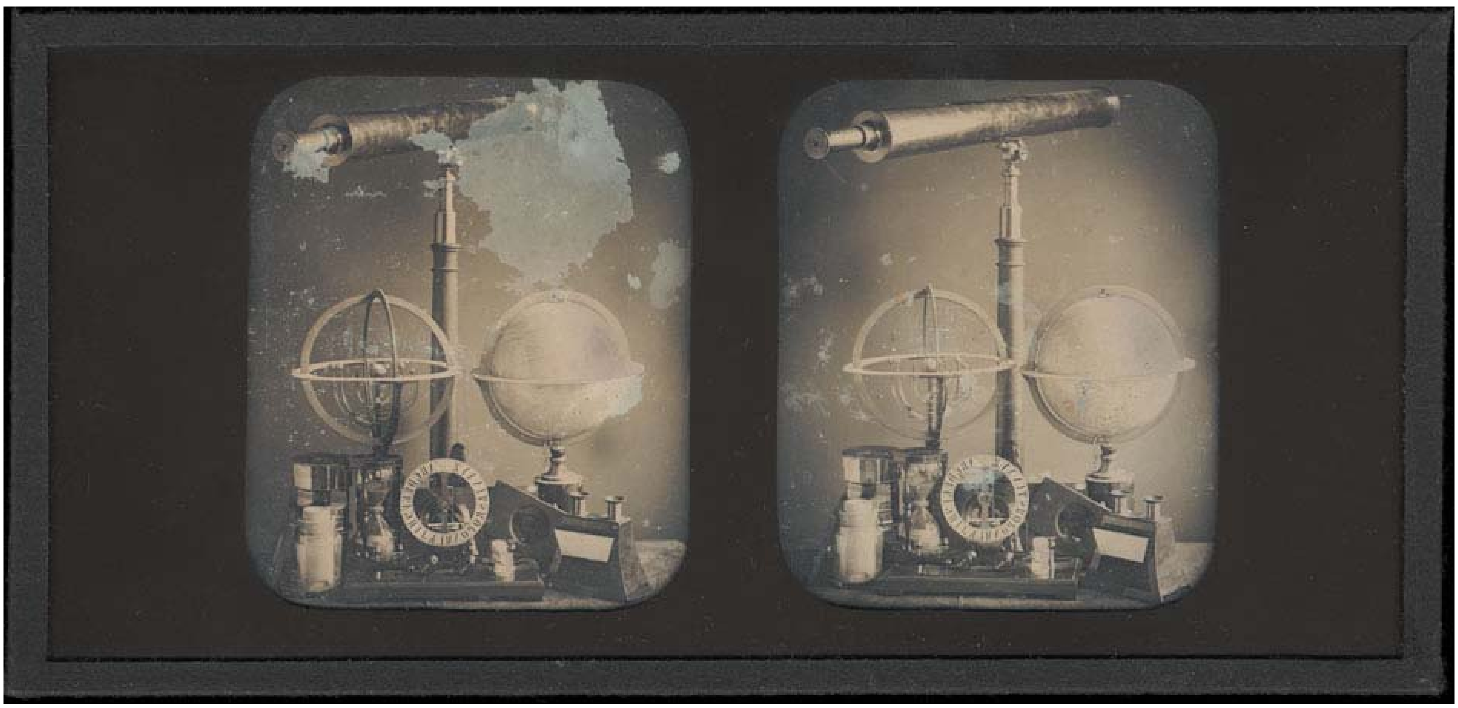
George Eastman House *International Museum of Photography and Film*
& **Image Permanence Institute,** Rochester Institute of Technology

CONSERVATION OF STEREO DAGUERREOTYPE:

Examination and Documentation of the Characteristics



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Advanced Residency Program In Photograph Conservation, 3rd Cycle. July 11, 2005

PREFACE

As I am finishing this report on one of the projects I have been involved in, I am overwhelmed and amazed by how much I have learned in such a short time.

Looking back at two very intensive years as an Andrew W. Mellon Fellow in the third cycle of the Advanced Residency Program in Photograph Conservation, I can hardly grasp the amount of information we have been given by leading experts and colleagues in the field of Photograph Conservation. I know, that it will take a long time to digest and to fully understand the impact of this learning experience that was given to me here in Rochester. The knowledge gathered here is be something I will be able to draw from for the rest of my career and I am grateful to have been given the chance to participate and develop with the other fellows through this program.

Last year I was given an assignment to describe the characteristics and typical deterioration issues of cases for stereo daguerreotypes. This was the beginning of my interest in stereo daguerreotypes. Stereo imagery had already caught my attention a few years earlier, and being introduced to the early theories behind binocular vision combined with the birth of photography has been a fantastic journey, that will not end with this report.

During my research I have been able to combine all aspect of my interests: researching the early history of photography in rare catalogues and periodicals at the wonderful libraries of George Eastman House, The University of Rochester and Rochester Institute of Technology. I have studied the principals of binocular vision by creating models of the Wheatstone and Brewster viewers, as well as capturing stereo images in all possible ways. Finally, I succeeded in making reasonable stereo daguerreotypes after many trials and errors. The practical experiments thought me important issues in stereo imagery, which furthermore has helped me realizing potential problems in the preservation of the objects.
I was also given the opportunity to study more then 200 stereo daguerreotypes in several collections and to assist in the creation of the protocol for a database on documentation of daguerreotypes.

I have been involved in the exhibition of Southworth and Hawes stereo daguerreotypes, of which three pairs now can be viewed in the Grand Parlor and Gallery Stereoscope replicas in the exhibition: Southworth & Hawes: Young America. The work showed, that there is a need for a better understanding and documentation of the stereo pairs in order to ensure the preservation and correct presentation of the stereo effect.

I have been forced to reach outside the conventional field of the photograph conservator, as the cased and framed photographs demanded knowledge of materials, such as paint, pigments, glass, and all of the related deterioration issues. This has been a great challenge and has involved help and advice from conservators in the field of Glass Conservation.

Finally, the research project has given me a chance to meet and talk to many collectors and conservators worldwide.

It is impossible to incorporate everything I have done in regards to the research project on stereo daguerreotype into one report. This report will concentrate mainly on the documentation and examination of stereo daguerreotypes, as well as provide information on the materials and techniques use in the making of the reverse painted glass passepartout. Finally, the report will provide examples of typical deterioration, as well as preservation issues on stereo daguerreotypes.

Lene Grinde

Rochester, New York
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This research project would not have been possible without the generous support of many people and institutions.

