ART CONSERVATION DEPARTMENT
BUFFALO STATE COLLEGE

Documenting Photographs: A Sample Book

CNS 695, Senior Specialization Project

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ABSTRACT
This project surveys a number of examination and photodocumentation techniques as they might be applied in photograph conservation practice. It also provides examples and suggestions of how photograph conservators might use these techniques to aid in diagnosing and documenting the condition of photographic materials.

1. INTRODUCTION

Photodocumentation has been an intrinsic part of art conservation practice from the very beginnings of the modern profession. It provides the visual evidence of the efforts of all conservation professionals in preserving the cultural and artistic heritage of mankind. The conservator's graphic record, particularly photographic, becomes an important part of the history of the artifact and of the body of knowledge of the conservation profession.

The field of photograph conservation is young in comparison to other specialties in the field. Recently, efforts have been made to help this young profession to grow, such as the generous funding from the Andrew Mellon Foundation to establish the Advanced Training Program at the George Eastman House and the Image Permanence Institute starting in 1999. There is no better time than now to give photodocumention of photographs its own chapter, in the hope eventually to provide a comprehensive sample book for photograph conservators and through it contribute to the growing body of knowledge in this specialty.

It has been stated clearly that the premise of photodocumentation is “to illuminate the artifact and expose the film in a manner that will accurately record all desired information and will minimize the risk of damage to the artifact,” and “to make a meaningful record of the present condition of the artifact or of change in its condition during and after conservation treatment.”(Kushel, 1980) There are three basic areas emphasized in these statements: proper technique; the creation of truthful and meaningful records; and the minimizing of the risk of damage to the artifact during this process. In this project, however, I also hope to extend the discussion beyond the scope of these basic principles and into the use of photodocumentation and nondestructive examination techniques to detect and analyze problems or changes associated with the conservation treatment, as well as the aging, of photographic materials.

Many sophisticated analytical techniques, such as scanning electron microscopy (SEM), transmitted electron microscopy, and x-ray fluorescence spectrometry (XRF), have been successfully used to identify materials found in/on photographs (Barger & White, 2000; McCabe and Glinsman, 1996; Bogvad Kejser, 1996). However, these often require the taking of samples, and are expensive, and not readily accessible. It is the goal of this research to explore non-destructive photographic and examination techniques as a diagnostic tool to detect, record, and illustrate the conditions and characteristics of photographic materials.

There are several excellent publications regarding photographic techniques and how to photograph works of art. Literature concerning copying and duplicating photographs is not difficult to find. For instance, some sources point out the highly reflective nature of daguerreotype plates and have interesting discussions and innovative approaches about setup in an effort to photograph daguerreotype images with the maximum contrast (Fraprie, 1940; Croy, 1966). Thus, it is not the focus of this report to describe in detail how each photograph was taken unless it is a new approach. What this report intends to present is an overview about what information can be obtained and how the condition of photographic materials can be observed and recorded through various photographic and examination techniques.

2. DOCUMENTING PHOTOGRAPHS

Graphically speaking, the project was organized along two axes: the photographic processes being documented; and the photographic and examination techniques used for documentation. Table 1 shows the processes and techniques that I planned to explore. Though it was desirable to include as many samples as possible for survey purposes, time permitted only a representative sampling of historic processes, and the study is thus by no means exhaustive. Samples examined were from personal collections and the study collection of the Art Conservation Department, Buffalo State College. To further narrow down the scope, I did not include color photographic processes in this study; all the photographs examined were monochromatic. Not every technique listed in the table was employed because of time limitations and material availability. Those used are marked with a check mark (√)in Table 1.

Table 1: Photographic Techniques v.s. Photographic Processes: an overview of this project

	Normal	Raking	Specular	Transmitted	Mono-chromatic	Photo-macrograph	Ultraviolet visible fluorescence	Reflected UV	Infrared
Salted paper	√	√	√		√	√	√	√	
Cyanotype	√	√	√						
Platinum	√	√	√						
palladium									
Gum dichromate									
Oil & bromil									
Carbon									
Albumen	√	√	√		√		√	√	
Collodion	√	√	√		√		√	√	
Matt-collodion	√	√	√		√				
Gelatin	√	√	√		√		√	√	
Daguerreotype	√		√		√			√	
Ambrotype	√			√			√		
Tintype	√	√					√	√	
Lantern slide				√					

The examining process proceeded by employing one examination technique at a time on all samples. When it was necessary, a photograph using that specific photographic technique was taken to provide an illustrative example. The results of my observations are presented here proceeding from the simpler examination techniques to the more complex.

2.1 Normal Illumination

It is routine for conservation professionals to take photographs of artifacts with visible light simply arranged to provide illumination that allows for the observation and recording of basic information, such as shape, color, and subject matter. Photographic materials are not exempt and it is extremely important to have a truthful reproduction of a photograph.

