Care of photographs

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1 | Introduction

It is hard to imagine the impact of photography at its inception in 1839. For the first time, people had the means of seeing an exact likeness of a scene. And not only that. A photograph provided a means of preserving that exact likeness for the future. Before 1839, people relied on drawing and painting, or describing a view in words to recall it. With the invention of photography, the viewer of the photograph could see the exact scene without having to be there in person. Understandably, the work of both the two early proponents of photography, William Henry Fox Talbot in England and Louis Jacques Mande Daguerre in France was received with great enthusiasm by society at the time. The newspaper *Gazette de France* wrote in its edition of January 6th 1839: "We announce an important discovery of .... M. Daguerre. This discovery partakes of the prodigious. It upsets all scientific theories of light and optics, and it will revolutionise the art of drawing.

M. Daguerre has found the way to fix the images which paint themselves within a camera obscura, so that these images are no longer transient reflections of objects, but their fixed and everlasting impress which, like a painting or engraving, can be taken away from the presence of the objects."[1]

In April 1839, the first examples of Talbot's work were presented to Queen Victoria and were "met with universal admiration from a large party"[2]. A review in the *Athenaeum* on 22nd February 1845 of *The Pencil of Nature* (the first photographically illustrated book which was produced by Talbot) stated that all who saw it would be "convinced that the promise of the art is great, and its utility and excellence, in many respects, of a high order".

Since these early days of photography until the present day photographs have continued to capture the imagination. Indeed, photographs are among the most accessible types of object in cultural collections. Everyone can relate to them. Virtually everyone has a personal collection of photographs. The proliferation of photographs has perhaps in one way been their downfall. They exist in relatively large numbers compared with objects such as paintings and sculptures and so they have not always received the same reverence or care. And yet the multiplicity of photographs is also why they are very important. They depict every aspect of human life and human emotion, now and in the past. They are to be treasured for what they tell us about ourselves and our society, for their artistic value, and in their own right as a record of the history of photographic processes. Not only are they important to us but they will be important to future generations.

Photographs do not always keep well over time. They do not just become torn and creased, they also fade and change colour. The issue of deterioration in photographs has been of concern to photographers since the earliest days of photographic history. In 1855, the Fading Committee of the Photographic Society [of London] produced a variety of recommendations on how the fading of photographs could be avoided or delayed. These included improvements on processes. Indeed, many subsequent types of photographic process were developed with the idea of permanence in mind. Some of these inventions have been more successful than others. But the intention was clearly there. The creators of these photographs wanted them to last. Over the years there has been a process of natural selection which ensures that before photographs come to the attention of institutions or family members, many will have deteriorated, been irreversibly damaged or lost. Therefore those remaining for future generations will only be a selection. And, some of these will be made using processes that are more prone to deterioration than others. Knowledge about the best ways to care for photographs has increased greatly in recent years, but photographic collections continue to require educated choices about their care and the ways in which they are used to ensure that they will tell their story in the future.

Although most people will have their own collection of personal photographs they may not be aware of the full extent of the photographic treasures in public collections. A medium size collection in a museum, library or archive may contain tens or hundreds of thousands of photographs. Large photographic collections number millions. A considerable amount of work takes place in cultural collections, often behind the scenes, to care for these photographs and make them accessible. Users of photographic collections might think that conservation consists entirely of repairing photographs one by one in a studio. This work is still carried out, but the field of conservation has grown and now includes the care of collections as a whole, making sure they can continue to be used. This ranges from considerations such as the environment in which the photographs are stored or displayed to the ways in which they are handled. All these factors have an influence on the life of a photograph. Many of these diverse activities relate both to large and small collections and this publication aims to provide a “snapshot” of the care of photographs in public institutions at the present time. Some personal collections, too, will become an important part of our cultural heritage in the future. They also need to be treated with care if they are to survive.

Many types of photograph have existed, but recently a radical new technology has been introduced: digital technology. This will have an effect on photographic collections in many ways. In 1999, the sale of digital cameras exceeded that of all other types of camera together for the first time. Already collections are beginning to amass work that has been produced digitally. How will these images be preserved for the future? Conventional

photographic collections are already being digitised under the criteria of access and preservation. What kind of impact is this having on photographic collections? Digital technology is not a panacea, but it offers many exciting opportunities. Some of the aspects of this new technology are considered in the following chapters, with some suggestions for the impact this will have on the care of photographs in the future.

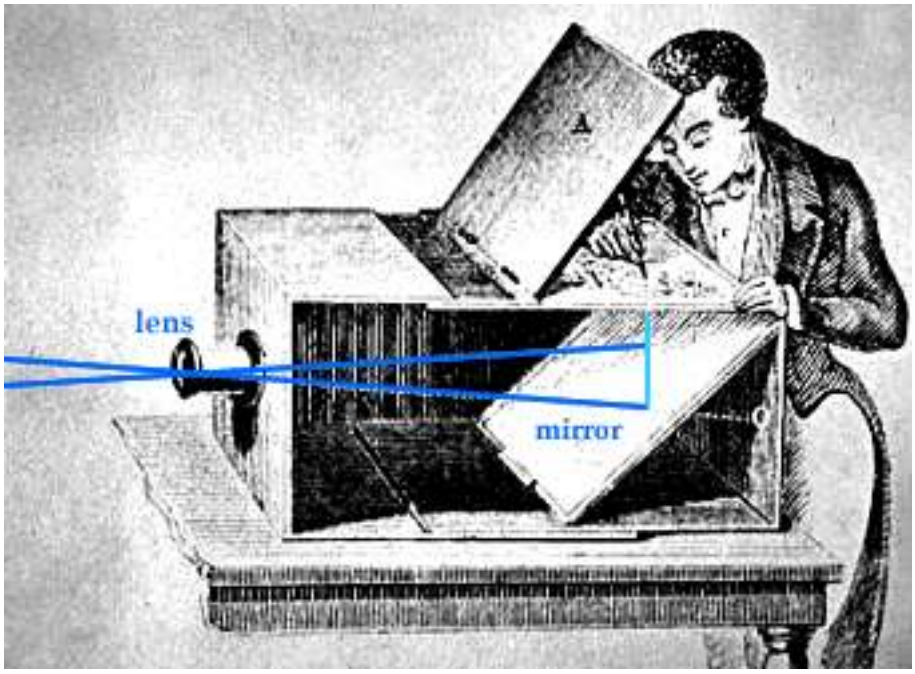
References:

1. Reprinted in full in B. Newhall ed., Photography: Essays and Images, (New York: The Museum of Modern Art, 1980) pp 17-18.
2. LA39-32 – 13 April 1839 (Theresa Digby to Talbot), manuscript in the Lacock Collection, Talbot Museum, Wiltshire.

*It is not the role of this booklet to cover copyright, but it should be borne in mind that copyright issues can limit the use of and access to photographic collections. Institutions have to be fully aware of the restrictions imposed by copyright laws.

2 | What is a photograph?

The word “photography” is derived from the Greek and literally translated means “writing with light”. A surface must be capable of permanent alteration on exposure to light in order to produce a lasting image. Throughout the late 1700s and early 1800s the light sensitivity of various chemicals was observed and even used to produce images. The earliest camera images, called Heliographs, were produced by Joseph Nicephore Niepce in the 1820s. They consisted of a bitumen-coated plate which hardened on exposure to light and was subsequently developed in lavender oil. The images were produced in a camera obscura*(Fig.1) with an exposure time of several hours to days, and so the process was not very practical. Experimental work by others also resulted in images, but these images continued to darken when viewed under light, and it was not until 1839 that more practical methods for producing lasting images were described by Talbot and Daguerre.



*Before an image can be captured, a suitable optical device is required. By 1839, the camera obscura had already been in existence for many centuries. In the camera obscura light from an image of the outside world passes through a small hole and produces an inverted image on a facing surface. Often a whole building was used as a camera obscura, with a hole being cut in an external wall and the image projected on to a facing wall. Various adaptations were made including the use of lenses and screens, and employing tents instead of buildings. This enabled the camera obscura to be transported and used for shows, or by artists for making tracings.[1] It was the camera obscura that was to become the basis for the photographic camera, where light is passed through a small aperture and focused by lenses on a light sensitive surface.