I would first of all like to thank the Andrew W. Mellon Foundation and ANGELICA RUDENSTINE for generously founding this two-year fellowship and for giving me the unique opportunity to participate, to evolve and to fulfill a dream of becoming a Fellow in the Advance Residency Program in Photograph Conservation

I thank co-directors GRANT ROMER and JIM REILLY for their great support throughout my time as a fellow. I especially would like to thank Grant for his advice during this project, for introducing me to the exclusive world of stereo daguerreotype and for sharing his grand knowledge on daguerreotypes.

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I thank the staff and faculty of the Advanced Residency Program in Photograph Conservation, especially conservator JIUAN-JIUAN CHEN for her support and help in getting the project organized, for introducing me to the staff of Art Conservation Department at Buffalo State College and for finding time to take me to Buffalo, DOUGLASS NISHIMURA and DANIEL BURGE at the Image Permanence Institute for advising and conducting a Photographic Activity Test for me, and program manager STACEY VANDENBURGH for helping me getting my budget straight and for providing information on Rochester living and surviving.

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collections of stereo daguerreotypes. Collector MATTHEW ISINGBURG for sharing his knowledge on stereo daguerreotypes. Collector ALLAN JOHANSON for responding to the research query I placed in the Daguerreian Society Newsletter. Collector and violinist WIM VAN KEULEN for showing his beautiful collection of stereo daguerreotypes and stereoscopic viewer. Conservator STEPHEN P. KOOB at Corning Glass Museum for his knowledge on glass deterioration. Curator of Collections Access BRIAN LIDDY at the National Museum of Photography, Film & Television in Bradford, UK for his help and for providing access to the beautiful collection of stereo daguerreotype. Conservator ADRIANNE LUNDGREEN for sharing her research and work on stereo daguerreotypes. HANS ROSEBOOM at the Rijksmuseum, Study Room in Amsterdam for letting me study the collection of stereo daguerreotypes. ROBERT PULLEN at the Guildhall Library, City of London for giving me the unique change to study un-mounted stereo daguerreotype plates. MARTIN SCOTT for his thoughts and perspectives. ZITA SOR for her patience and understanding.

I will also like to thank the late JÁNOS NOVOMESZKY, who was a great asset to the field of photograph preservation and a passionate stereo daguerreotype collector. The field has lost a great advocate, but his thought and visions will be remembered.

I want to thank the staff of the George Eastman House, especially archivists DAVID WOODERS, JOE STRUBLE, and TODD GUSTAVSON for making America's largest collection of stereo daguerreotypes available, for letting me work on the stereo daguerreotypes of Southworth & Hawes, and for giving me the possibility to study Southworth & Hawes' The Grand Parlor and Gallery Stereoscope. In addition, I thank photographer BARBARA GALASO for providing me with many images of stereo daguerreotypes from the collection,

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Finally I would like to thank ANDREAS GRINDE, who was brave enough to take this journey with me, and who luckily became just as fascinated with the three-dimensional world as me. Without his help, understanding, and outstanding patience, this project would never have been possible.

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ABSTRACT

The rarity, beauty, and importance of stereo daguerreotypes are widely recognized, yet their complexity and vulnerability are not. As more scholarly attention is paid to early photography, greater valuation will surely be given to the first forms of stereography, which is already seen as a very significant element of the history of photography. No doubt, conservators will be asked more frequently to address problems.

When confronted with jeopardized stereographic daguerreotypes conservators and students of conservation lack guidelines for making corrective interventions. It is proposed to create a guide, which establishes protocols for examination, documentation, and analysis, which provides illustrations of the issues typically presented by this form of photographic object. Such a guide will not only serve the conservation of stereo daguerreotypes, it will also give a model for approaching similar photograph conservation challenges, where housing structures are unusually complex and vital.

INTRODUCTION

Conservation of cased or framed photographs involves decision-making and treatment of many different materials, with properties that often go beyond the field of the photograph conservator. The preservation of original housing materials, as well as the photographs, is important in order to preserve the integrity of these objects. It is therefore a necessity for photograph conservators to broaden their knowledge of the materials, their complexity and vulnerability.

Stereo daguerreotypes are examples of early-housed photographs in jeopardy of losing their historical and artistic integrity due to the lack of information and guidelines for the conservator, curator, and others who care for photographs.

The majority of stereo daguerreotypes are mounted behind a plate of reverse painted glass known as a passepartout. This framing style was developed in France for protecting and beautifying the pictures. These objects were expensive, only affordable for the upper-middle class, and followed the tradition of 19th century aesthetics. Later, the cased stereo daguerreotype style was developed, which was a new version of the miniature pocket case style. The housing for stereo daguerreotypes was designed for protecting and for securing the plates, as much as for enhancing the overall appreciation of the object.

The housing of the stereo daguerreotypes is particular important as it is a part of the object specially designed to fit a stereoscopic viewing device. The proper viewing of the two stereo plates depends on the correct mounting in specific housing before the plates can be placed correctly in a viewer. Knowledge in the intended use of the stereo daguerreotype, and the technology behind early stereoscopic imagery is therefore a necessity for the photograph conservator to fully understand the importance of preserving the physical shape and appearance of the stereo daguerreotype housing.

Stereo plates can, and have been, mounted and viewed individually as common two-dimensional images. This obviously will change the historical integrity and aesthetics of the objects. Furthermore, stereo pairs can be mounted in contemporary housing systems and viewed in modern-styled stereoscopic viewers, but this alteration will be analogous to experiencing a Renaissance painting in a modern aluminium frame.

The variety of style in stereo daguerreotypes is great and very individualistic. It is not possible to cover all the variants in this paper. The objectives are to provide the overview of the typical structure and styles preserved in collections and explain the different features. This research was conducted at the George Eastman House in Rochester, NY and the National Museum for Photography, Film and Television in Bradford, UK. These museums represent two of the largest institutional holdings of stereo daguerreotypes, numbering about 100 stereo daguerreotypes, respectively.

The challenge to preserve these rare and beautiful objects requires informed decisions regarding the best preservation and conservation strategy. Such a strategy requires protocols for thorough examination, documentation, and analysis of the materials and techniques used in the original housing, as well as assessing the long-term stability of any materials used in the treatment.

The decision to replace a deteriorated housing should only be made with the understanding of the historical materials and techniques originally used, as well as their deterioration and affect on the photographic material. This makes it especially important to document and to understand as much as possible about the materials associated with the housing.

The following text will take the reader through an illustrated examination of physical characteristics, associated with housed stereo daguerreotypes, with particular focus on the stereo daguerreotypes mounted in reversed painted glass passepartouts. The following will also suggest the rough outlines for a typical treatment proposal for stereo daguerreotypes.

Finally, it is suggested to view the images in the text with a pair of lenticular glasses.

TERMINOLOGY

In the following text, two different mounting styles of stereo daguerreotypes will be discussed: stereo daguerreotypes mounted in reverse painted glass passepartout are hereafter referred to as the *passepartout style*, versus the stereo daguerreotypes mounted in miniature cases, referred to as *cased style* (Figures 1 and 2).