Image tonality (color) is one of the key qualities of photographs, in both monochromatic and color photographs. In terms of monochromatic photography, for example, different processes exhibit different characteristic tones. Even within the same process, a final image can be different in tonality depending on different toning recipes, sizing, type of paper, etc. Thus, image tonality has become one important clue for the identification of photographs in terms of process. For example, both of the two photographs in fig. 1 and fig. 2 have a paper-like surface. The image forming material of both photographs clearly resides in the paper fiber. According to the identification chart in *Care and Identification of 19thPhotographs* by James Reilly, these two photographs belong to the first category, which includes photographs with a one-layer structure, such as salted paper prints, cyanotypes, or platinum prints (Reilly, 1986). Their tonality clearly indicates that they are not cyanotypes because they are not blue. Their excellent image condition makes it unlikely that they are salted paper prints. Further, with relatively confidence one can also conclude that fig. 1 is a platinum print and fig. 2 is not, based on the characteristic neutral tone of a platinum print.

Fig. 1. "*City Cross and High Street, Winchester*," platinum print, 7 3/8 x 11 9/16 inches, normal illumination.

Fig. 2. *Two Ladies, Tea Party*, gelatin silver print (no baryta layer), 9 3/8 x 7 inches, normal illumination.

To ensure the color in documentation slides or photographs truthfully represents the original subject, it is important to include, whenever possible, a known color standard reference within the photograph of the artifact. Any color shift because of lighting, fading of the slide, or improper processing can be corrected according to the reference. In particular, with the rapidly increasing use of digital imaging in preservation and conservation documentation, an embedded color reference in a digital file becomes extremely helpful for calibration of the image color. Conservators have commonly used Kodak Q-13, including both the grey scale and color separation guides. A custom-made reference plate, seen in both fig. 1 and fig. 2, was created for smaller objects during this project (see Appendix B for the construction of this reference plate).

2.2 Raking Illumination

Pictures taken with raking illumination emphasize the surface features of photographs, such as texture, planar deformation, abrasion, and cracking of binders. Fig. 3 is an albumen photograph. Made from beaten egg white, albumen is used as a photographic binder that characteristically exhibits fine cracking from fluctuations in relative humidity. The detail illuminated with raking light, shown in fig. 4, documents clearly this characteristic fine fissuring along the grain direction of the paper support.

Fig. 3. *Image of Two Paintings and One Sculpture,* albumen print, image size 5 ¾ x 5 5/8 inches, normal illumination.

Fig. 4. Detail of fig. 3, showing cracking of albumen binder, raking illumination.

2.3 Specular Illumination

Specular illumination has been widely used in conservation to observe and document, for example, the surface sheen of paintings. Surface sheen can also help in the identification of photographic processes or in the observation of other information about a photograph. Specular illumination involves the adjustment of the lighting used for examination and documentation so that the light source itself is reflected off the surface of the subject directly to the observer. The light source itself may be diffuse, flood, or point (fiberoptic) and it may be placed on, or adjacent to the viewing axis (**axial specular illumination**) or opposing the viewing position (**oblique specular illumination**).

Fig. 5. *Two Boys Playing in the Field*, gelatin silver print, 7 ½ x 4 ½ inches, normal illumination.

Fig. Detail of fig. 5, showing surface sheen produced by gelatin binder under specular illumination.

The sheen of photographic materials can come from materials such as albumen, gelatin, and collodion binders as well as varnishes and other coatings. For example, as a key for the identification of photographic processes, photographs can be categorized as those with binder and those without binder. Fig. 6 is a detail of the photograph in fig. 5 and is taken with specular illumination. The detail shows the slightly reticulated surface and its surface sheen that is used to identify this photograph as a gelatin print.

2.4 Special Application of Specular Illumination to Daguerreotypes

Daguerreotypes have intriguing ability to be positive or negative images, depending on how they are viewed, see fig. 7 and fig. 8. For a healthy daguerreotype, there is a perfect correlation between the positive view and the negative view at each point in the image. Surface damage on a daguerreotype plate, such as staining, corrosion, scratches, negates the correlation. Thus, the comparison between the positive image and the negative image of a daguerreotype can serve as a qualitative indicator of its image degradation (Arney, 1994).

Fig. 7. *Girl Seated*, daguerreotype, 1/6 plate, normal illumination, showing positive image.

Fig. 8. Same image as fig. 7, but showing negative image under specular illumination.

Capturing a positive image of a daguerreotype with maximum clarity requires more than a copy stand. The highly polished daguerreotype plate is like a mirror, which can reflect the camera positioned directly in front of the plate. The common practice to solve the problem of reflection is to position the camera at an oblique angle to the plate, so that the camera will not “see” its reflection. However, photographs taken in this way will slightly distort the shape of the daguerreotype. Another option is to surround the camera lens with a matte black surface either via a flat card or more effectively via a black "tunnel" (with side openings for lighting) between the lens and the daguerreotype. While a bit more cumbersome, this method results in no distortion and is relatively effective, but occasionally complete elimination of unwanted reflections is not possible. For a photo studio equipped with a view camera, one easily and effectively avoids both the reflection and distortion by positioning the plate at an angle, and tilting the lens and the ground glass of the view camera parallel to the plate.

Capturing a negative image is more difficult, especially in terms of elimination of the reflection of the dark lens when surrounded by the white surface that must be reflected back to the camera by the smooth mirror-like portions of the plate.

A goal of the research was to find a simple method to document both the negative and positive images, which would also minimize variables between the two setups. The setup for the negative image is illustrated in fig. 9. A light box placed on one side (seen on the left) supplies the ideal diffuse illumination. A piece of clean, thin glass is positioned below the lens at approximately a 45 degree angle. The glass plate reflects the diffuse surface of the lightbox onto the daguerreotype, which then reflects it back through the glass and directly into the camera, creating a strong negative image. (If needed, a piece of black card held below and to the side of the camera can be used to eliminate any spurious reflections from the top surface of the glass.)