Daguerre and Talbot had slightly different priorities in creating a photographic process. Both were concerned with producing an exact likeness, but Daguerre was a commercial artist who thought in terms of producing prestigious unique images. His Daguerreotype

images were produced on a silvered copper plate that was exposed directly in the camera. The images were presented in a case or frame, and purchased by relatively wealthy customers.

Anonymous, Daguerreotype

Talbot, a frustrated amateur artist, was not only interested in photography but also in printing techniques. With Sir John Herschel, he devised the idea of a negative from which many positives images could be produced. Talbot's processes, including negatives, resulted in silver images on paper. (The paper negatives were waxed to make them translucent before use). The negative was produced by exposure in the camera, and the positive was then produced by passing light through the negative to the light sensitive paper placed in contact with it. This idea is taken for granted now, but at the time, the merging of the principles of photography with the concept of printing was farsighted. While the Daguerreotype had virtually ceased to exist within 20 years, Talbot's work lead to the conventional photographic processes of today, where many prints can be produced from one negative.

William Henry Fox Talbot, "Leaves of Asparagus," 1840

In the early days of photography, making a photograph demanded much more of the photographer than the "point and shoot" snapshots possible today. The photographic materials often had to be prepared by the photographer, unlike later machine-made ready-coated supports. From the 1850s to the 1880s virtually all negatives were wet collodion negatives. These were glass negatives which had an emulsion of collodion (gun cotton in ether). The emulsion had to be coated in a portable darkroom and exposed while still wet. These negatives were contact-printed which meant that there was no scope for enlargement from the negative and so the negatives were much larger at that time. Therefore, there were

significant logistical problems in transporting all the materials required for making photographs.

Many early photographers endured considerable hardship to bring their images to public view. For example, Samuel Bourne took many wonderful photographs of the Himalayas, but this required him to go on expeditions for several months, transporting his glass plates and chemicals mostly by mule, and at one point carrying them across a river on inflated buffalo skins. Roger Fenton, a pioneer of photojournalistic photography in the Crimean War, needed to take 36 large chests of provisions to the Crimea, including a darkroom which was a former Canterbury wine merchant's carriage. The temperatures in the Crimea were so hot that touching the carriage would cause the skin to burn. His problems were compounded by plagues of flies which had to be cleared from the carriage, the door closed (causing the temperature to rise still further) and dust allowed to settle before preparation of the plates could begin. Despite thinning the collodion, it was still almost too dry to be developed after the time needed for exposure had elapsed.[2] Even so, many of Roger Fenton's images have survived as some of the icons of 19th century photography.

Exposure times in early photographs were longer than today; many seconds in some instances. Judging the correct exposure time required considerable expertise on the part of the photographer. Emulsions varied from plate to plate and weather conditions changed. For this reason figures and moving objects often appear blurred in scenic views. For portrait photography sitters were frequently held still by clamps around the neck and waist, hardly conducive to a friendly expression!

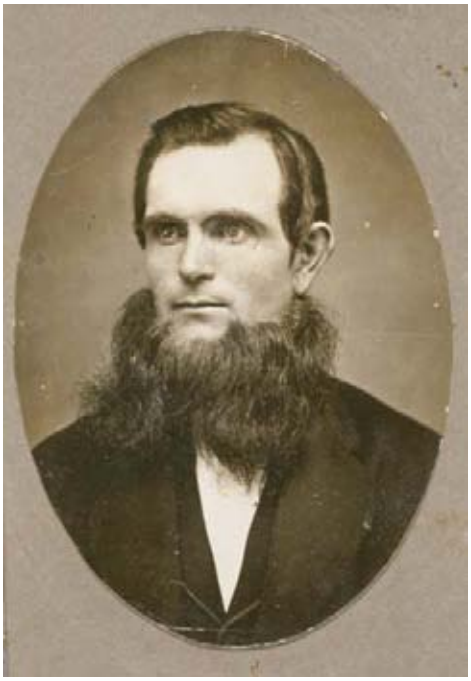
Practical skills were required for the preparation of prints as well as negatives. Prior to the 1860s, most photographic paper had to be coated by the photographers themselves. The printing paper was exposed in daylight and therefore the exposure time could vary considerably from minutes to hours. Wet collodion negatives were overly sensitive to blue light, often resulting in over-exposed skies. Therefore many photographers used separate sky negatives and the final print was a combination image from several negatives. With all the practical difficulties associated with early photography it is remarkable that so many fine prints were produced. Indeed many 19th century prints show much greater detail than those of today because they were contact-printed and not enlarged from a small negative.

Anyone studying the history of photography will see that most processes are adaptations of earlier ones with perhaps one or two materials changed. The evolution of photographic processes was driven by aesthetic sensibilities, a desire for permanence, and practical considerations such as the ease of use and cost of materials. All conventional photographs consist of at least a support and a chemical which forms the image. Most photographs also

contain a binder which is often (but not always accurately) referred to as the emulsion. This holds the image in a distinct and separate layer on the surface of the support. In addition to

these layers there is sometimes an intermediate layer between the support and binder which may serve a variety of purposes. Obscure processes or processes since the early 20th century may contain even more than three layers.

From Talbot onwards, the major image-forming component of black and white photography has been silver. However, two other groups of materials are found in the final image in prints from the 19th and early 20th century. These are metals other than silver (namely iron and platinum) and pigments. These other groups are not unusual in collections but generally occur in much smaller numbers.



Example of a printed out prints (P.O.P.)

The ssence of the formation of the image in all silver processes is the conversion of silver halide (ie. bromide, chloride and/or iodide) to silver triggered by the presence of light. There are two main ways that this can take place and these produce either printed out prints (P.O.P.) or developed out prints (D.O.P.). In printed out prints the sensitised printing paper is exposed to light (usually daylight) in contact with a negative, in a printing frame, until the final image appears. The printing paper is then fixed and washed. There is no development stage. The printing out process results in a sepia coloured image and to many people this is the typical sepia image of the 19th century. Printed out prints were sometimes toned, often with gold which gave a purplish brown hue.

In developed out prints the sensitised printing paper is exposed to artificial light (usually under an enlarger) for a short period of time. This produces a latent image which is not visible to the human eye. The printing paper is then chemically developed until the image appears. After this, the printing paper is placed in a stop bath, fixed and washed. Developed out images give the most neutral black and white images typical of 20th century photography. Late 19th and early 20th century black and white negatives are also developed out images.

In a less common third type of silver image formation, silver is deposited from the developer on to the silver particles of the latent image. This is known as physical development. Physical development produces slightly colder, more neutral tones, than printed out prints. Early and mid 19th century negatives were also produced in this way.

Despite some pioneers in the mid 19th century it was not until the early 20th century that practical colour photography was introduced. The earliest process most people might see in collections is the Autochrome, which relied on dyed starch grains for its colour, and had a glass support. This was in use just prior to the First World War. However colour paper and film materials did not come into more common use until the 1930s and 1940s.

Detail of a autochrome

Early processes relied on additive synthesis which meant that red, green and blue light, (the primary colours) were added together in varying proportions to produce the final image. If all the colours were added together white light was produced. One of the main examples of an additive process is the Autochrome. However, subtractive processes soon took over as the mainstream and these ultimately relied on dyes being formed in the photograph which absorb (subtract) undesired colours from white light to leave the colours required. The common subtractive processes were introduced from the 1930s onwards, including Kodachrome, Ektachrome and Agfacolor. Ironically, silver does not only play a major part in black and white photography but also in colour photography. The difference is that the silver is not usually present in the final image in colour photography. Its role is to trigger the process of image formation by conversion from silver halide to silver, in turn causing the correct dyes to be formed in the correct locations. The silver is then bleached and removed.

Apart from the various image forming materials, there have also been variations in the binders and supports used. The main binders for negatives and positives evolved from egg albumen to collodion and gelatin, (although albumen was not widely used for negatives). The main supports for photographs include glass, paper and film, but metal, cloth and leather were also used. 19th and 20th century photographers draw repeatedly from this group of materials to form new photographic processes. Although these are the materials found in the vast majority of photographs, there are always oddities, particularly from the

19th century when photographs were largely handmade and there was considerable experimentation by individual photographers.

