illustrations is not unlike the conservation of documents on paper. Nevertheless, we must forewarn that the inks used in the manufacturing of photomechanical processes may be extremely sensitive to alkaline treatments, especially Prussian blue, often used in the manufacture of blue inks.

It is important to identify this pigment, through analysis, before subjecting a photomechanical print to a deacidification treatment, since the alkali can destroy it completely. For this reason, envelopes with an alkaline reserve must be avoided.

Woodburytypes should be treated like carbon prints on cardboard and sometimes varnished with shellac. Over time, the gelatinized layers become extremely sensitive to humidity. Avoid aqueous treatments, especially if there are indications of an infection of microorganisms.

Digital printing processes

It's true, as Jürgens says, that in the last 25 years, virtually all amateur and professional photographers have switched from film-based to digital cameras and that the new generations of photographers have probably never loaded film into a camera.

Nowadays, everything is done by digital means: camera, digital retouching, printers, scanners,

Jürgens introduces us to the conservation of digital prints and emphasizes the importance of their identification. This is important to understanding the constituent materials and the printing processes, as well as for creating strategies for their acquisition, handling, storage, exhibition and conservation.

Digital processes have always endeavoured to resemble analogue photography. Therefore, they are continually searching for new mediums that possess “photographic quality”.^{[14](#)}

Below is a brief chronological summary of the most common digital prints:

The first to appear are the ink jet prints (1940-50), followed by the continuous inkjet and piezoelectric inkjet (DOD) (1970), dye

sublimation printing D2T2 (1986), pictographs (1987), rints¹⁵ (1990) and thermal autochrome IRISprints¹⁶ (TA) (1994).

In the early 1990s, the IRIS Graphics® printer (Continuous inkjet. Ink containing dyes) printed at high resolution on various support materials. Special attention should be paid to IRIS prints during transport and exhibition, as they are quite sensitive to light, atmospheric humidity and water.

At the end of the 1990s, the first pigment-based inkjet prints appeared, which had a superior stability when exposed to light than the dye-based inkjet prints. Even so, the colours were more muted, which prompted many artists to forego this kind of printing, preferring colour intensity to colour stability.

Today, pigment-based inks can achieve the same colour as the dye-based inks, and some of these can be as stable as the pigment-based inks.

Through the use of dyes and advanced pigments, as well as complex coatings for surfaces, some contemporary inkjet systems have surpassed the photographic materials in terms of image stability in light exposure conditions, as well as in the case of long-term storage in the dark.

Conservation of digital prints

Jürgens points out that the use of synthetic dyes and pigments in most processes reveal that digital prints, in general, will benefit from a cool or cold environment that is relatively dry for long-term storage.

He also mentions the widely held consensus that most digital prints should basically be treated as complex paper objects. However, he also observes that, according to the kind of process, its sensitivity to heat, light, abrasion and even humidity can vary. For example, special attention must be paid to IRIS prints during transport and

exhibition, due to their sensitivity to light, atmospheric humidity and water.

According to the ISO 18920 (2000) a maximum of -3°C and a relative humidity of between 30 and 50% is recommended for long-term storage, and a maximum of 25°C for medium term storage¹⁷.

Advances and development in conservation and restoration of photographic heritage

Reilly (2010) affirms that photographs are only prepared to face direct exposure to the world for a truly short time. The conservators are ever aware of this - nothing lasts forever. Cultural assets, like everything in life, have an expiry date and from the moment they are created, the materials begin the process of transformation towards their elemental state.

Nevertheless, thanks to the basic principles of photograph conservation, which are still valid, and thanks to the investigative studies and the knowledge acquired about the materials that comprise the current photographs, we now know what we need in order to conserve photographs for centuries to come.

For example, in the past it was thought that black and white analogue prints were very stable (we can actually say that this is true in comparison with the first chromogenic dye prints). Their deterioration was only attributed to defective processing: a bad fixer or wash. We must insist on maintaining stable environmental conditions with a relative humidity below 50%, since we know that the corrosive reactions of humidity with the silver cause the images to fade.

Training of a photographic heritage conservator - restorer

Ian and Angela Moor explain from an academic viewpoint, the finer points of being a photographic conservator: “A photographic conservator is someone who has undergone a recognised programme of training enabling them to intervene at any level in the preservation of historic photographs. Their expertise should enable them to implement a full and effective preservation policy which includes collection surveys, access, handling and patron usage, storage, exhibiting, digitisation, disaster preparedness and any other administrative and advisory role within the arena of photographic preservation. Their training should also render them capable of undertaking treatments ranging from the simplest level of intervention such as handling, transporting and duplicating photographs to re-housing and packaging photographs for storage, usage or exhibition, to the most complex of interventive conservation and restoration treatments dealing with a whole range of both physical and chemical degradation problems arising from the passage of time, human interaction, flood or fire.”