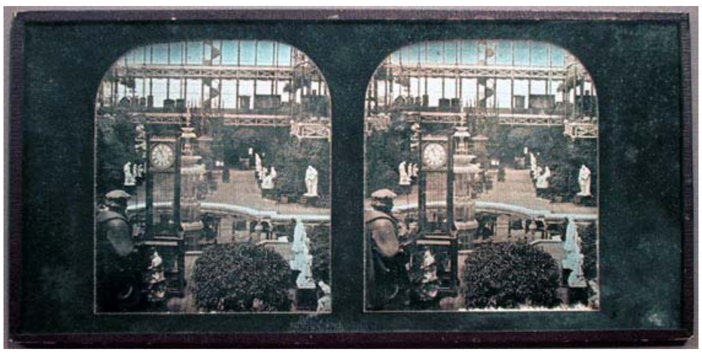


Fig. 1: European stereo daguerreotype in reverse painted glass passepartout style mounting

Fig. 2: The cased stereo daguerreotype

EXAMINATION

Knowing what to look for and recognizing unusual and significant cases are the goals of examination.

To perform a thorough visual examination, guidelines are needed, which will ultimately assist in making informed decisions about restoration and preservation proposals.

The following guidelines or protocols are meant to provide an overview of the construction and housing found in stereo daguerreotypes, by grouping the key visual and analytical characteristics of the objects.

Examination of the object has fundamentally four points of views, as illustrated in Figure 3:

- The technology or application
- The physical structure or construction
- The chemical structure
- The deterioration of the object

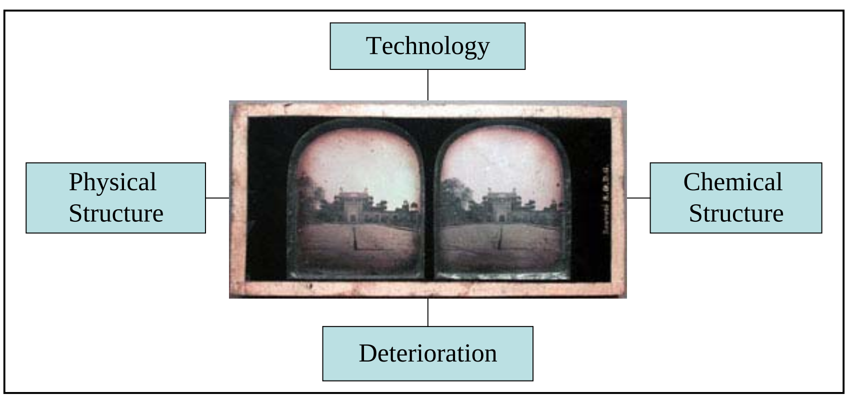


Fig. 3: The four point of views in examination of a stereo daguerreotype

Choosing to examine an object from only one or two angles will provide valuable information, but a better understanding of the object can only be obtained by inspection from all four directions. Within these first four categories of the examination protocol, there are several sub-categories, which will be introduced sequentially.

Examination is conducted mainly under normal light conditions, but also in raking and ultra violet light, using a binocular reflecting-light microscope, as well as lenticular stereoscopic viewing glasses. Analytical examination is performed by using Fourier Transform Infrared Spectroscopy (FTIR) and X-ray Fluorescence Spectroscopy (XRF).

TECHNOLOGY

The interest in stereoscopic imagery was heightened during the Crystal Palace Exhibition in London, 1851. (See Appendix 1: "A Short History of the Study of Binocular Vision and the Stereo Daguerreotype.")

J. Duboscq exhibited Sir David Brewster's lenticular stereoscopic viewer, along with a set of stereo daguerreotypes. The Queen of England immediately ordered a set for herself. This royal interest sparked the public attention, creating a demand for stereoscopic images.

Daguerreotypists (such as Antoine Claudet, Alexie Gouin, John Mayall, and Warren Thompson) also viewed the stereo daguerreotypes at the Great Exhibition, and quickly adopted the techniques thereafter.

The stereo craze began when the daguerreotype era was being threatened by the introduction of the wet collodion process in 1851. The main period for stereo daguerreotype was therefore relatively short: from 1851 – early 1860's or roughly 5 years until wet-collodion became predominant.

The principals behind stereo imagery

The human brain is able to perceive relative distance and three-dimensionality because of a comparison of the two slightly different images seen by each eye at the same time. In 1849, Sir David Brewster developed (on the basis of Sir Charles Wheatstone's theories on binocular vision) the lenticular stereoscopic viewer, in which stereo daguerreotypes were studied the following year in Paris.

The principal behind the creating of stereo image pair is simply to capture first one image of a subject and then capture a second image of the same subject after having moved the camera 63 mm in a horizontal direction. The distance of 63mm or 2 1/2 inch is equal to the intraocular distance between the human eyes.

The advantages of binocular cameras were obvious at the time, but it was impossible to produce two identical lenses in terms of grinding and polishing until years later. Special movable camera holders were therefore developed to be attached to camera tripods for quick and accurate camera movement.

Identification of left and right view

When identifying the left view from the right view in a stereo daguerreotype pair, one needs to find an area in the image and to study the shape and perspective of the given object. In the left side view, which is the image the left eye will see, it is possible to see more of the left side of the given object (indicated by the arrow) in Figure 4 and vice-versa in Figure 5.

Fig. 4: The left side perspective of an object

Fig. 5: The right side perspective of an object

The lenticular stereoscope

The lenticular stereoscopic viewer was unique because of its relatively small physical size, as compared to the larger Wheatstone viewer. The lenticular viewer was a beautifully curved shaped box, which eliminated the reflectance of the daguerreotype plates, as the stereo plates were boxed inside the viewer (Figure 6). A hinged lid was attached to one side of the viewer, which would admit and control the light on the daguerreotype plates. The letter S in Figure 6 indicates a slot in both sides of the viewer, where the passepartout was inserted before viewing.

On top of the viewing box two lenses were attached, each being one half of a double convex lens. The pair was cut from one lens because of the difficulties in producing two identical lenses. The lenses would first of all ensure that the left eye would see the stereo pair intended only for the left eye and vice-versa. Secondly, the lenses would magnify and optically reduce the distance between the two mounted daguerreotype plates, making it easier for the brain to experience the three-dimensional effect.

Figure 7 illustrates the optical principles in Brewster's stereoscope seen in cross-section. The letter L indicates the lenses. AB is the position of the stereo daguerreotype plates and A^1B^1 indicate the optically merged the two images that are seen with the left and the right eyes through the lenses, respectively.