In recent years, a major development has been the introduction of digital photography. Despite the fact that it relies on very different technology to conventional photographic processes, it still contains some elements of photography. As a new technology, it continues to be rapidly updated. In essence, it relies on light hitting a surface and producing a localised electric charge in the surface. The magnitude and location of the charge can be detected and converted to a digital signal; a series of 0s and 1s. This digital information can be relayed and stored in various formats and the variety of formats continues to increase. They vary from tapes to disks, (CD, DVD) with magnetically or physically altered surfaces. There are also hard copies (namely paper) produced from digital information in a further variety of techniques. Some of these hard copies still have attributes associated with conventional photographic processes, such as a gelatin layer, but many have just as much in common with other printing processes.

It is clear from the above that photographic processes can be quite diverse, and correspondingly the results achieved by different processes can vary considerably in similar circumstances. The original photograph can therefore convey information or a quality which cannot be reproduced by another process. This also means that some processes have been more suitable for particular effects. So, a photograph can also be partly defined by the relationship between the process and subject matter. For example, at the advent of photography the Daguerreotype was largely used for portraits. Its role was superseded in turn by the wet collodion positive (commonly called Ambrotype) and the tintype. Each of these processes was cheaper and easier to accomplish than the one before, and commercial portraiture became progressively more accessible to the mass of the population. Therefore the Daguerreotype tended to depict the relatively wealthy and was expensively presented, whereas the tintype often depicted the working classes on a day out and was less posed and more crudely made. Talbot's photographs depicted a variety of scenes or general views. His sepia printed out images had no binder so the paper fibres were clearly visible, giving a soft pictorial effect to the image. This effect was further increased by the fact that these prints were produced from waxed paper negatives which did not give sharp definition. The introduction of the wet collodion negative on glass together with the albumen print could give a very sharp finely detailed image and it was the conjunction of these two processes that gave photography the boost to become a popular medium. These are a small selection of examples of the relationship between process and subject matter, but they serve to illustrate the information which can be gained from a photograph.

There are many characteristics which can be used to identify photographic processes. Correct identification in many cases is vital so that appropriate preservation techniques can be devised and safely carried out. However, identification is not always easy, even for the professional, and there is no substitute for experience and comparing known examples with others. Some of the more readily accessible characteristics are listed below, but for a conclusive identification they are not always sufficient and even an expert will sometimes have to use laboratory techniques.

Identifying characteristics include:

- Positive or negative.
- Number of layers.
- Materials used.
- Surface finish/ texture.
- Colour or black and white.
- Contrast and tone.
- Format (size).
- Method of presentation.
- Inscriptions and edge markings.
- Image substructure. (If a regular pattern is visible, either with the naked eye or under magnification, a print is likely to be a photomechanical reproduction rather than a photograph).
- Reproduction of detail.
- Type of deterioration.
- Date.

The accompanying table illustrates the major photographic processes and their most obvious identifying characteristics. Colour photographs are more complex to identify with differing products under the same trade names at different times and so have generally not been included. For reasons which are explained in the next chapter, detailed identification of colour photographs is often unnecessary as preservation solutions will be the same for different processes.

References:

1. Coe, Brian, The Birth of Photography, London, Ash and Grant, 1976, pp9-11.
2. Strasser, Alex, Victorian Photography, London and NY, publisher unknown, 1942, pp 37-39.
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3 | Problems and solutions for photographic materials

Photographs are perhaps one of the most vulnerable types of object held by museums, libraries and archives. They frequently display problems which reflect their past circumstances. Users and owners of personal collections of photographs will be familiar with some of the more obvious types of deterioration such as fading and changes in colour in slides and prints. But in order for photographs to be preserved, deterioration needs to be reversed as far as possible, and also prevented in the future.

It is a common perception that most conservation work is carried out in a studio behind the scenes in an institution, repairing damaged objects. It is true that this is still an important part of conservation, but in recent years, particularly for photographic collections, conservation has expanded to cover the wider issue of care for collections as a whole. This includes, for example, developing policies about handling the collection and the environment in which the photographs are used or stored. In institutions too small to employ a conservator, outside conservation advice is usually sought and in house staff (curators, archivists, librarians) will be responsible for the general preservation of the collection.

Deterioration in photographic collections can be divided into three main types. The first is physical (structural and mechanical) damage. Examples of this are tears, creases, holes and abrasion. This type of damage is usually cuased by poor handling or poor methods of storage and display. The second type of deterioration is chemical damage and includes, for example, fading, colour change and tarnishing (sometimes called “mirroring”). The causes of this may be internal components of the photograph itself or external chemicals such as pollutants. The final type of damage is biological and can be active or inactive. This usually refers to mould, insects or rodent damage, although it is not unknown for a pet to sabotage a collection of family photographs! Frequently a photograph will exhibit several kinds of deterioration. The environment surrounding the photograph and the way it is used will have a considerable impact on the rate of deterioration. Chemical and most biological deterioration can increase considerably in warm damp conditions.

Inevitably whether for institutions or personal collections there are financial constraints and so choices have to be made about which problems require the most urgent attention. Sometimes, in an institution, practical conservation treatment of an individual object takes priority. Sometimes the priority will be changing a factor affecting a collection as a whole, such as lowering the temperature. Judgements about the priorities for conservation will take into account factors including the photographic processes involved, the rate of

deterioration, the environment surrounding the photographs and the probable use of the photographs. It is not worth treating a photograph and then returning it to a destructive environment. Sometimes there may also be different ways of approaching the conservation of an object. Unfortunately not all problems are treatable with conservation, for example most types of fading and tarnishing cannot be reversed. However, altering the environment can have a significant effect on the future rate of this type of deterioration and therefore prevent further damage. Specific examples of material in general photographic collections which might have a high priority for attention are mouldy photographs, or early 20th century film-based negatives in a warm environment which are deteriorating rapidly, or torn prints which are frequently viewed and handled.

There are established guidelines for the work of professional conservators. The intention of remedial conservation treatment is to preserve the integrity of what remains of the original object for as long as possible, thus rendering it accessible to the maximum number of people, now and in the future. Practical conservation treatment of an individual photograph takes place after an assessment of the photograph which may include consulting other scientific and historical experts. This will determine the composition and condition of the photograph and the nature of any alterations. This helps to evaluate the causes of deterioration and the type and extent of any treatment needed.

Professional conservation treatment usually consists of one or more of the following stages:

a) Dry cleaning to remove surface dirt (using a dry substance to which the dirt adheres and can be gently brushed clear).
b) Wet cleaning to remove stains and deposits
    i) using water or water vapour
    ii) using organic solvents
c) Repairs – using adhesives and sometimes other materials, such as paper splints, to add further strength to the repair.
d) Replacement of good quality conservation materials for poor quality original materials where one component of an original is considerably speeding up the rate of deterioration of the rest. Examples of this would be changing the backing board in a framed photograph, or replacement of strawboard boxes with conservation board boxes. (All original material is generally kept, even if it has been necessary to separate it from the rest of the photograph and the rest of its housing, as it still can tell us something about the original photograph).
e) Addition of good quality materials to reduce/prevent the deterioration of one component caused by another, (for example an additional museum board backboard, or a window mount to separate the cover glass and photograph in a frame).

It is not the purpose of the conservator to detract from the original creation by adding cosmetic work or by overly invasive conservation treatment. It should be possible to see where conservation has been carried out, but conservation should not be obtrusive. Often it will be a compromise. What might be beneficial to one component of a photograph may be detrimental to another and so conservation has to achieve the optimum life for a photograph overall. It is also considered important that conservation treatment should be reversible as far as possible in case it should ever need to be undone, for example in the event of another type of damage occurring later, or if new improved treatments become available.