Maynés agrees with Klaus Hendriks on the essential knowledge a photographic conservator must possess. Some of these are: understanding the diverse photosensitive materials, the old processes and degradation, techniques of photographic reproduction, the practice of conservation, chemical treatments, storage and exhibition of photographs, execution of scientific tests applicable to photography and the documentation of the interventions carried out¹⁸

Conversely, Ian and Angela Moor, talk about the shortcomings of the specialized programs in Photographic Conservation: they should promote a proper balance between science and conservation, theory

and skills, given that the improper application of science is generating a degree of precaution and intimidation which is having a very negative effect on the interventive component “All recognised training programmes must represent the perfect marriage between skills and science, providing an environment within which photographic conservators can broaden, deepen and develop both their practical skills and ethical approach, through the teaching and undertaking of treatments, and also their knowledge base, through connoisseurship and applied materials conservation science. Interventive treatment techniques and approaches for paper, metals, glass, plastics, leather, textiles, ceramics, bone and ivory, wood, and the various applied image bearing colloids, principally albumen, collodion, starch, gum and gelatine, must be taught.”

Anne Cartier-Bresson explains that at the Atelier de la Restauration et Conservation des Photographies de la Ville de Paris (ARCP) photograph preservation is not regarded as a separate discipline, but as an integral part of the assessment and dissemination of the municipal collections.

The ARCP has worked on the creation of plans and strategies for the diffusion of the photographic collection of Paris, as well as the creation of a Plan for the Maintenance and Evaluation of Photographic Heritage, (its initials in French PSVPP) which is responsible for carrying out studies and conservation plans, digitization campaigns and diffusion projects for the municipal collections.

They have also carried out conservation plans for photographic collections with specific problems, such as the conservation plan for contemporary photographs: colour testing in large format chromogenic film processing, Polaroids®, dye destruction transparencies (like Cibachrome®) including a multitude of digital prints, mounting onto rigid backings...

Digitization as a preventive or destructive conservation tool

Reilly comments on the sad reality faced by many institutions; the long, costly task of digitizing the collections and subsequent expense and time necessary to guarantee the survival of traditional photographic objects in the ways we now view as necessary. One factor that acts as a detriment to conservation is that sometimes, the entities do not know what they should conserve: the original material or the digital substitute. It is easy to argue that both fulfil a purpose and that both deserve to be preserved, but in practice, there are increasingly fewer entities that can afford this luxury and that must make a difficult decision.

It is unsettling when entities are unable to satisfactorily resolve these kinds of issues and must decide what to preserve; the original material or the digital substitute... According to Ángel Fuentes, and all photographic conservators agree; the digitization of photographic objects must only be understood as a tool that contributes to the extension of their life spans. Digital files must never substitute the photographic object, given that they only contain information about the heritage, whereas the physical-chemical records possess economic and cultural value.

Digitization helps us manipulate, store and organize our photographic files and should be regarded as a tool that helps us safeguard the historical originals from the risk involved in handling them. This way, the user can access the digital file using a computer, while the original photograph is stored away and protected.

Storage materials

According to Ángel Fuentes, before choosing the direct contact protective materials, for your photographs, it is crucial to keep four important factors in mind: the morphology of the material to be protected, the state of conservation of the originals, the environmental parameters of the repositories and archive rooms, as well as their recovery and usage.

The relationship that exists between the protected material, its state of conservation and the climate control measures requires special attention, given that this dynamic can either limit or broaden the choice of guaranteed materials that may be used. For example, if the fluctuation in the relative humidity exceeds the recommended parameters, plastic protective materials should be avoided.

The environmental parameters include the control of air quality, relative humidity and temperature. The proper balance of these factors will exponentially increase the lifespan of the safeguarded materials. It would serve no purpose to have our photo collections stored inside wonderful long-term conservation envelopes and storage containers that have passed the PAT, if we do not have a space and appropriate atmospheric conditions that can guarantee their conservation.

As Ángel Fuentes said: “There is a Golden rule that is not always followed: do not use the original boxes the industry sells the unexposed photographic material in. This kind of packaging is not apt for housing the processed photographic material for long periods of time. There is another Golden rule: something is much better than nothing; so, if we do not have another way to protect them, we will use these boxes”.

Back in 92 we first advised against using glassine paper as a material to use as a primary protective material for our photographs. This is a fact that we have been able to corroborate over the years since it is a material that despite having passed the PAT (ISO

18196:2007) is not permanent. It ages poorly, contracting and forming channels that end up altering the photographic emulsion.