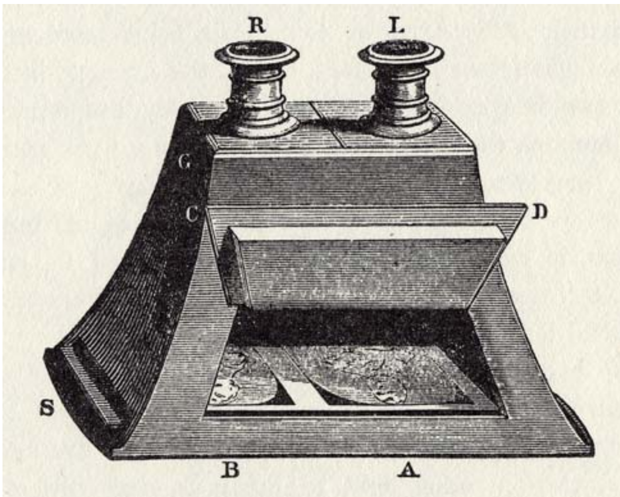


Fig. 6: The lenticular Brewster stereoscopic viewer

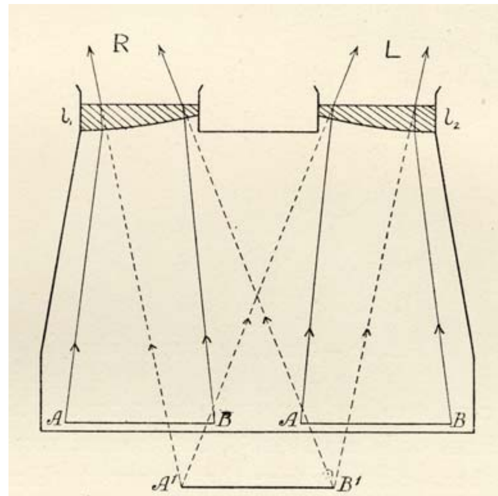


Fig. 7: The optical reduction of the distance between the plates inside a Brewster viewer

Mounting of stereo pair

Correct mounting of the pair is crucial in order to obtain stereoscopic effect while viewing the daguerreotype pair in the lenticular viewer. To understand how to mount the stereo pair, it is first of all important to remember that the lens in the camera fundamentally reverses the image on to the daguerreotype. This reversal has to be compensated for in the mounting of the stereo pair, as the daguerreotype plate captured to the left side of the object will appear to be taken from the right side, as if seen in a mirror.

If the camera view is unknown, one simply has to recognize the left side perspective in the photographed image. This plate has to be mounted so that only the left eye sees it in the viewer, which means to the left side of the passepartout and vice-versa for the right plate.

The correct mounting of the stereo pair is crucial, as reverse mounting of the stereo pair will results in a peculiar false stereoscopic effect known as pseudo-stereoscopic effect. The result is a complete reversal of perspective, so that objects nearest to the observer are experienced in the stereoscope to be the farthest away, and vice-versa. (See Figure 8). If the subject photographed is a composition of a number of separate objects at different distances, the relative distance between these will appear reversed.

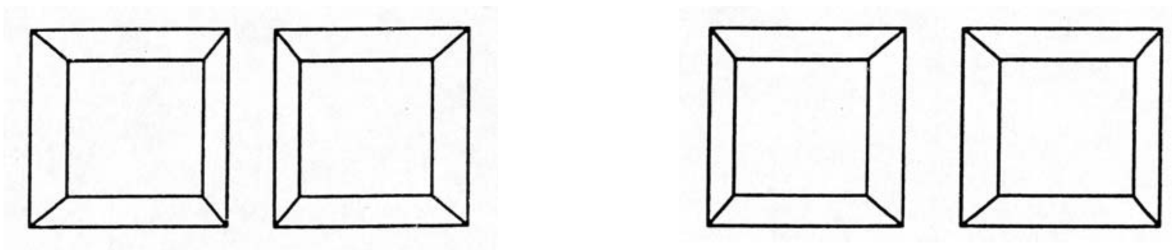


Fig 8: Stereoscopic versus pseudo-stereoscopic images (In the left view one is looking at a box sitting upside down with the bottom towards the viewer, where as in the right view one is looking inside the same box with the bottom away from the viewer.

Stereoscopic perspective

The stereoscopic perspective in the stereo pair is often forced beyond the horizontal intraocular difference, especially in close-up shots of a subject. Figures 9 and 10 show examples of forced stereoscopic perspective, where the right side views clearly have been taken from a large distance than the intraocular distance, and it seems that the objects have been turned clockwise as well.

Even though the two images seem to be two individual daguerreotypes of the same object, the forced perspective will provide the viewer with a three-dimensional experience. This must be used within limits and shows the flexibility of the human brain. The forced perspective was taken with one single objective camera.

Fig. 9: Forced stereoscopic perspective perspective of stuffed animal

Fig. 10: Unidentified forced stereoscopic perspective of a nude study

To obtain the most natural stereoscopic effect of an object of known dimensions situated at any given distance from the camera, it is necessary to vary the lens separation or the intraocular distance according to the distance and depth of the object. For example, a stereoscopic image taken with a smaller lens separation will give the illusion of an object larger than that in real life. A larger lens separation on the contrary will give the impression of an object smaller than that in real life. Mathematical formulas have been created to calculate the best lens separation (Judge, 1926).

Number of plates for the stereo pair

The majority of the stereo daguerreotypes consist of two single daguerreotype plates (Figure 11), but stereo daguerreotypes were also produced with both stereo images on one plate (Figures 12 and 13).

A special plate holder on a slide was used in order to avoid the reversibility of images in the camera. The slide was designed to move the plate in between the capturing of the stereo images, so that the left side view of the photographed object would be captured on the right side of the plate, and the right side view on the left side of the plate.

Fig. 11: Claudet two plate stereo image pair

Fig. 12: Unidentified one plate stereo image pair (mounted)

Fig. 13: Lemaire one plate stereo image pair (un-(mounted)

This way it was possible to mount the plate in a passepartout and to view the stereo daguerreotype in a lenticular stereoscopic viewer, since the left eye would see the left side perspective, and the right eye the right side perspective of the object.

The subjects and applications

Relative short exposure time was already allowing the daguerreotypists to make portraits, as the interest for stereo daguerreotypes increased in 1851. The main subjects were however limited to sculpture, architecture, still life, as well as to portraiture (Figures 14 through 17).