As mentioned earlier, one major way in which conservation has evolved is in its broader responsibility for care of collections as a whole. Photographs often occur in relatively large numbers in public institutions and general collection care can have more of an overall impact on a collection than individual conservation treatment. This more modern approach to conservation, of which practical conservation treatment is only a part, although an important part, is usually referred to as preservation. Preservation covers storage and display (materials and the environment) and policies for minimising damage during the use of photographs.

It is very important for all photographic collections that the environment is kept within reasonable limits. There are essentially four major environmental factors that need to be considered: temperature, relative humidity, light and air quality. High levels of temperature, relative humidity, light, and poor air quality can all cause greatly increased rates of chemical deterioration, such as fading and tarnishing. High temperatures, or extremes of relative humidity (both very damp and very dry) can also cause irreversible physical damage, such as flaking or peeling emulsion.

The interaction with the environment works in a different way for physical damage compared with chemical damage. Physical changes such as curling may occur over a wide range of relative humidity, but at a given temperature there is a set upper and lower limit of relative humidity outside which that change suddenly becomes irreversible. For example, at 25°C, the physically safe range is 35-60% relative humidity and at –25°C it is 20-40% relative humidity.[1] These limits provide the minimum environmental standards for any collection. The physical changes are primarily concerned with extremes of relative humidity. However, the chemical rate of deterioration shows a steady proportionate increase as the temperature rises. For example, if at 21°C (50% relative humidity) the rate of deterioration is assumed to be 1.0, at 15°C (50% relative humidity) it will be approximately ½ and at 10°C it will be approximately ¼. Therefore while it is possible to be definite about

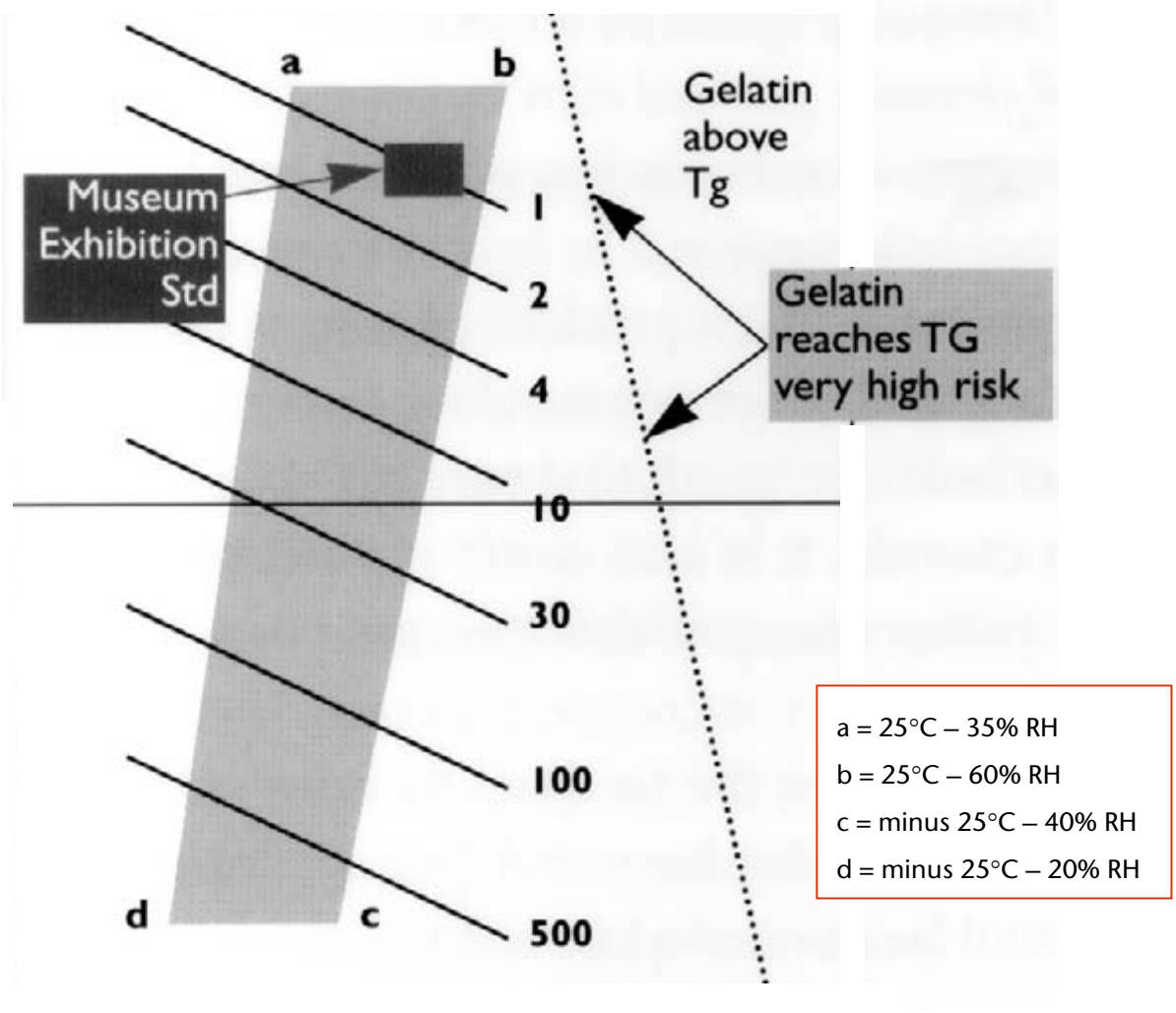
the acceptable parameters for environmental conditions being set to prevent physical damage, the choice of temperature to prevent chemical damage, such as fading and tarnishing, is not so well defined.

The rate of chemical deterioration gradually increases/decreases with temperature. The upper temperature limit should be set at what is considered the maximum allowable rate of deterioration for the most sensitive material in a collection. Take, for instance, two types of photographic collection at the same temperature. One fades visibly after 10 years, one fades visibly after 100 years at that temperature. If the temperature is allowed to rise by the same amount for both, where the rate of deterioration for both doubles, one will fade visibly in 5 years, one in 50 years. Clearly in the first case, reducing the temperature is an even more immediate priority. Imagine that severely torn, frequently requested photographs were also present in both collections. In the second collection with photographs fading at a slower rate, the priority for the next year might be to repair the torn photographs, rather than lower the temperature. In the instance of the collection containing photographs fading faster, the priority might have to be to improve the environment as an immediate step. The judgement will be based on a combination of published research data and experience. Judgements constantly have to be made to ensure that the resources are spent most effectively.

Carte de visite.
Fading and yellowing of an albumen print

As deterioration slows down at lower temperatures, it would seem logical that cold storage will provide the optimum conditions for preserving photographs and this is indeed true. Cold storage vaults have been in existence for some time in a small number of larger institutions. However, photographs need to be warmed up very slowly to avoid condensation and physical damage, and this obviously creates certain practical problems, namely how to access the material. In recent years, methods of reusable sealed packaging have been devised, which mean that, for example, a box of film negatives can be brought from freezer temperatures (-18°C) to room temperature in 2-3 hours. This has brought the advantages of cold storage to much smaller collections with lower budgets as they can now use domestic freezers for small quantities of less stable photographic material. The high relative humidity inside the freezer is no longer of importance because

the bags are only ever opened and closed in an environmentally controlled room at room temperature. Further research continues to find even quicker and more economic ways of achieving the advantages of cold storage. The photographs in this type of storage also lend themselves to duplication, so that copies or digital access can be provided for casual enquiries and the original material is there for more detailed viewing and continues to remain so. Cold storage is not necessary or suitable for every kind of photograph, but it has a particularly beneficial role in the preservation of colour and early film-based material.



© Diagram: Museum and Galleries Commission

Given the fact that light is so fundamental to the creation of photographs, it is not hard to see why some photographs still continue to retain some degree of light sensitivity, particularly if they were not processed well. Byproducts of the photographic process are sometimes light sensitive as well, and some of the original constituents of photographs have also turned out to be detrimental in the presence of light, causing effects such as yellowing. Unfortunately, with most processes, fading due to light is not reversible and can only be limited by minimising exposure in the first instance. The degree to which this is

necessary depends on the sensitivity of the material. This explains why light levels in research and exhibition areas often need to be reduced. Another solution is to reduce the time of exposure by, for example, having lighting which responds to the presence of people and is only on when people are present, or having a moveable cover over a case which can be lifted during viewing and replaced. Sometimes, even in exhibitions, copies are displayed instead of originals when the originals cannot be safely exposed to light, for example William Henry Fox Talbot's early photographs. Conservation always has to balance access for people now against access for people in the future.