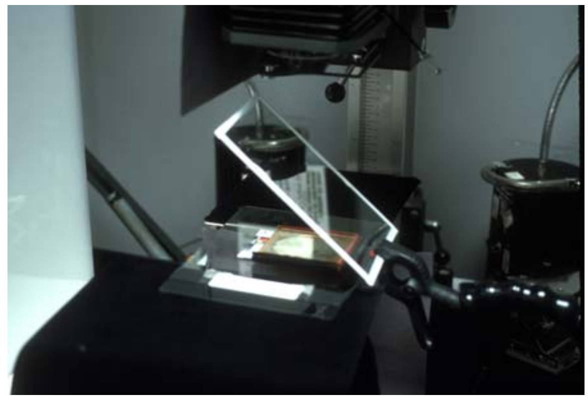


Fig. 9. Setup for taking a negative image of a daguerreotype shown in fig. 8.

To document the positive image, the glass is removed and a matte black card with a lens hole is positioned directly in front of the camera. If desired a small white card can be used to reflect additional light onto the daguerreotype surface on the side opposite the light box. For further control, the daguerreotype can be placed on top of a piece of glass elevated above the table surface. This can also be used to eliminate any shadow of the daguerreotype cast onto the table, since the shadow can be made to fall outside the field of view.

2.5 Transmitted Illumination

Transmitted illumination is an indispensable photodocumentation technique for photographs that are meant to be viewed with transmitted light, such as lantern slides, glass plates, autochromes, and transparencies. It is also a useful diagnostic approach for examining many other photographic processes, to reveal or document structure, materials, anomalies, etc.

For example, Fig. 10 is an ambrotype, which was treated and resealed. During the treatment, it was found that there were three pieces of hair in the black varnish layer, seen in fig. 11, which were not previously visible. Evidently, the black varnish was applied with a brush. The brush shed and left these pieces of hair behind. This evidence was obscured after the photograph was sealed, but was clearly revealed again using transmitted illumination, without having to reopen the sealed photograph.

Fig. 10. *Boy Seated*, ambrotype, 1/9 plate, normal illumination.

Fig. 11. Same image as fig. 10, taken with transmitted illumination.

Note: Inclusion of identification data and reference standards is difficult in transmitted illumination photographs, but is important. (Note, for example, in figs 10 and 11 that the absence of this material makes it impossible to ascertain the size of the ambrotype and assess the accuracy of the color; also missing is the ethically required date and identification information.) The usual way of including this information is by local top illumination; this is somewhat cumbersome to set up well, and also, as the light source is different than that transilluminating the subject, does not provide a good color reference. To solve this problem, a special identification/reference plate was designed for use in transmitted illumination photographs, and can be seen in fig. 12. The color patches and the grey background in the reference have known density. The matching of these densities in the photograph with those in the reference helps to indicate the accuracy of the reproduction. This reference plate is described in detail in Appendix B.

Fig. 12. A negative along with a reference plate for transmitted illumination.

2.6 Monochromatic illumination using a sodium vapor lamp

Most image-forming materials of photographs are subject to fading, tarnishing, or other disfigurements that may make the original image difficult or impossible to read or document, prior to conservation treatment. The use of monochromatic illumination (primarily sodium vapor lamps) has been used in the examination and documentation of paintings for decades, as a means of enhancing the visibility of a paint surface that is obscured by darkened coatings. This same technique can also be used to visually enhance the contrast of faded or tarnished photographs without altering the original.

Fig. 13. Daguerreotype illuminated under sodium vapor lamp

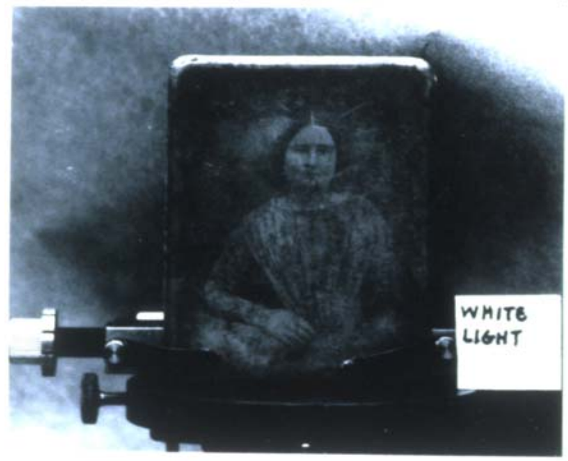


Fig. 14. Daguerreotype illuminated under white light

Both pictures were reproduced from the book, *the Daguerreotype: 19th Century Technology and Modern Science* by S. Barger and W. B. White, p. 214.

Materials have different characteristic absorption of a specific wavelength of light. The most important image forming material in photography, silver, characteristically absorbs in the blue region of the spectrum. A totally yellow light source like sodium vapor (589 and 589.6nm), has no blue component, and thus can optimize the tonal separation and contrast of silver images. Fig.13 and 14 are two pictures taken from Susan Barger's book, *The Daguerreotype: Nineteenth-Century Technology and Modern Science.* She demonstrated that the original image of a damaged daguerreotype was significantly enhanced when illuminated with a sodium vapor lamp (fig. 13) over its appearance when illuminated by white light (fig. 14) (Barger & White, 2000). She also noted that the tarnish, if thin, would be relatively transparent to these wavelengths. Hence, a daguerreotype image obscured by tarnish could be enhanced and documented photographically with this technique (Barger & White, 2000).