Fig. 14: Portrait

Fig. 15: Sculpture study

Fig. 16: Interior view of the Great Exhibition, 1851

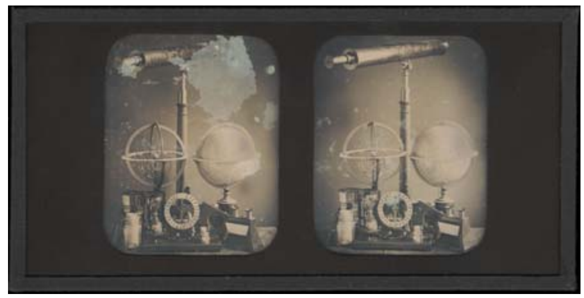


Fig. 17: Still life by Duboscq

Sculpture and still life were popular subjects for the daguerreotypist since the very beginning of photography. Sculpture was available, especially among the artistic and intellectual classes, from which most of the daguerreotypists came from. Sculpture was also immobile, and the white plaster cast would photograph well. Daguerreotypes of statues would therefore persuasively demonstrate the visual capability of the medium. The added three-dimensional effect of stereoscopic daguerreotypes presented an undeniable case for the usefulness of the medium as a means for reproducing the "true-to-life" appearance of existing artworks, as well as any object in general. Furthermore Figure 18 shows a crystal on a drinking glass, which suggests an interest in the application of stereo daguerreotype to reproduce scientific matters such as shape and surface.

Though stereo daguerreotypes were expensive objects to make and to buy, it must have been considered a promising business opportunity because of the fast-growing demand. The interest in the reduced-scale copies of statues, as well as the affordable self-portraits, reflect a growing bourgeois market for such things and with it the commercialization of the art market itself (Batchen, 2004).

The commercialization was also reflected in the great interest in erotic subjects, or academic studies, as they were called (Figure 19). It was illegal to produce erotic photography, but several daguerreotype studios were known to make erotic stereo daguerreotype anyway. This is the main reason for why erotic stereo daguerreotypists remained anonymous.

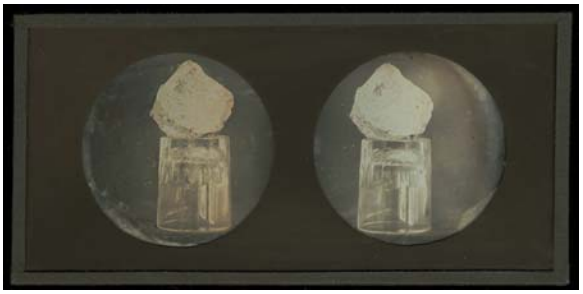


Fig. 18: Scientific study of crystal

Fig. 19: Erotic scene by unknown photographer

PHYSICAL STRUCTURE

The physical structure of the housing of stereo daguerreotypes can be divided into two inclusive categories: the secondary housing and the primary housing. Most of the stereo daguerreotype in passepartout style will only have primary housing, whereas the cased stereo daguerreotype characteristically has a secondary housing as well.

The protocol for examining and describing the physical structure and related information on the object is divided into five categories:

- Secondary package
- Primary package
- Plate
- Image
- Labels and Notation

The five categories follow a checklist of data entries produced as an example of a protocol for a database on stereo daguerreotypes. (See Appendix no. 2: "Protocol for Examination of Stereo Daguerreotypes.")

Each category has sub-categories, which reveal the diversity within the primary and secondary housing; see the flowchart of the categories in Figure 20 for better overview. The key characteristics in each category will be examined in the following text under each corresponding category, working from the outside of the secondary housing to the inside of the primary housing.

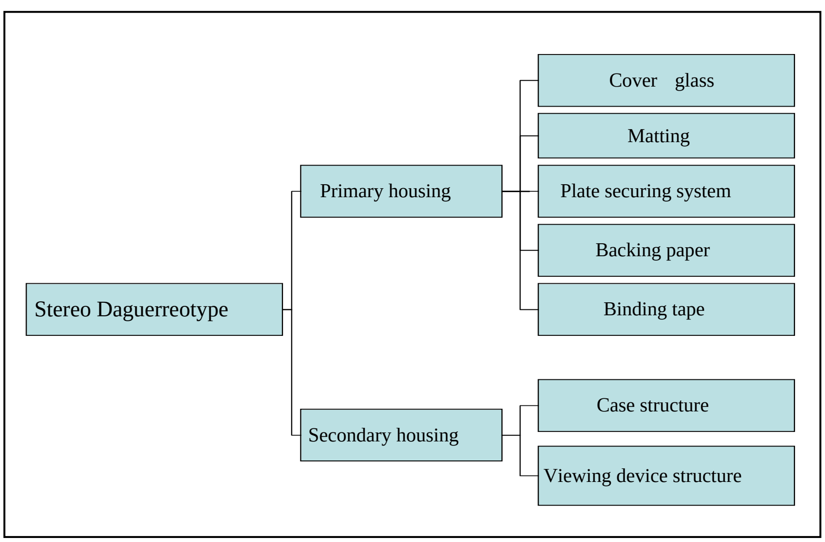


Fig. 20: Flowchart of the categories for the key visual characteristics

Secondary housing

The secondary housing is the outer shell of the stereo daguerreotype plates. The secondary housing can be a slipcase, a box, or a case with a special build-in stereoscopic viewing device. Secondary housings for the passepartout style are extremely rare.

The following examination of stereo daguerreotypes will only describe a few secondary housings for the passepartout style. For information on stereo daguerreotype in the cased style, see "*Stereoscopes – the first One Hundred Years*" by Paul Wing (Wing, 1996).

Case Structure

Secondary housing designed to hold stereo daguerreotypes mounted in the traditional passepartout style are extremely rare.

The dimensions of the secondary housing for the passepartout style stereo daguerreotype are commonly just slightly larger than the primary housing (typically 17 x 8 cm), in order to minimize the final size of the cased object as much as possible.

Claudet designed leather slipcases (Figure 21), as well as boxes, to hold several stereo daguerreotype passepartout. The vulnerability of the passepartout style is obvious. It is therefore logical to wonder if other daguerreotypists created similar case systems designed to hold stereo daguerreotype in passepartout style.

The framed Claudet stereo daguerreotype (Figure 22) can be a much later addition to the passepartout, but shows the value of the stereo daguerreotype as used for portraiture framed for display on the wall.

Fig. 21: Claudet leather slipcase

Fig. 22: Wooden frame with Claudet Stereo Daguerreotype

Viewing device structure

The production of collapsible cases with built-in stereoscopic viewing device for stereo daguerreotypes in passepartout style was primary done by the major stereo daguerreotypists, such as Claudet and Kilburn. Claudet might even have sold his case as a proprietary item, as his cases are usually found complete with a hand-tinted Claudet view (Wing, 1996).

There was general interest in producing stereoscopic viewing cases, and small quantities of cases varying very little from the patented Claudet and Kilburn cases were made by a number of individuals.