Air quality is also an important environmental factor in the care of photographic collections and airborne pollution can be very damaging. Photographic collections stored in industrial areas often show considerable discolouration and fading. Most pollutants are oxidising agents in various forms. These include peroxides, nitrogen oxides, ozone, sulphur dioxides and hydrogen sulphide. Photocopying machines are a source of ozone, which acts as a bleach, and for this reason photocopiers are not housed in areas where there are original photographs. Paints are a source of peroxides and photographs should not be placed in redecorated or newly decorated rooms until the paint has hardened and dried, which may take several weeks. Water-based paints tend to be less damaging than oil-based paints. Likewise floor finishes and furnishings can generate similar gaseous pollutants. Cleaning materials for storage, research and display areas have to be carefully chosen. For example, bleaches and cleaning agents containing ammonia are particularly harmful to photographs. Dust also contributes to physical damage through abrasion, and chemical damage. Building work can be a major source of contamination.

Apart from these environmental factors, the other main sources of deterioration in collections as a whole are the storage and display materials and methods used. Examples of poor quality storage materials are strawboard (which was used to make the original suppliers' boxes for glass plates), unrefined wood pulp boards and some plastics, primarily PVC (polyvinyl chloride). (PVC has been used, mostly in the past, for plastic sleeves and album pages). These materials cause chemical and physical damage. For example, original strawboard boxes emit oxidising agents which cause silver images to tarnish, discolour and fade. The boxes themselves degrade and become brittle, often splitting at the corners. This can result in physical damage as the negatives slide out of the box and are easily broken without due care. Adhesives used in the past for enclosures and mounting photographs often become brittle and brown, causing further discolouration. Framed photographs frequently suffer from poor quality mounts and backing boards. Fortunately there are now good quality conservation materials available which fulfill the required criteria for being suitable for photographs.

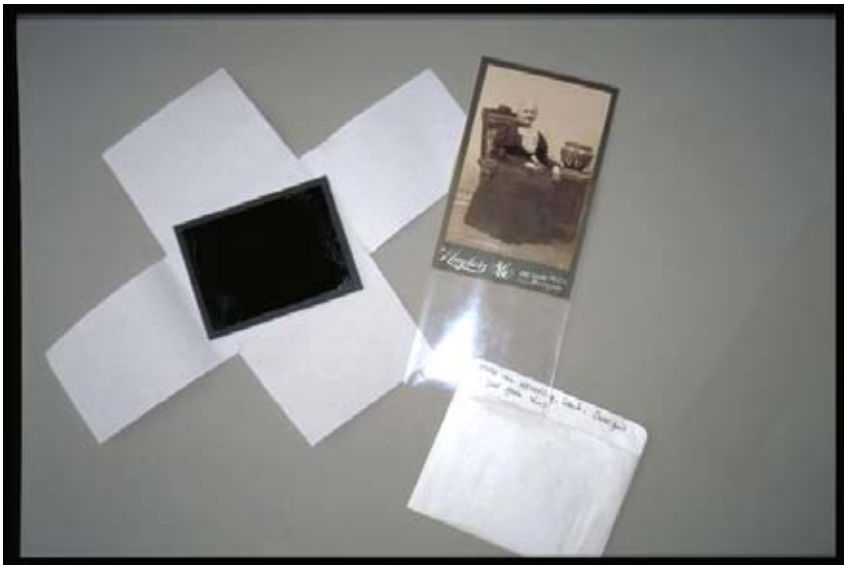
PAPER AND BOARD FOR PHOTOGRAPHIC CONSERVATION PURPOSES SHOULD:[2]

- have a high alpha-cellulose content (above 87%)
- have a pH of 6.5-7.5
- have an undetectible, reducible sulphur content be free of lignin, pH buffers, metal particles, acid, peroxides and harmful sizing agents

Examples of photographic conservation papers are Silversafe®, pHoton™ and Microchamber®. Examples of photographic conservation board are TG Off white and Dull White Heritage 100% Cotton Museum Board and Microchamber®.
The most widely used plastic in heritage institutions is polyester (known as Melinex® or Mylar®).

PLASTIC SHOULD:[3]

- be free of plasticiser (added to make it flexible)
- not be glazed or coated on the surface



Papers and boards are used for repairs, and as storage materials and display materials. Glass and early film-based material (at room temperature) are usually best stored in paper sleeves. Four flap envelopes are often used as the design means that there are no adhesives which might cause problems in the future.

Plastics are used mostly as sleeves. Later film-based material, or early film-based material which is to go into cold storage, or prints can be stored in plastic enclosures. The exception is where the surface of a photograph is fragile, for example with hand colouring or flaking emulsion, as there may be a problem with surface damage of photographs.

Photographs sleeved in either paper or plastic can then be stored in cabinets or in conservation grade boxes on shelves. Photographs going into cold storage in freezers require the sealed packaging mentioned earlier.

Consideration also needs to be given to the constituents of any cabinets or display cases so that they are safe for photographs. If innovative materials are proposed for use in a display, they can be scientifically tested in advance to determine whether or not they will be safe for photographs. The same can be done for the finish on cabinets, although it is already known that cabinets should be made of metal with a baked enamel or powder-coated finish. Anodised aluminium is also suitable. New wooden cabinets are not generally advisable as they tend to give off damaging fumes. Sometimes as an interim measure, old cabinets can be lined with Microchamber paper (which contains chemicals which actively absorb pollutants) until the cabinets can be replaced.

There is one particular film base found in photographic collections which requires special attention. This is cellulose nitrate. It was introduced in 1889 and used until about 1950. (Old stock may have been used after this date). It was used for both motion picture film and still images. It is relatively flammable, and degraded film can catch fire at temperatures as low as 38°C. As it degrades it turns brown, becoming sticky and brittle, and eventually becoming an opaque beige powder. It is very difficult to extinguish if it catches fire as it

produces its own oxygen as well as very toxic fumes. For this reason, and the fact that it gives off gases which can damage other photographs, it should be separated out from other photographs and placed in cold storage, or in a separate well-ventilated room. However, cellulose nitrate which is severely degraded should not be retained in any circumstances in the interest of the rest of the collection and health and safety. Some institutions feel they cannot provide adequate facilities for material which poses a storage risk, and therefore duplicate and dispose of the original material (which has to be done by arrangement with the local authorities). However, it is preferable to keep the original material if the storage facilities are available.

Nitrate degradation

The other two areas of preservation which should be mentioned here are good handling and housekeeping practice. Most of these two areas are common sense and may seem quite mundane, but simple good practice can play a considerable part in helping to maintain a collection in good condition. They are also often the cheapest and simplest measures to put into effect. Examples of these include always handling photographs with clean hands (and cotton gloves where appropriate), and not eating, drinking or smoking where photographs are handled and stored.

Most institutions also have a plan for coping with different types of disasters, usually fire or flood which unfortunately can occur in the best protected institutions. Even in a fire, the major cause of damage can actually be due to water used to put the fire out. Unfortunately there is often a time delay after the fire has been extinguished, or after a flood, before being

allowed back in to a building and this can result in mould damage. Most institutions take practical steps to minimise damage in the event of any disaster, for example, not storing collections in basements where water may collect, not having water pipes running directly over storage areas and raising all the collections off the floor. They will also have the conservation equivalent of a first aid kit in case material needs to be removed rapidly and to protect the staff involved.

It is clear from all the factors described above that preservation is important, from the selection of new premises for a collection, to the choice of storage materials, to the general use and maintenance of a collection. It is an integral part of the everyday life of a photographic collection and is essential for providing the widest possible access. It is also self evident that those who work with a photographic collection, and those who use it both have a part to play in ensuring it survives for the future.