2.7 Photomacrography

Photographs printed from negatives can have many identical copies. Not only can different museums hold prints from the same negative, but also one institution can have more than one copies of the same image. To distinguish one copy from another, like trying to tell two identical twins apart, is difficult. In this project I explored a method of producing "fingerprints" for photographs to aid in this task.

Fig. 15. *Niagara Falls no. 1*, salted paper print, 4 5/8 x 3 ¾ inches, normal illumination.

Fig. 16. *Niagara Falls no.2*, salted paper print, 4 5/8 x 3 ¾ inches, normal illumination.

Fig. 15 and 16 are two salted paper photographs printed from the same negative with the same recipe and processing. Even though the paper support is of the same type, the precise arrangement of paper fibers on the surface of the two prints is completely different. Photomacrographs taken from identical image areas of the two salted paper prints indeed show distinct difference in paper fiber orientation, see fig. 17 and 18. One photograph has completely different fingerprint from the other. To see how well the orientation of the paper fibers would be

Fig. 17. Detail of fig. 15, photomacrograph (8x magnification on a 35 mm slide; the area shown is approximately 4mm across).

Fig. 18. Detail of fig. 15, photomacrograph (8x magnification on a 35 mm slide; the area shown is approximately 4mm across).

retained after wet treatment, I immersed print no.1 for one hour and then air-dried it. Figs. 19 and 20 show the same spot taken before and after washing. While some fibers were disturbed by washing, in general the pattern of the fibers remained unchanged. This method of fingerprinting, of course, relies on the visibility of paper fibers, and thus is applicable only to cyanotypes, platinum prints, and other binderless, paper-based photographs.

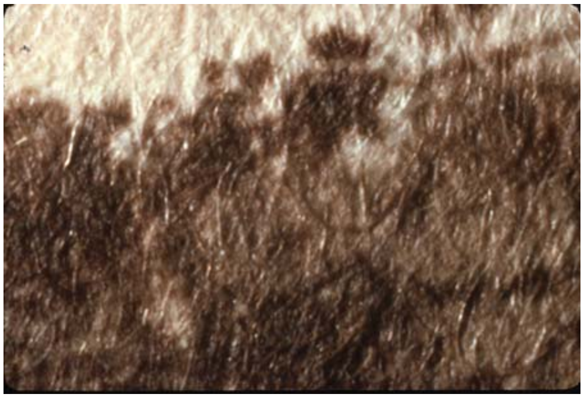


Fig. 19. Detail of fig. 15, photomacrograph before washing. (8x magnification on a 35 mm slide; the area shown is approximately 4mm across),

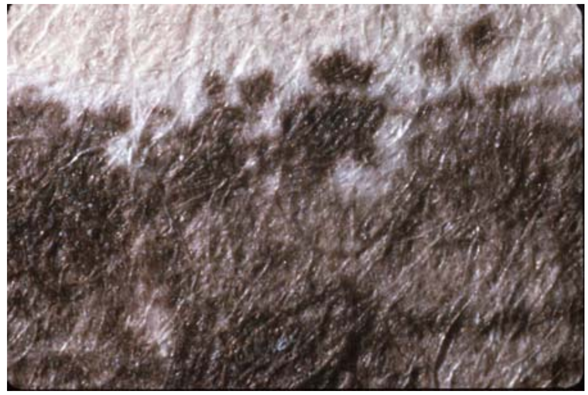


Fig. 20 . Detail of fig. 15, photomacrograph after washing. (8x magnification on a 35 mm slide; the area shown is approximately 4mm across),

2.8 Ultraviolet examination

Ultraviolet examination has been widely applied in art conservation as a non-destructive diagnostic method. The characteristic responses of materials to ultraviolet radiation, either by the way they reflect or absorb the radiation itself (see section 2.9 below), or more commonly, by the visible fluorescence that is induced by the radiation, can help conservators to identify materials or diagnose condition. The portions of the ultraviolet spectrum that have been found to be most useful are the short wavelength region (UVC, 200-280nm) and the long wavelength region (UVA, 320-400nm).

Fig. 21. *Group Portrait*, gelatin silver print, 9 9/16 x 7 9/16 inches, irradiated by long wave ultraviolet and showing strong visible fluorescence from optical brighteners.

It has been reported that the cyanide residues on daguerreotypes exhibit strong fluorescence when excited by short wave ultraviolet radiation, UVC, (Daffner, Kushel & Messinger, 1996). It is also well known to photograph conservators that optical brighteners in modern photographic papers can exhibit brilliant fluorescence under long wave ultraviolet radiation. The photograph of fig. 21 is printed on Kodak black and white professional paper. The optical brightener in this paper fluoresces a bright bluish white under long wave ultraviolet radiation, UVA

Photographic binders also have different responses to ultraviolet radiation. Figure 22 includes three cabinet cards with images printed from different photographic processes: two albumen prints on the right and a collodion print on the left. When examined under UVA, different fluorescences were observed, (see fig. 23). Albumen binders fluoresce with bluish, cool white color, while the collodion binder does not appear to fluoresce. From the degree of fluorescence, one can thus distinguish a collodion print from an albumen print.