Figure 23 shows a Baker stereoscopic case, which is constructed to accept the stereo daguerreotype passepartout into a recess in the lid of the case. A pair of convex lenses mounted 2 1/2 inches apart in a figure-eight-shaped holder is fitted into a flap, which is hinged to the front bottom of the case. The lenses are mounted in a folding system, which will allow the person operating it to adjust the viewing distance for optimum focus. The Baker case is based on a similar case patented on March 23, 1853 by Claudet (Wing, 1996).

Fig. 23: Baker leather case in Claudet style

Fig. 24: French leather case in Kilburn style

Figure 24 shows an early French stereoscopic viewing case. The case is unidentified, but is similar to a case designed and patented by William Edward Kilburn in January 12, 1853.

The wooden case has two lenses mounted directly into a lens board, which is hinged into the lid of the case. The lens board has sidepieces attached, which spring to the side of the lid when the case is opened. This forms a solid boxlike stereoscopic viewer, which is open at the top and darkened in the interior.

Primary housing

The dimension of the passepartout style is characteristically 17,3 x 8,4 x 0.2 mm, with variations within a few mm. The passepartout style was designed for the Brewster viewer and the format of the passepartout is therefore determined by size and function of the viewer.

The daguerreotype plates are held in a matting and plate securing system that extends the dimensions of the passepartout lengthwise. The extra length to the passepartout would make it possible to insert and to remove the passepartout from the slot in the Brewster viewer.

The construction of the primary housing for the passepartout style can be sub-categorized into the following five groups (see flowchart in Figure 20):

- Cover glass
- Matting
- Plate securing system
- Backing or finishing paper
- Binding tape

Cover glass

The thickness of the glass is typically 2 mm, but may vary from 1 – 3 mm, even within objects produced by the same daguerreotypist.

Matting

The main purposes of the matting system were, first of all, to act as a cover system securing the plates underneath, and secondly, to obtain a more advantageous optical condition for better viewing by masking out the images.

The passepartout was also a way of expressing a certain personal style, as well as being a trademark for the particular daguerreotypist. The style of the passepartout varied only slightly within each daguerreotypist, which suggests a very thorough concept for the well-established stereo daguerreotypists like Claudet, Thompson, Williams, Duboscq, Lemaire, and Goüin.

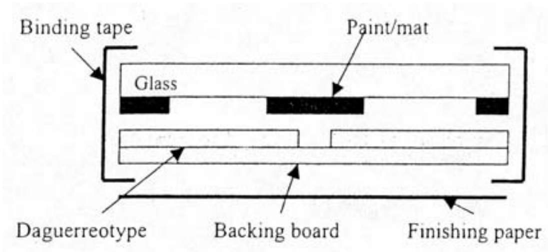


Fig. 25: The housing system (cross-section)

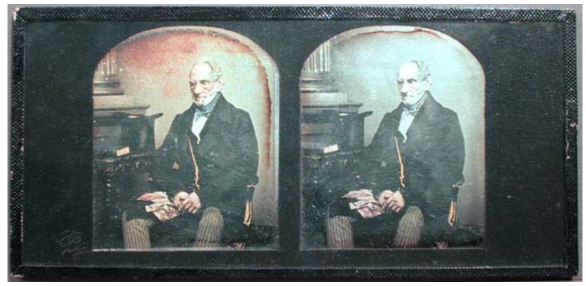


Fig. 26: T. R. Williams stereo daguerreotype (Passepartout with paper matting)

Fig. 27: Duboscq stereo daguerreotype (Reverse painted glass passepartout)

Fig. 28: Duboscq stereo daguerreotype (Reverse painted glass passepartout)

The three passepartout shown above are all (except for the one by T.R. Williams) made by reverse painting on glass. T.R. Williams typically used a paper mat for his passepartout as shown in Figure 26.

A few stereo daguerreotypes were mounted in the traditional French paper passepartout or sink mat style with raised window edges (Figure 28).

The most common reverse painted glass passepartout are, not surprisingly, made of one or more layers of dark paint, typically black. The dark-colored passepartout would, first of all, direct the viewing of the images in the stereoscope and maximises the three-dimensional illusion of looking through a window into a hidden world. Secondly, the dark masking would block out the mounting system inside the passepartout.

But black was not the only color used for the passepartout. Warren Thompson had, for instance, a passepartout style in dark reddish brown, painted in one very thin (almost translucent) layer (Figure 32), and several of unidentified stereo daguerreotype passepartout are in more or less dark colors, like blue or red.

The choice of color, as well as the widespread use of golden borders around the window opening in the passepartout, shows a desire to decorate the passepartout and further express a certain style connected to the images and the daguerreotypist.

Fig. 29: Claudet passepartout style

Fig.30: Duboscq passepartout style

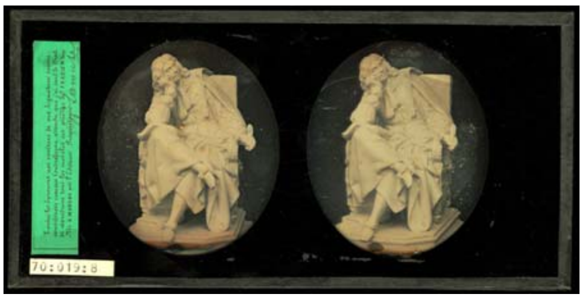


Fig.31: Lemaire passepartout style

Fig.32: W. Thompson passepartout style

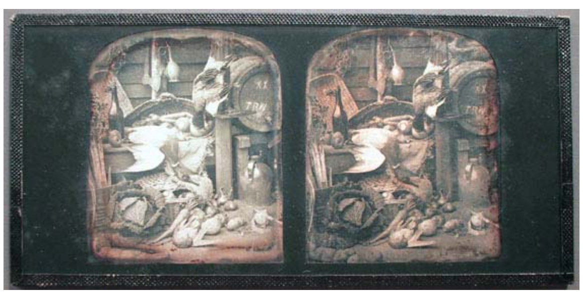


Fig.33: T. R. William passepartout style

Fig.34: Goüin passepartout style

The choice of border was a question of taste and should not distract from the principal object, the image. The style of the golden border is found in both a single or double line, as used by Duboscq (Figure 30) and Thompson (Figure 32).

The shape of the window mat follows the popular styles also seen in the housing of single daguerreotype plates: the oval (Figure 31), the elliptic (Figures 29 and 33), the double elliptic (Figure 34) and the square format.

The reverse glass painting

Historical references to the original techniques used in crafting the reverse painted glass passepartout for stereo daguerreotype have yet to be discovered. The technique used for making the reverse painted glass passepartout must, however, originate in the historical tradition of reverse glass painting.

Reverse painting on glass comes from the German technique *hinterglasmalerei*[1], which embraces all aspects of gilding and painting on glass. It also refers to paint bonded to glass and not fired in kilns. The French terms for reverse painting on glass are *fixés sous verre*[2], *fixés*, or a more commonly used term *verre églomise* (Binnington, 2001).