References:

1. McCormick-Goodhart, Mark H., The Allowable Temperature and Relative Humidity Range for the Safe Use and Storage of Photographic Materials, Journal of the Society of Archivists, Vol.17, No.1, April 1996, pp7-21.
2. Clark, Susie, Preservation of Photographic Material, London, National Preservation Office, 1999.
3. As 2.
4. As 2.

SAFE PRACTICE FOR HANDLING AND HOUSEKEEPING[4]

- Clean hands should be used for examining photographs, preferably with lintless cotton gloves, to avoid leaving finger-prints and stains on photographs.

- Working surfaces should always be clean. If necessary, the surface can be covered with cheap, plain paper such as unprinted newsprint, which can be changed as soon as it becomes dirty.

- Two hands should be used to hold the photograph and if possible the photograph should be supported with a piece of stiff card, especially if the photograph is fragile or brittle. The emulsion surface should not be touched as far as possible.

- If a photograph appears stuck to its container, a conservator's advice should be sought about removing it.

- Loose prints and glass plate negatives should not be stacked up as this can cause physical damage.

- Tightly rolled or curled prints should be left to a conservator for treatment.

- Photographic albums should be supported with a book cradle (specific V-shaped support) to protect their structure when open. Book snakes (snake-like covered weights) should be used to hold the album open at the relevant page.

- Do not eat or drink while examining photographs. Smoking can also harm photographs as even short-term exposure to nicotine can cause staining.

- The use of ink, especially felt-tip pens, should be avoided. If photographs become at all damp, the ink may travel through to the image side, and the caption may eventually become illegible, as well as damaging the original. An HB pencil should be used.

- Adhesive tapes, staples, pins, metal paper clips and rubber bands should not be used as they can all cause physical or chemical damage.

- Photographs should only be viewed in light which has been ultra-violet filtered to avoid damage.

- Dust may harm photographs, not only because surface dirt may build up on them, but also because dust will cause scratches and blemishes. Therefore the environment should be kept clean.

4 | Access

Photographic collections are used in a variety of ways that are depending on the purpose of the collection. An exhibit might reveal the pearls of a collection of fine art photographs to a public that will travel to the institution that holds the collection. A historian might find clues to an important event in the past in a specific photograph. Photographs might be used to be reproduced in a history book or newspaper. A researcher might be conducting a study on a photographer and therefore will have to get a close look at the work of this artist. These are just a handful of examples of the use of photographic collections. What is common to all these activities is that the photographs have to be accessed in some form.

There are various ways to access a collection. A few examples shall illustrate a couple of possibilities.

One can imagine a large collection of glass plate negatives. Since it is not possible to access the pictures without handling all the heavy glass plates, and in addition it is very difficult to make judgments about a picture when looking at the negative, the collection will most probably not get used, unless there are tools available to make access easier. One possibility would be to make prints of the glass plate negatives and file the prints, but this still does not make it very easy to find the picture one is looking for. Therefore, some information about the pictures has to be collected and put into a system that makes searching, and therefore access easier. One way of storing the information could be to create a card catalogue. The user will have to browse through the cards to find the photographs. Another approach would be to put the information into a database and the user will have to use a search engine to get the pictures he/she needs. Once the correct photographs have been identified, it will be easy to pinpoint the file cabinet where the print from the glass plate is located.

Another collection consists of hundreds of valuable fine art prints. Since some of the prints date back to the late 19th, the conservator of the collection recommended to store the prints in a cold storage vault, where special access rules are in place. This means a solution needs to be created for accessing the photographs. One route to take would be to produce duplicates of the prints that can be accessed easier than the originals since they are stored at room temperature. However, the creation of good duplicates is not cheap, and the conservator advised to keep the duplicates in a cooler storage area as well. That means that another way has to be found for accessing the collection in an easy manner. One way to go

could be to digitize the original prints at the same time a conventional photographic duplicate is being made. The digital images are being put into a database program together with the information about the photographs, and a search for a specific photograph is not only bringing up the information on the screen but also a good quality digital image can be viewed.

A third collection is a large collection that is heavily used for publications of all sorts. The photographs are in various states of deterioration, and the collection is housed at room temperature. The decision is being made to move the collection into cold storage to slow down deterioration. But what happens to access? Since the photographs are heavily used, a conventional duplicate would be deteriorating at a high rate as well. The decision is being taken to digitize the collection at very good quality, high enough to satisfy most if not all of the needs for reproduction. In addition, cataloguing of the photographs has to happen to make it possible that prospective users can find the pictures they are looking for. Good detailed information about a photograph enables easy access and easier match to specific requests with a specific photograph.

All these examples illustrate, that there are various ways of accessing a collection – there is not one right way – every collections has its needs and the access strategy taken needs to be adhered to that. It is also important to keep in mind, that there are several areas that have to be worked through to access a collection. First of all, a survey of the collection has to be conducted to know what kind of photographic materials can be found in the collection. The findings of this survey will help to choose the right approach to getting access to a collection. If either conventional duplicates or digital files are used for access, a plan for their creation has to be worked out. In addition, a lot of information about the photographs has to be collected in order to be able to search for a specific picture. This information if in most cases extensive and collecting it is very labor intensive. There are many more tasks to perform until access is gained and it is obvious that only a team with a specific skill set will be able to be successful. Partners in the team are an imaging person, e.g., a photographer, a conservator, an IT person, a collection manager, a cataloguer and a preservation person. All decisions along the way have to be taken as a team.

Most importantly, one should never forget that access has to be granted in a way that is not harmful to the originals. The role of preservation in the use of collections is to provide access in the most effective and safe way.

Access and preservation work together particularly well in the area of cold storage. Cold storage for occasional access to the original photographs, in conjunction with duplicates for frequent access, is a good solution for a significant number of collections.

Developments in cold storage methods make it more and more feasible. Due to warm up time needed when accessing photographs, it is usually necessary to make appointments in advance to see original materials. However, if duplicate access is available and the advantages of cold storage are made clear, this is generally acceptable. This can be eased even further with having a digital image of the photograph at a quality high enough for most uses accessible.

5 | Digitizing photographic collections

What it boils down to is that photographs are not stable as was explained in the earlier chapters. This means that in one way or another the photographs have to be copied to keep them "alive."

The best managed conversion projects have clear goals. Brainstorming, the first phase of project management, is the time to talk about the outcomes. "Starting at the end" is an effective way to ensure smooth beginnings. Too often there is still a tendency to dive right into questions of technology, e.g., which scanner should I buy? before articulating the purposes that digital reformatting must serve. The starting-at-the-end approach refers to focusing on outcomes before analyzing source materials or evaluating conversion processes.

Setting goals is a process of thinking about things from several angles before writing project plans. What are the possible outcomes for the collections? What are the potential benefits to users, to collection managers, and to the institution?

Before a digitization project starts, the collection has to be carefully surveyed. Not only the images but also the cataloguing system should be evaluated. In the long run, the inadequacy of the current image description methods and the enormous amount of cataloguing yet to be done with image collections will be the factors that restrict progress toward a digital future, rather than the lack of suitable imaging technology.

Evaluating the characteristics of the source materials to be digitized is part of the planning process. This involves determining the number of images to be digitized, identifying whether the source format is film intermediate or original materials, considering the size of the materials to be digitized, assessing any unusual characteristics of the source material, and reviewing the condition and disposition of originals.

The scope of the project and the characteristics of the source materials translate into image-capture specifications and procedures for building a collection of digital images. The project should be planned to progress efficiently and the workflow should be well organized. Digital equipment must be chosen to optimize quality and level of production, the appropriate hardware and software must be selected, and image capture and editing rules must be set to maximize efficiency.

6 | Planning a digital imaging project

It is important to consider the purposes for which users will access the digital images. Will they use the images for on-screen browsing or for reference and detailed study? Will images be printed (after the clearance of the copyright of course)? What size will they be printed?

The answers to these questions affect the technology requirements and equipment specification. Just imagine a 35mm negative and a wall size print – they can for sure not be digitized on the same flatbed scanner. Another consideration is whether one should expect to be able to accommodate as-yet-unknown users who wish to access images for reasons no yet evident.