Fig. 22. Three Cabinet Cards, two albumen prints on the right and one collodion on the left, normal illumination.

Fig. 23. Same images in fig. 22, irradiated by long wave ultraviolet, and showing the difference in visible fluorescence between albumen and collodion binders.

The photography of ultraviolet induced visible fluorescence can also be used to document organic varnishes on photographs as well. Photographers had already recognized the vulnerability of the collodion binder since the very beginning of the invention of the wet-collodion process. They did not hesitate to varnish tintypes, ambrotypes, and wet-collodion glass plates to protect them from scratching and tarnishing. Mastic, sandarac, amber, Canadian balsam, copal, and dammar have been listed as varnishes for tintypes and ambrotypes (Eastabrooke, 1972). The modern ambrotype seen in fig. 24 is vanished with sandarac. Under UVA, the varnish fluoresces a pale greenish color, and appears like a haze over the surface of the photograph (fig. 25). The identification of the presence and type of varnish applied on tintypes and ambrotypes (some resins may have distinctive fluorescence colors) can help conservators to determine preservation measures or treatment options.

Fig. 24. Left, *Self-Portrait*, ambrotype, 1/6 plate, normal illumination.

Fig. 25. Right, Long wave ultraviolet visible fluorescence photograph of the image in fig. 24, showing fluorescing varnish.

Note that the varnished ambrotype remains as a positive image when viewed under UVA. The two tintypes in fig. 26, however, appear to be negative under the same viewing conditions, as seen in fig. 27 and 28. Both tintypes were tested with water and proved to be gelatin tintypes. Since gelatin is a more robust material, gelatin tintypes are rarely varnished. Fig. 29 shows a

Fig. 26. Left. Two unvarnished tintypes (On the right, *Two Men in Front of a Shop*, 1 ½ x 2 3/16 inches; on the left, *"Bill & Bob at Aquarium NY,"* image size 1 15/16 x 3 inches), normal illumination.

Fig. 27. Below left. *"Bill & Bob at Aquarium NY"*, irradiated with long wave ultraviolet, and showing a negative image.

Fig. 28. Below right. *Two Men in Front of a Shop,* irradiated with long wave ultraviolet, and also showing a negative image.

Fig. 29. "*Mrs. Choussore (?) and children*," wet-collodion glass plate, 6 ½ x 4 ¼ inches, normal illumination.

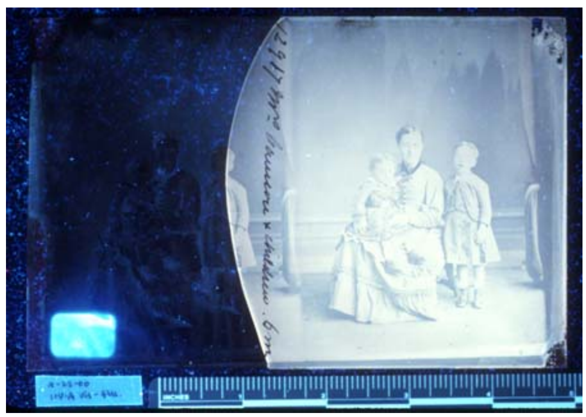


Fig. 30. The wet-collodion image in fig. 29 irradiated with long wave ultraviolet, and showing a positive image on the right (varnished) and negative image on the left (unvarnished).

photograph of an underexposed collodion glass negative plate (possibly for making ambrotypes) taken under normal illumination. The plate is varnished only half way across. Its visible fluorescence photograph, seen in fig. 30, clearly demonstrates that the varnished side appears to be a positive image, and the unvarnished side a negative image. The observation is summed up in the following table.

Table 2. Images of Gelatin Tintypes, Collodion Tintypes, and Ambrotypes Observed under Visible Light and UVA Radiation

	Gelatin tintypes	**Collodion tintypes**		**Ambrotypes**	
	Unvarnished	Unvarnished	Varnished	Unvarnished	Varnished
Visible light	*Positive*	*Positive*	*Positive*	*Positive*	*Positive*
UVA radiation	*Negative*	*Negative*	*Positive*	*Negative*	*Positive*

From the table, it is reasonable to make a presumption that varnishes change our eye's perception of these images under ultraviolet radiation. The explanation of this phenomenon is illustrated in diagrams 1 to 3. Tintypes and ambrotypes are underexposed negatives that are made into positive images by being placed against a black background. Under visible light, the areas with silver particles reflect light back to the viewer, and thus become the highlight areas (diagram 1). Areas without image particles allow light to pass through and be absorbed by the black background, turning the area into shadow. The viewer thus sees a positive image. Under UVA, silver particles do not fluoresce and the binder does. If the photograph is not varnished, areas of high silver content thus appear relatively dark, and areas of binder with little silver content appear relatively light due to the fluorescence of the binder (diagram 2); a negative image is thus observed. If the photograph is varnished, and the varnish fluoresces strongly, the varnish functions as a bright visible light source illuminating the image underneath (diagram 3), a situation just like that in diagram 1;a positive image is observed.