The term *verré eglomisé* is derived from the name of an 18th Century French art and picture frame dealer, Jean Baptiste Glomy. Glomy introduced a fashion of framing prints behind glass mats decorated with gold leaf for borders and then painted black over the gold decoration. The term was commonly adopted by early 1850's, and became the generic term for all sorts of painting and gilding behind glass, of any date (Figure 35).

Reverse glass painting became an industry as demand increased. Methods included stencilled designs, what was at that time the front-runner of the modern transfer decal. The stencils allowed for a faster production on an assembly line by applying the guidelines from a picture on the glass and then filling in the colors from behind.

Fig. 35: A verré eglomisé frame

The proposed techniques used for the making of the passepartout for stereo daguerreotypes are derived from information gathered from a visual study of several reverse painted glass passepartout for stereo daguerreotypes.

The techniques are simple but systematized painting techniques, that only differ slightly in the way the golden lines or borders would be applied. One, by which the gold border is created, is using a ruling pen and a stencil. Another method uses a stencil or a type of decal to mask out the width of the lines and borders to be painted.

The first step would be to apply the desired design, most likely by the use of stencils. The design of the passepartout could have been pre-cut into a stencil, which was then adhered to or pressed against the glass while applying the paint.

Guidelines could alternatively have been drawn from a stencil onto the glass before paint application, which might be what is seen to the left of the gold line in Figure 36.

Figure 37 shows the misalignments of the two outer gold borders, suggesting that stencils could be the shape of only one of the window openings, and that the stencil had to be moved from one side to the other to mark the second window on the glass.

[1] *Hinterglasmalerei*: *Hinter*; behind, *malerei*; painting.
[2] *Fixés Sous verre*: *fixés*; fix, *sous*; on, *verre*; glass.

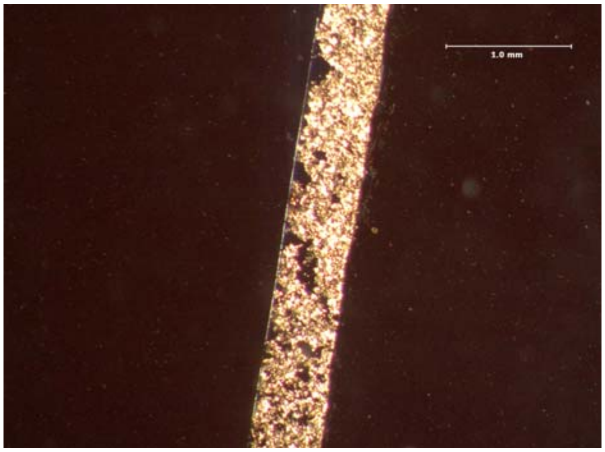


Fig. 36: Guidelines for the golden border

Fig. 37: Outer gold borders slightly misaligned

A subbing layer was then applied where the gold lines were to be painted (Figure 38), which was followed by a dusting of bronzing powder. What looks to be the subbing layer seeping underneath the edges of the stencil can be seen along the edges for the gold lines (Figure 38).

The subbing layer and the bronzing powder was then aloud to dry before excess powder was removed, most likely by blowing air, often leaving residual powder behind (Figure 39).

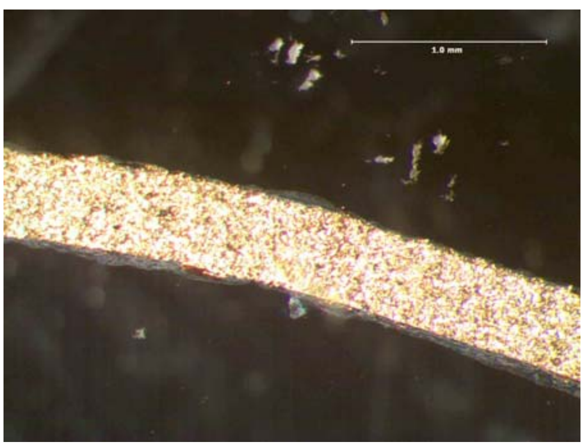


Fig. 38: Subbing layer between the glass and the bronzing powder

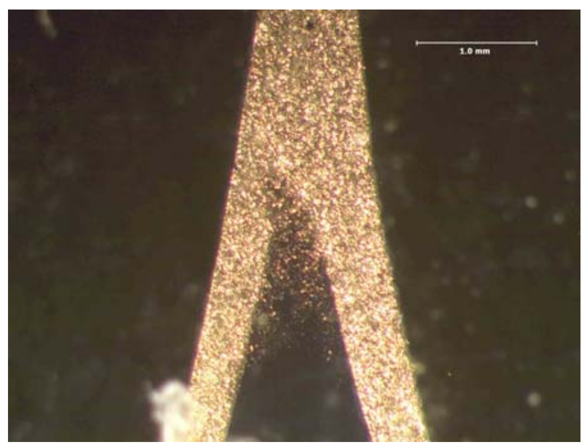


Fig. 39: Residual bronzing powder

The clear relief of the border (Figure 40), and the fact that there is no bronzing powder in the subbing right next to the clear golden line (Figure 39), suggests that the stencil stayed on the glass while the subbing layer and bronzing power was applied.

The golden lines did not have to be completely opaque, as a layer of dark paint behind a slightly transparent golden border would create a deeper color (Figure 41).

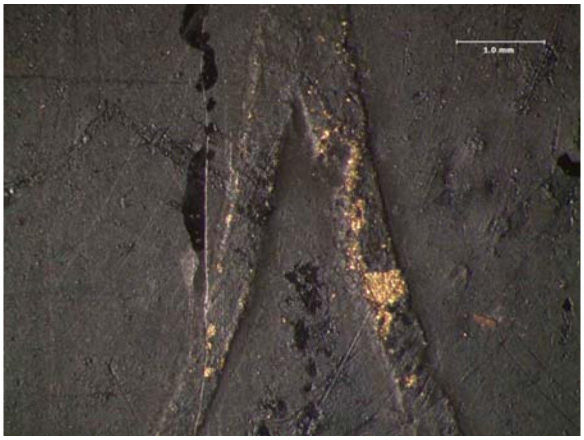


Fig. 40: Black paint covering the golden lines

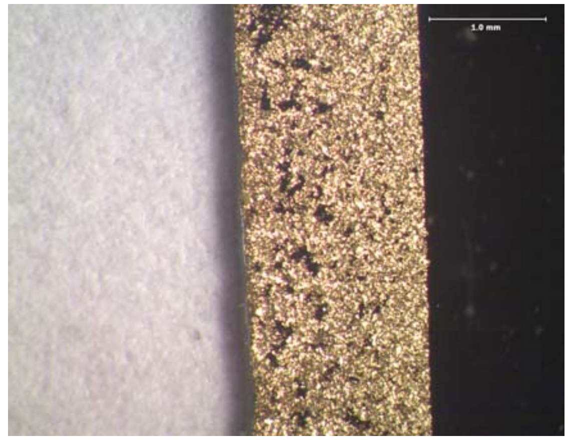


Fig. 41: Black paint behind bronzing powder creates a deeper golden color

The paint was then applied to the passepartout, on top of the golden lines and onto the edges of the window stencil or masking in a very thin layer (Figure 40). Some differences can be seen in the application of the paint to the passepartout. Where most have visible paint strokes on the surface, some will show the characteristic surface of paint being applied by some type of airbrush equipment (Figure 46).