Formerly, the use of chemically stable paper of either cotton fibres or paper pulp with an alpha cellulose percentage greater than 87% was recommended. They contained no dyes or any products prone to damage the image due to migration or decomposition. Likewise, they were free of chemical impurities, especially the sulphur derivatives in lignin or peroxides. Essentially – the papers referred to as permanent, and the use of alkaline reserve was recommended in order to prevent acidification of the photographic materials.

Currently, for a material to be declared apt for safeguarding photographs, it must meet two requisites: it must be permanent, and it must have the Photographic Activity Test (PAT) accreditation

Alkaline reserve in materials used for safeguarding photographs is currently discouraged. According to Fernanda Valverde, the current Director of the Photographic Materials Group (PMG), the Image Permanence Institute (IPI) initiated an investigation regarding this and discovered through stories of personal experiences that the storage materials with alkaline reserve had caused silver mirroring (showing the watermark from the protective paper sleeve in the “mirror”.) We know for certain that it is not recommended for processes that are slightly acidic in nature, such as cyanotypes and prints created using dye-transfer)[19](#).

As for arranging plates in conservation boxes, in the past the recommendation was to store them vertically, with the plates resting on either the long or short edge. Today, according to the ISO 18919 (2000) the plates must rest on the long edge and avoid being stored horizontally, given that the plates from the 19th century are very vulnerable to breakage due to their irregular thickness.

Nowadays, the only plastics recommended are polyester, polyethylene, and polypropylene, since they are inert synthetic

polymers. However, the plastics are airtight and are only recommended in archival rooms equipped with humidity and temperature control. Without these conditions, condensation may accumulate on the interior of the photographs, a softening of the gelatine agglutinate may occur and adhesion to the protective sleeve may result; microorganisms may even develop.

The future of photo conservation

Today, we say that photograph conservation is a new discipline, but the truth is that it is the newest of the specializations in conservation and restoration of cultural assets. Outside our field, it is largely unknown and at best is seen as interesting. People understand the restoration of a painting on canvas, of an archaeological object or a book, but restoring a photograph seems rather strange.

On many occasions, when a stranger has asked me about my profession and I respond that I am a photograph conservator, they are always intrigued, and immediately ask me the following question: and how is a photograph restored? A complex question, if ever there was one. Most people think that photographs can only be “restored” [20](#) digitally, or more precisely, through digital retouching. I then explain that photographs exist on many different supports: metal plates, glass plates, plastic supports, and the most common material - paper (without going into detail about binders, substances key to creating an image...). Lastly, I try to illustrate what restoring a photographic copy would be like so they can understand it: If you have a photograph with a fragment missing, you can make a graft using Japanese tissue, and if necessary, you can also apply a barite layer, the binder and finally, the chromatic reintegration, dot by dot, simulating the photographic grain.

Notwithstanding, photograph restoration is also widely unknown within the field of conservation and restoration of cultural assets. As

it happens, last year, I was working in a museum cleaning and conditioning some photographs when a group of people on a guided tour came in. When I explained that I was carrying out a minimal intervention: cleaning and conditioning, using conservation materials, one of the people in charge from another specialization, commented that photographs were not restored.

As Ian and Angela Moor say, the question as to whether intervention-based conservation treatments are appropriate or necessary, is naturally always a legitimate one. It is also fundamental to any evaluation of the criteria related to the proposal of photographic treatment.

However, this unfamiliarity with the discipline of photographic conservation and restoration is nobody's fault. It is we, the specialists, who must explain and divulge and assign value to our profession. In order to do this, we must start at the beginning: teaching conservation and restoration of photographs in the schools, at universities and museums and anywhere they will listen to us.

During a visit to Peter Mustardo's studio, Better Image²¹, in NY, he commented that the future of photography lies in digital prints printed directly on different supports, such as methacrylate, different plastic materials and metal plates...so, this is what awaits us as photograph conservators of heritage in a not-too-distant future ...

As for colour photography, from the analogue era to digital, we can be pleased to have achieved greater image stability, if we consider the instability of the first chromogenic ink processes compared to the stability of the current pigment-based inkjet prints. Another of the advantages of digital processes is that they are beneficial to the environment, given that they don't require water or chemical substances for the image formation and fixing process

As for the work situation, according to Reilly (2010), the growing economic value of photography and its unquestionable cultural

status, has given rise to professional conservators of photographs and their incorporation in the foremost museums all over the world. He applauds this change, although he believes it should have come much sooner.