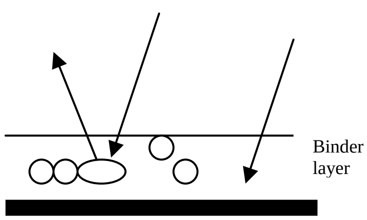


Diagram 1. Unvarnished sample viewed under visible light
Note: circles are silver particles

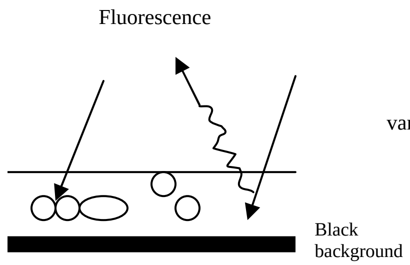


Diagram 2. Unvarnished sample viewed under UVA radiation

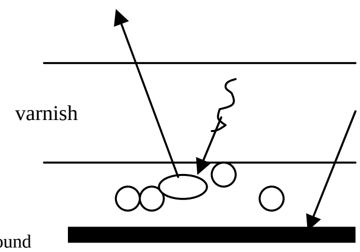


Diagram 3. Varnished sample viewed under UVA radiation

I examined one ambrotype under UVA that was varnished with Paraloid B-72. It remained a negative image because Paraloid B-72 is a synthetic polymer that does not fluoresce under UVA, and thus cannot provide the visible light source needed to illuminate the underlying image.

Silver mirroring is a common degradation observed in silver photographs. It obscures image details and disrupts the spatial continuity from highlight to shadow. Figure 31 illustrates a gelatin silver photograph that exhibits severe silver mirroring in the areas of high density. Surprisingly, the silver mirroring disappears when the photograph is examined under UVA, and obscured details are revealed (fig. 32). For example, one can clearly see a bicycle parked by the porch, which is almost indiscernible in fig. 31. The outline of the sitting man also becomes clear. Because it does not fluoresce, the highly reflective mirroring is not visible when viewed under UVA, and the spatial disruption it causes by lightening the shadow areas disappears. The image reclaims its original spatial depth and clarity that can then be well documented photographically.

There are several approaches proposed for treating silver mirroring, either removing it or by concealing it with a coating (Hendriks, et al, 1991; Luzeckyj and Brückle, 1999). If the mirroring is found to be an important part of the history to the object, it is preferable not to remove it. In this situation, a visible fluorescence photograph serves as a viable option to document the information contained in the original image.

As discussed above, albumen exhibits stronger fluorescence than collodion. Comparing the visible fluorescence photographs of gelatin and albumen prints (fig. 23 and 32), both of which fluoresce, does not provide a clear distinction between these two binders. A more precise measurement, such as might be obtained with ultraviolet induced visible fluorescence spectrometry is necessary for accurate discrimination.

Fig. 31. Left. *Group Portrait on the Porch*, gelatin silver print, 4 x 4 7/8 inches, normal illumination.

Fig. 32. Right. Long wave ultraviolet visible fluorescence photograph of the image in fig. 31

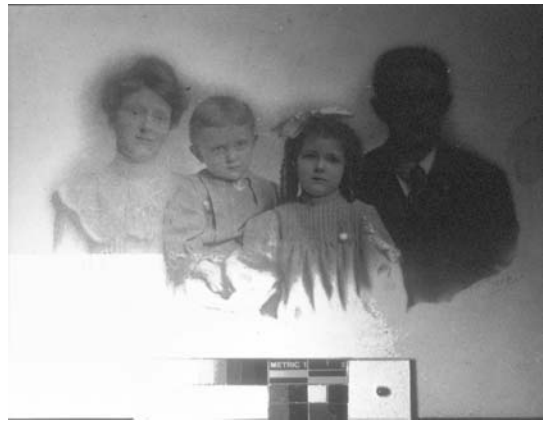
2.9 Reflected UV Photography

Reflected UV photography has been widely used in forensic science to document evidences that are invisible to human eyes (Krauss and Warlen, 1985). A reflected UV photograph is taking using a UV pass filter over the lens of the camera. In the case of reflected UVA (longwave) photography a Kodak 18A filter is used, which allows UVA to pass through and expose the film. In the photograph, areas of the subject that reflect UVA appear bright, and areas that absorb UVA appear dark. (Reflected ultraviolet photography using UVC is also possible, and may have good application to examination work, but it requires the use of a special quartz lens on the camera, because ordinary optical glass absorbs UVC wavelengths.)

Because of its short wavelength and resulting tendency to scatter, ultraviolet radiation does not have good penetrating ability. With reflected UV photography, this characteristic can be used to advantage in the observation and documentation of surface characteristics. For example, the scratches, corrosion (seen as white spots), and blisters in a damaged tintype are very visible in its reflected UVA photograph (fig. 33). The mottling pattern in fig. 34 represents the surface texture of a platinum print.

Fig. 33. Left. Reflected longwave ultraviolet photograph of a damage tintype, showing emulsion lifting and corrosion.

Fig. 34. Below. Reflected longwave ultraviolet photograph of a platinum print, showing surface texture.



The heavily mirrored image mentioned above (fig. 31) interestingly appears as a negative in a reflected UVA photograph (fig. 35). Areas of mirroring appear bright indicating that the mirroring is highly reflective to UVA. Up to now, the most widely accepted theory for silver mirroring formation is that the silver in the binder is oxidized to silver ions, which migrate from the binder to the surface, and subsequently reduce back to metallic silver (Neilsen, 1993; Nishimura, 2000). As a metal, silver reflects UVA. This theory is supported by the results shown in the reflected UV photograph.