Several issues must be addressed when planning a digital project. How does one decide upon the initial scope of the project and its immediate and long-term goals? Answering these questions involves identifying institutional needs and the type of original material to digitize, deciding whether the image is being created for a use-specific project or a use-neutral archive, and assessing the budget.

A use-specific initiative is designed with a particular goal and with specific users and uses in mind. The goals are usually limited to improving access to photographs, rather than encompassing archival and conservation goals. The images created in this way may be limited in their use for other purposes. For example images that were digitized for posting on a web site by casual users, will in most cases not be appropriate for research or book and catalog publication, which typically require high-quality capture. A disadvantage of use-specific projects is that the resulting images might not be appropriate for other uses, should the need arise.

A use-neutral project creates images that can be repurposed for various uses in the future, some of which are not yet known at this point in time. It is therefore mandatory, that the digital files not only optimized for current work flows and imaging devices but will continue to be useable on future, yet unknown delivery and output systems. This requires a lot of experience from the team that is involved in creating the images in the first place.

It is also very important to be clear early on about the amount of the photographs that will be digitized. Solutions for a small number of images will most likely be different from the ones used for a large number of images. And one has always to keep in mind that a large number of photographs can mean thousands of photographs.

One often hears about the need for best practices or guidelines for digital conversion. In the area of project management the first measure of best practice is likely to be one of the ends justifying the means. If digital reproductions are well received and have been made in a timely and cost-effective fashion, the project will naturally be considered a success.

Prioritizing by value, use, and risk

The selection process for digitization is very important. There are three main points that have to be taken into consideration for selection: namely value, use and risk of the photographs[1].

There are various levels to the value of an object. A photograph can have an evidential value and serve as a historical or legal proof of an event. Artifactual value refers to original materials that have value due to their nature. Associational value refers to original materials that have a relationship to an eminent individual, place, event, such as photographs signed by an artist. Information value refers to the photograph's content in relation to the purpose of the collection. And last but not least, monetary value refers to the current market value of a photograph.

Risk comes in several forms: legal, social, and preservation. Legal risks in form of copyright and social risks have to be weeded out during the selection process. The preservation risk has to be carefully evaluated taking the findings of the survey into account. The highest risk materials are chemically unstable, which results in their self-destructing and damaging or contaminating nearby materials. Moderate risk materials are experiencing primarily mechanical or physical damage due to their housing and handling and the characteristics of their material. Materials that are deteriorating and losing their informational content naturally or gradually due to their component processes and materials are moderate risks. Low risk materials tend to be the more long-lived processes in undamaged condition and adequate storage conditions. The highest risk items have to be processes first. This can mean treating and digitizing them immediately. In any case the help of a photo conservator will be needed to determine the risks and the appropriate decisions.

[1] The following paragraphs summarize the selection process as proposed by Diane Vogt-O'Connor, Selection of Materials for Scanning in: *Handbook for Digital Projects: a Management Tool for Preservation and Access, August 2001* www.nedcc.org/digital/dman.pdf

The third factor in determining a collection's priority for digitization is use. High-use materials are those that are requested most frequently for reference purposes. Generally high-use materials have high value. On some occasions, materials of no perceivable value may suddenly become popular because of a particular event.

Value, risk, and use, when considered together indicate the collections requiring digitization. The key is that each of these factors must be determined in relationship to each other and not in isolation.

A popular rationale for investing in digital collections is that the surrogates will reduce, if not eliminate the physical handling that threatens fragile or unique materials. This sounds sensible, but remember that digital collections do not make themselves, and consider that a collection is likely to be handled more during conversion than at any other time during its life in an institution. Digitizing for preservation applies not only to outcomes, but also to the handling guidelines that will be mandated for the conversion process. Remember too, that increased care and handling generally translate to increased cost.

Digitization

Many digital imaging projects have served to draw attention to the state of the original collections. Money can be provided for large scale conservation and cataloguing as part of a digital imaging projects. The time of digitization is also a very good moment to think about the conservation of the photographs. Since the photographs have to be handled anyway to make them ready for scanning, appropriate conservation measures can be taken at the same time. A large enough, clean area has to be provided for the work to be done. The equipment for copying and scanning has to be chosen carefully, and oftentimes special adaptations will have to be manufactured, since the equipment has not been built for the digitization of valuable photographs in the first place.

Digitizing photographs is not an easy endeavor. Many institutions therefore rightfully decide to outsource the digitization process. If the digitization happens at another site, careful preparation and packing of the materials is needed.

The technical parameters for scanning impacting tone reproduction, color reproduction, spatial resolution, and noise have to be selected. Again, this is a task for an expert[2].

[2] Franziska S. Frey and James M. Reilly, *Digital Imaging for Photographic Collections. Foundations for Technical Standards,* Image Permanence Institute, Rochester Institute of Technology, 1999.

A common problem when using different computer systems or monitors to digitize the photographs is the difference between the images when created and used on the various systems. Systems need to be set up and calibrated carefully. More often than not this is not done properly, resulting in images that are not acceptable.

File formats and compression

There is a consensus within the preservation community that a number of image files must be created form every photograph to meet a range of uses. First, an archive or master image should be created. The archival master file should represent the highest quality the institution can afford to create and maintain over time. It should not be treated for any specific output and should be left uncompressed. It will also require an intensive quality review. From this archive file, various derivatives will be calculated. The archive file can be considered the digital negative. Most institutions consider TIFF files as the best solution for the archival file at this point in time. TIFF is an open standard, platform independent, and very versatile.

The derivative files are meant to be used. Speed of access and transmission, mainly for applications over the internet, and suitability for certain purposes are the main issues to consider in the creation of these derivative files. Their format has to be adapted to the usage.

Compression is mainly an issue for transferring data over networks. Image compression in an archival environment must be evaluated carefully. At present, most institutions store master files uncompressed. Instead of adapting the files to fit current limitations associated with bandwidth and viewing devices, the digital masters remain information-rich, ready to be migrated when new, perhaps better, files formats or compression schemes become available.

There are several approaches to image access. For the digital master, file size and security issues drive the decisions on the storage type chosen. Many institutions keep their digital masters off line, i.e., on tapes or other storage media. In any case, it is advisable to have at least two back-up copies of the master files stored off-line, in different locations, and under recommended storage conditions. Often, one version of the master file is stored near-line, e.g., on a tape robot system. If a file is needed it can be retrieved within minutes.

Storage, delivery and preservation

Once the digital files have been created they need to be safely maintained. This includes the storage of the files, their delivery, and the long-term preservation for future use. There are still many open questions for a successful digital preservation. Without having the infrastructure of a digital repository available it is very likely that many files created today will not be usable in some years. But on the brighter side: there is a lot of research going on in this area to create these digital repositories, or digital asset management systems.

Every repository will include certain "work-outs" the files have to go through, the most important being refreshing and migration. Refreshing involves periodically moving a file form one physical storage medium to another to avoid the physical decay or the obsolescence of that medium. Migration is an approach that involves periodically moving files form one file encoding format to another that is useable in a more modern computing environment[3].

Standards are an essential basis for sharing information, both over current networks and in the future. Standards will ensure the protection of the long-term value of digital data.

One very important chain in the link of preserving the data is the use of metadata. Metadata is data about data, in the case of a photograph it is the title of the picture, the photographer, the time it has been taken, the type of photographic material that has been used, etc.; but also all the information about how the file has been digitized, what the copyright and use status of the image is, and last but not least, how and where the file is stored in the digital archive. In addition it provides unique identification and links to organizations, files, or databases that have more extensive descriptive metadata about this work. Metadata of an image can be extensive and a lot more work has to be done to standardize metadata amongst institutions.

New technology also allows searching for files not only in one database. By extending the search to several databases, also different languages, and more images will show up that comply with the search criteria. To make this possible, institutions have to agree on common sets of metadata and how they are being used.

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[3] Gregory W. Lawrence, William R. Kehoe, Oya Y. Rieger , William H. Walters , Anne R. Kenney, *Risk Management of Digital Information: A File Format Investigation,* Council on Library and Information Resources, June 2000.