Although Ian and Angela Moor claim that in 2006, in England, there were fewer indefinite-term contracts for institutional conservators, which meant that the majority had to acquire experience in the private sector: “Conservator posts when vacated are not being refilled but absorbed by existing personnel. Most Institutes are seeking to cover in-house photographic conservation needs by assuming paper conservators can meet these needs. Many advertisements for paper/archives/objects conservators now ask for some experience with photographs. There are very few photographic conservation specific posts being created and the few photographic conservator posts that have been created are not being filled, which is the case recently, because there are simply not the trained photographic conservators around with the ability and the experience required to work with photographs.”

Fernando Osorio explained at the 15th edition of the Conference in 2018, the challenges faced by the professionals in photographic heritage conservation that work in private entities in Mexico and Latin America. The main problem was that private collectors made large investments in acquiring the collections without contemplating their long-term management and conservation.

According to his experience: “The success of the great photographic collections in private institutions is based on several elements, such as a detailed long-term planning, a solid institutional philosophy and an efficient documental policy. In addition, there must be a permanent conservation and preservation team, a strong determination for investigation and documentation, a well-structured exhibition projection, and an interest in educating specialists and

public users about the most important topics in photographic heritage”.

The situation in Spain is different, and not in a good way, Maynés affirmed that in Catalonia in 2012, not one institution had hired a specialist in photographic Conservation and Restoration. Unfortunately, eight years later, the situation is the same; our valuable photographic heritage and its ongoing care and upkeep, is in the hands of professionals from other disciplines: archivists, librarians, historians, documentalists, photographers and paper conservators with limited knowledge about conservation of photographs.

Similarly, Maynés Emphasized the fact that in Spain, the contributions to the discipline of Conservation and Restoration of Photographs are almost non-existent. If it is true that there is still a lot of work to do, at long last, in 2019, the first course in this material appeared in Catalonia, the “Master in artistic teachings in the Conservation and Restoration of Photographic Heritage” (Máster en Enseñanzas artísticas en Conservación y Restauración de Patrimonio Fotográfico”,) at the School of Advanced Studies in Conservation and Restoration of Cultural Assets of Catalunya (ESCRBCC).

It’s a first step, though this year we saw first-hand the lack of knowledge the new students possessed in this specialization and we were left with the feeling that they hadn’t got as much out of the course as they could have. The ideal scenario would be for photographic conservation and restoration to be introduced in the first years of the official undergraduate degrees, as another course that is offered. This way, the students who later wish to specialize will possess a solid base and will get more out of the master’s and carry out more interventions and more specializations on the material.

Thus, I agree with Ian and Angela Moor that it is impossible to become a photographic conservator in one year, just as it is

impossible to become a conservator of books, paper or prints, or drawings in that time. As they say: “Photographic conservation should be taught as a minimum 3-4-year specialism in its own right and the programme should reflect both the preventive and interventive needs of photographs equally. This should be followed by a further 5 years skills-based experience at which point accreditation as a photographic conservator should be sought.”

Currently, the PMG-AIC committee is making a compilation of the countries where conservation of photographs can be studied as an academic discipline, which will later be published on their web site. To date they have included the following countries: The United States, France, Canada, Portugal, Mexico, Colombia, Poland, Denmark, The Netherlands and Spain and we hope that the list continues to grow.

Conclusion

Since the revision of the articles mentioned, subject of this text, I have reached the conclusion that in Photographic Conservation and Restoration, as in any discipline, we have gradually learned over time, made mistakes and subsequently improved our profession from day to day.

There are practices that were followed by the first generations of conservators and restorers which are no longer carried out, just as there are materials that were formally recommended and which we have now determined can cause irreparable damage to photographic specimens.

Today, as photography conservators, we are faced with a great task. This task begins with consolidating the stewardship of 19th-century photographic materials, with their multitude of typologies,

presentations and formats, and carries right up through to the latest contemporary digital prints. We can say that thanks to technological advances and ease of communication, to the exchange of experiences and the collaboration with other international conservators, we can gradually advance and progress in this wonderful specialty that is Photographic Conservation.

We live in the digital age and are aware that digitization is an increasingly important tool, given that internet is a reality and a great resource for sharing our photographic memory. In the technological era we live in, it seems like what is not on-line does not exist. Therefore, digitization is not only a tool for preservation, but also for the existence of our photographic memory.

As our dear Ángel Fuentes said: “a photograph that is not protected is a photograph that degrades irreversibly.” Because a photograph is composed of different materials and due to its chemical composition, it is more susceptible to suffering significant and varied kinds of deterioration in a shorter space of time than other materials.

We have an unbelievably valuable photographic heritage, which is a visual testimony to our own history. However, it is also the most complex and fragile of all our cultural assets and requires specific and urgent conditions that will guarantee its longevity. While it may be true that to date there is still a lot to do and that time is working against us, the good news is that we are advancing day-by-day. It is in our hands to give photography the heritage value it deserves and to finally do things right in order to secure its conservation for future generations.

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