Fig. 35. Reflected longwave ultraviolet photograph of the image in fig. 31, *Group Portrait on the Porch*, showing silver mirroring as areas of highlight.

The contrast between the silver mirroring and the rest of the image can be enhanced by a reflected UV photograph. Parts of the silver image that are not covered by mirroring do not reflect UV and appear dark in the reflected UV photograph; non-image areas also show little UV reflection. The reflected UV photograph can thus serve as a map to document clearly where silver mirroring occurs.

2.10 Infrared Photography

Infrared photography, another invisible radiation, like ultraviolet, can reveal materials that are not discernable to human eyes. It also has been used extensively in conservation for a variety of purposes such as detecting under-drawing and erased graphite notation. It also has great potential in photograph conservation. One such application is in the documenting of daguerreotypes.

As mentioned above in section **2.6**, thin tarnish on daguerreotype can be transparent to a yellow or red light source. For heavily tarnished daguerreotypes, the silver sulfide or oxide layer is too thick to allow for penetration by visible light, but may be penetrated by infrared radiation (Barger & White, 2000). In such a case, the obscured original image may be documented through infrared photography or infrared reflectography. Experimental work to support this presumption had not done by the time of this report.

3. CONCLUSION

It is clear through the examples, that the examination and documentation techniques discussed above are useful as non-destructive methods for the diagnosing and documenting of photographic artifacts.

This project is only a preliminary survey, and should be followed by further research. For example, the explanations of the observations made on coated and uncoated tintypes and ambrotypes, need to be verified with more examples and testing. More experimental effort in the area of UV induced fluorescence will help to characterize optical brighteners, binders, and coatings in/on photographs. A method of quantifying silver mirroring through reflected UV photography might be explored, as should applications of infrared techniques to the examination and documentation of heavily tarnished daguerreotypes, or of other photographic materials.

The examples used for this report (listed in table 1) cover only small number of the many photographic processes developed during the past, such as carbon, bromoil, and gum dichromate prints as well as the big category of color photographs. The building of a reference repository requires a far more comprehensive sampling than was possible here.

Last but not least, there are issues regarding the safety of the objects that cannot be ignored during the process of photography and technical examination. One important caution to keep in mind is that photographs were once light sensitive materials and some still remain so, such as salted paper print and photogenic drawing. Long exposure to intensive light source can cause either image fading or darkening, and mishandling presents even greater risks. The safety of the object should not be compromised by the effort to obtain a good photodocumentation record, and the balance between the two has to be continually considered.

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Reilly, J. M. 1986. *Care and Identification of 19t-Century Photographic Prints.* Rochester, NY: Eastman Kodak Company.

Source of Materials:

Filters 18A, Kodak Eastman Company; distributed by Tiffen Company, 21 Jet View Drive, Rochester, NY, 14626, tel: 716-328-7800, fax: 716-328-5078, web site: www.tiffen.com.

Kodak Q-13, Kodak cat# 152-7654, same as above.

Color Compensation filters, same as above.

Autobiographical Statement

Jiuan-jiuan Chen concentrates her studies in paper and photograph conservation at the Art Conservation Department, Buffalo State College. She is currently interning at the National Archives of Canada after she completed her 5 ½ months internship at the National Gallery of Canada, both in photograph conservation. She spent her summer internships in photograph conservation at the Harry Ransom Humanities Research Center, George Eastman House, and Heugh-Edmondson Conservation Services. She worked with NEDCC at the Frederick Law Olmsted National Historic Site on preserving the Site's Drawing and Plan collection as her preprogram experience.

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Table 1. Photographic Techniques v.s. Photographic Processes: an overview of this Project.

Table 2. Images of Gelatin Tintypes, Collodion Tintypes, and Ambrotypes Observed under Visible Light and UVA Radiation.

SMALL-SCALE REFERENCE PLATES

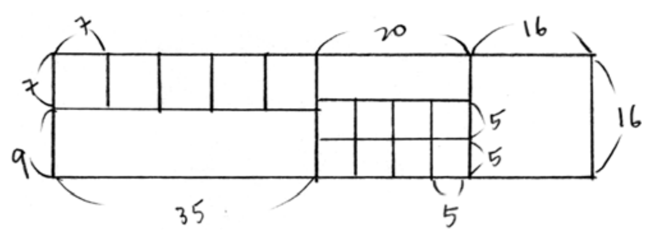
for conservation photodocumentation of photographs

In order to maximize image size in the conservation documentation of photographs, two differently sized small-scale reference plates were designed. The plates hold all necessary photographic references and provide space for artifact and image identification. They were originally designed for 35mm-format documentation of 1/6 plate and 1/9 plate daguerreotypes, but are equally useful for the photodocumentation of any small artifacts, or of details.

Construction of the Larger Scale Reference Plate

Overall measurements are 16 mm x 71 mm. The plate is constructed from a piece of 4-ply mat board toned with indelible black ink. (One can use black mat board, but museum-quality board is suggested for best durability.)

scale: mm



The gray scale and color scale (full-intensity only) patches are cut from a Kodak Q-13 Color Separation Guide and Gray Scale (small-20 cm), cat. #152 7654. (Note that as of January 2000, Kodak turned over manufacture and distribution of this item to The Tiffen Company, LLC.)