There are also increasing numbers of digitally created images being acquired by institutions and these too, have associated preservation issues and need to be dealt with in a correct and well thought-through manner. There is a lot of work going on at the moment on how to deal with these objects "born-digital." However, one thing is certain, institutions need to have guidelines on how files need to be prepped before they can be acquired. Anything else will lead to a nightmare and the most likely loss of many files.

Another issue that has to be considered is the use of digital hard copies that have been printed from digital files, since a soft copy on the monitor is not the final output in many cases. Institutions are receiving digital prints into their collections; hence thought has to be given to the preservation of these prints. How long will they last? Did the artist use the best available materials? Many institutions also consider giving out prints from their digital files instead of producing photographic prints from a duplicate.

However, we have to keep in mind that worries about the permanence of photographs are not a new phenomenon. Right after the introduction of photography, the first conferences on image permanence were taking place and people tried to understand what was happening to the different materials. Not so much different from today, where people meet to discuss permanence issues of digital prints.

Outlook

As more projects are undertaken and user profiles studied, the balance between access and preservation will be better understood and it will be possible to improve the project design and management. Likewise, the cost implications, particularly of preserving the data, will be better known.

Is this the right time to begin digitizing collections? In some cases yes, in some cases no. Thinking to digitize a whole collection as a first project will most likely end in disappointment. However, starting with a small project is always a good idea. Shared experiences will help to build stronger and stronger projects.

There are many treasures yet to be discovered in photographic collections – let's start the work, and share the pictures.

7 | Present and future developments

The introduction of digital technology is having a considerable impact on the way libraries, archives, and museums deal with their photographic collections. Examples of digital collections that can be accessed remotely are plentiful[4]. However, the digitization of photographic collections is only one of the many new activities involving digital imaging technology that are already fairly well established in many institutions. There are also an increasing number of professionals using digital imaging technology as a tool to take better care of the original photographs. Conservators, e.g., are building digital image databases to keep a watchful eye on the photographs they have to care for. The new technologies help them, e.g., to monitor any changes to a valuable photograph using various imaging methods. Digital technology also helps to understand collections better, since new relationships between images all of a sudden become obvious in a database or new observations can be made in the digitized photographs[5].

All these activities need to and will improve in the near future on both, the technical and the administrative fronts. Increasingly, image processing will become more automated and user-friendly, and consistent color management from input to output will be available. Standards for digital imaging projects relating to imaging technology, metadata, and digital preservation issues will be more clearly defined and used. As more experience is gained, project management, personnel, and team issues will be more routine. People with many different skill sets will have learn to work together. Certainly there is a need for more training to get from here to there, thus enabling those working in institutions to make well informed decisions about digital projects. It is mandatory for everybody involved to all have a common language as a first step to prosper in this emerging field. It is also most likely, that there will be new professions evolving, e.g., conservators for digital information, and many more that are just started to be envisioned.

Many of the problems arising form the need to scan for an unknown future use are not yet solved, and there is a great deal of uncertainty about how to proceed. Those responsible for some of the large digital reformatting projects report the same problem: Rapid changes

[4] See for example: American Memory: memory.loc.gov/ammem/fsowhome.html ;
Picture Australia: www.pictureaustralia.org;
Early photography 1839-1860: http://www.earlyphotography.nl/;
Albums de la base Mémoire, autochromes de la guerre 1914-1918 :
http://www.culture.gouv.fr/documentation/memoire/Interro.htm
Galleri Nor : http://www.nb.no/gallerinor/

[5] See for example the Nebraska Historical Society: http://www.nebraskahistory.org/

in technology make it difficult to choose the best time to set up a reformatting policy that will not be outdated tomorrow. We all know that the computer we order today is already outdated when it arrives on our desk a few weeks later.

However, if one looks at all these obstacles that have to be mastered, a few key concepts have to be kept in mind. Digital imaging technology offers distinctive advantages to institutions holding photographic collections. Photographs can be easily searched for within an institution and more and more also amongst several institutions with just one search. Pictures can be delivered directly to the reader without human intervention; likewise, information content can be retrieved by readers remotely. Digital image quality is impressive and is improving constantly. New ways to deliver manageable portions of large image files promise to revolutionize the ways in which research materials are used for teaching and learning.

But one should not forget: Digital imaging technologies require tremendous capital investment for underlying support systems. Digital image conversion requires a deep and longstanding institutional commitment to traditional preservation, the full integration of the technology into information management procedures and processes, and significant leadership in developing appropriate definitions and standards for digital preservation [6]. The risk of loss is high, far higher than in most other programs and activities carried out in a cultural institution. Should one be discouraged by these difficulties? No, but one should keep in mind, that things will not be simple.

Although the advent of electronic storage is fairly new, a substantial amount of information stored in electronic form has deteriorated and disappeared. Large amounts of digital information are already lost, due to media that is not readable anymore, due to the lack of the needed hardware and software or it has simply been deleted by user error. To prevent further loss, we need to come to grips with the problems of longevity in the digital world.

In the past few years, significant progress has been made to define the terms and outline a research agenda for preserving digital information that was either "born" digital or transformed to digital from traditional sources. *"Digital preservation refers to the various methods of keeping digital materials alive into the future"* [7]. But we also have to keep in mind, that it is only worthwhile worrying about preserving digital objects when we have figured out how to make digital products that are worth preserving.

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[6] Paul Conway, *Preservation in the Digital World*, Commission on Preservation and Access, March 1996

[7] Don Waters, John Garrett: *The Preservation of Digital Information*, 1996

Only few organizations have developed guidelines for digital asset management. We need to keep in mind that preserving bits is only a small part of the problem. This problem is dwarfed by the much larger problems of ensuring that file formats will be accessible, and by problems involving organization, policy, and roles and responsibilities. Any long-time preservation strategy for digital information must incorporate cooperative relationships among physically dispersed locations and organizations. Why did certain pieces of art or books survive? Well, the answer is simple, because there was more that one copy and the copies were being hold in different locations.

Without having a repository in place when starting a digital project the save preservation of these files is most unlikely. The repository follows the model of a bank, where customers deposit their money and for a fee the bank becomes the custodian of the money. In case of a repository, images instead of money are deposited following a rigorous set of guidelines for the preparation of the files. At the point in time when these files need to be accessed again, a copy of the file in the most up-to-date file format is being delivered to the user – though, refreshing and migration will have been taken place for the file. The user is not aware that anything has changed with the file; since the changes need to be made making sure that the integrity of the file is not being hampered. The institution will be paying for the service of depositing the files and keeping their format up to date.

At this point in time, extensive metadata is our best way of minimizing the risks of a digital object becoming inaccessible. Various types of metadata that appear unimportant today may prove critical for properly viewing and using these files in the future.

The use of digital photography will be steadily growing over the next years, thus making it necessary, to be ready to keep these files. Also in this case, metadata are critical. A lot of source material is today being created digitally, and we have to keep in mind that for objects being born digital, preserving them has to start at the moment they were created. With conventional photographs we could wait some years with thinking about preservation, and indeed we do not have perfectly fine photographs in our archives, but since the degradation occurs steadily, but slowly, we still have a vast amount of pictures available. This will not be the same with digital photography. If we do not take care of these digital photos from day one, they will not be there for the future generations.

The lack of communication between the technical field and the institutions remains a formidable obstacle in all these endeavors. Both, institutions and industry are interested in a dialogue, but often there is no common language. It cannot be emphasized enough that if institutions fail to communicate their needs to the hardware and software industries, they will not obtain the tools they need for their special applications. Archives and libraries have

to know that they too, can and have to be involved in creating the new standards in this field. What it boils down to is that photographs, neither conventional nor digital are permanent. However, there is a big difference between a collection of conventional photographs and a collection of digital photographs. A conventional collection is a passive collection, meaning that we have some time to deal with all the problems of deterioration. The colder the temperature where the photographs are stored, the more time we have to properly take care of them. A digital collection however, is an active collection. We need to take proper action from the time the files are being created; there is no way around that. This mind set has to prevail in order for digital pictures to survive. But we must not forget that caring for the original artifacts, analog or digital, remains the primary duty of an institution.

Georgian photographer Ermakov traveling around with his equipement (1860s).