The **gray scale** uses only 5 of the 20 steps printed on the Q-13 scale. The individual gray scale patches for the reference plate are cut to measure 7 mm x 7 mm. The steps used are:

Gray scale patch number	A	3	M	13	B
Density	0	.3	.7	1.3	1.6

The **color separation patches** measure 5 mm x 5 mm and are positioned as follows (full-intensity only):

cyan	yellow	magenta	black
blue	green	red	3/color

The **illumination direction indicator** at the right end of the plate measures 16 mm x 16 mm. The gnomon is a spherical pin head 3 mm (1/8") in diameter. (Small map pins, available in office supply stores, serve well for this purpose.)

The gnomon can function as a **polarized illumination indicator** if a pin with a shiny metal head is used. The pinhead will appear black in a standard set up (i.e., vibration direction of the camera's polarizing filter oriented at right angles to that of the polarizing screens) because the reflections of lamps in the pinhead will be at extinction.

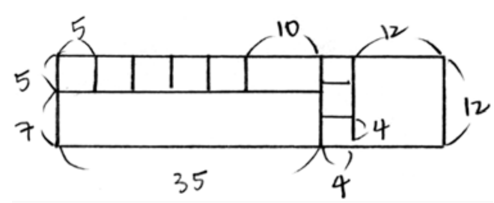
The **size scale** is a 2 cm portion of a gray metric ruler.

The **data holder for date and identification information** is constructed of a strip of 3 mil (0.003 inch) Melinex® polyester film. The top and bottom edges are folded to create a channel which can hold a paper label with date and other identification data. The data holder measures 35 mm long with a channel width of 9 mm. Because of the small size of the holder, it is easiest to make the first fold, and then trim it to proper width. The second fold is made against a piece of 2-ply mat board cut just a hair line smaller than the size of the channel. Again, the excess polyester is trimmed to proper width. This creates an open channel. In cross-section, the label holder appears:

Construction of the Smaller Scale Reference Plate

Overall measurements are 12 mm x 51 mm. It is also constructed of a piece of 4-ply mat board toned black.

scale: mm



The **gray scale** contains the same 5 patches as the larger plate. Each patch is cut to measure 5 mm x 5 mm.

Because of the small size, only three of the full intensity **color patches** are used. Each patch measures 4 mm x 4 mm. They are:

cyan
yellow
magenta

The **illumination direction indicator** measures 12 mm x 12 mm. The gnomon is a spherical pin head 3mm high.

The **size scale** is a 1 cm portion of a gray metric ruler.

The Melinex® **data holder** measures 7 mm x 35 mm.

APPENDIX B

REFERENCE PLATES FOR CONSERVATION PHOTODOCUMENTATION OF PHOTOGRAPHS UNDER TRANSMITTED ILLUMINATION

This reference plate is designed to aid in the photodocumentation of photographs or other artifacts that are transilluminated. It provides space for date and identification information, a size scale, and standard color reference patches. The size should permit easy visibility of the plate without compromising significantly the image size of the subject. The plate pictured below is 8cm in length and 1cm wide and should suffice for most small subjects; one approximately twice as long and wide would be appropriate for larger subjects.

<u>Materials</u>:

- A photocopy on overhead transparency film of a white-on-black ruler on a gray card. (Check that image size of the ruler is accurate.) The print density of the copy machine should be set lighter than normal so that the gray card density is relatively low. The ruler will be clearly visible and the surrounding gray background will serve to dim the intensity of the light box surface in the photograph and allow for clear visibility of written information laid over it.

-OR-

- A large format (4x5) negative of a ruler on a black background taken at precisely 1:1 magnification. The ruler should extend no more than halfway across the frame so that a blank area is created that will serve as a light grey background for the date and identification information. (See below* for details on producing this negative.)

- CC 40Y, 40C, and 40M gelatin filters (densities 0.05,0.21,0.32 respectively). Other filters may be chosen, if desired.

- Opaque black paper or background velour.

<u>Constructing the reference plate</u>:

After the photocopy or negative and color filters are trimmed to size, secure them with tape to a larger piece of clear 3 mil Mylar®. Cut a window in a piece of black opaque paper (or black velour) sized to expose the ruler, blank information area, and the filters. Carefully position the window and adhere the black paper to the Mylar® with double sided tape. The paper and Mylar® support can then trimmed to create a reference plate of the desired size.

Inserting date and identification information:

Information is simply written on a piece of Mylar® and laid over the information area in the reference plate

***** Making the negative of the ruler with black and white 4x5 film:

Set the view camera precisely at 1:1 magnification. Place the ruler on a black background and position it so that it extends into the frame less than half way. (If more than one reference scale is to be made, place additional rulers in the frame.) Light it evenly, and take an exposure reading off the black. (Remember to increase exposure two stops for magnification, if not using TTL metering). Once the exposure is calculated, increase the exposure setting one additional stop. This will produce a negative in which the ruler will be clearly visible and the surrounding background a medium gray (with a density around 5.5); this background will serve to dim the intensity of the light box surface in the photograph and allow for clear visibility of written information.

Jiuan-jiuan Chen 7/01