The final step in removing the used stencil or decal would create the perfect aligned edges of the gold line and black paint seen in the passepartout windows (Figure 42), which again supports the suggested theory.

Fig. 42: The perfect aligned edges of the gold line and black paint

Several of the passepartouts show a slightly uneven or saw-toothed edge facing the windows (Figure 43). Painting and removal of the proposed masking of the window will give very similar results to the edges (Figure 44).

Different paint media at different levels of hardening will of course give different structures to the edge, but a passepartout painted without the use of a stencil or masking of the window would not give this type of edge.

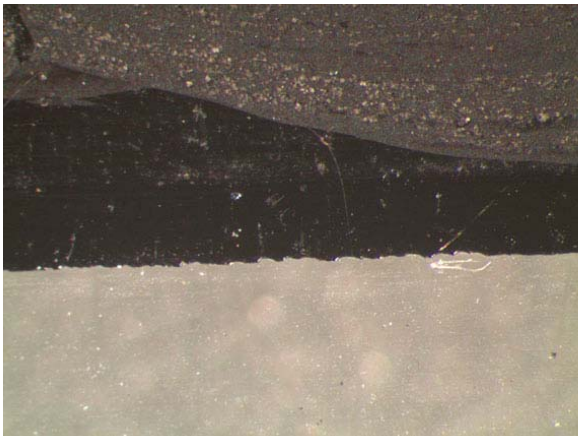


Fig. 43: Uneven or saw-toothed edge on original passepartout

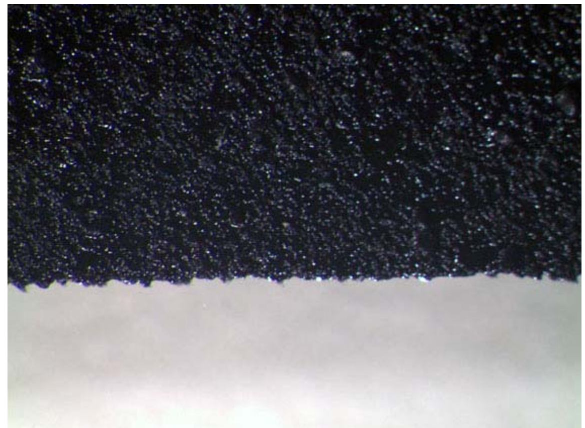


Fig. 44: Uneven or saw-toothed edge on new test

Inscription on the passepartout could be part of the reverse painted design, exemplified by the characteristic design by Warren Thompson. It is obvious that he used a stencil to paint his business name: W. Thompson, Rue de Choiseul, 22 (Figure 45), which was then over-coated by the primary reddish brown passepartout paint (Figure 46). The seeping of the paint underneath the edges of the stencil can be explained by the difficulties in sustaining close contact between a very small stencil and the glass.

Fig. 45: Close up of the stencilled painted business (front view)

Fig. 46: The reddish brown paint over-coat name (back view)

Plate securing system

The plate securing system for the primary passepartout packages is characteristically a sink mat system or simply strips of tape adhering the corners of the daguerreotype plates directly to the backing board.

Claudet stereo daguerreotype plates are typically secured by a sink mat system. A thin paper spacer is between the daguerreotype and the cover glass, and three paper tape strips are holding the plates inside the sink mat (Figures 47 and 48).

The passepartout system used by Duboscq and many other stereo daguerreotypists would typically only use strips of tape to hold the plates in place (Figures 49 and 50).

Fig. 47: Claudet sink mat system securing the plates with three paper tape strips covering here the left side window

Fig. 48: Close-up of sink mat system

Figure 50 shows a four-flap jacked system with strips of securing tape, as well as an adhesive. The securing systems will characteristically have a thick backing board of either one piece or a four-flap system. This system consists of four triangular-shaped cardboard pieces placed inside of package to form an envelope-styled backing. This system is suggested to be a part of a pre-manufactured package system developed for easy assembling and access to the plates. A cut along the edges of the cardboard pieces would open the package like an envelope and give access to the plates from the back without damaging the binding system.

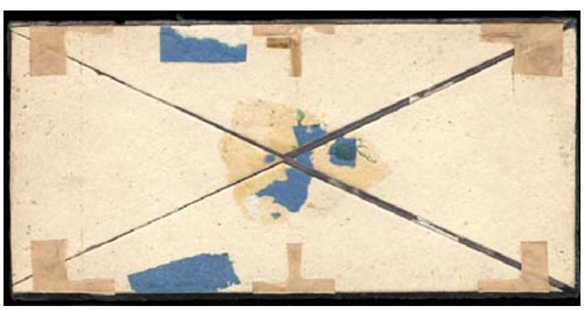


Fig. 49: Tape strips securing the corners of the plates of a Duboscq passepartout

Fig. 50: Duboscq four flap jacket system and adhesive

The discolouring of the adhesive in Figure 50 suggests a practice of using adhesive directly on the copper back of the daguerreotype plates. Chemical reaction between adhesive and copper would result in the blue coloring of the adhesive.

This suggests the following procedure in mounting of the plates: the four triangular-shaped cardboard pieces were laid on top of a finishing paper (see Figure 52) and possibly held together with a small piece of paper tape. The plates were positioned on top and (after most likely having checked the position of the plates under the cover glass) the plates were secured with adhesive underneath and/or tape strips from the front. The tape strips would also function as a thin spacer between the daguerreotype surface and the cover glass.

The cover glass was placed on top, and the finishing paper was adhered to the front edges of the cover glass. This jacket system is found on many stereo daguerreotypes, suggesting a pre-manufactured system or a well-accepted system.

Backing paper (finishing paper)

The backing or finishing paper would finally wrap the package and is therefore the visual backing of the stereo daguerreotype primary package. The finishing paper will often contain or function as a printed business label (Figures 51 and 52; also Figures 60-65).

The unaltered finishing papers are often wrapped around the edges of the cover glass, as explained under the securing system.

Several major stereo-daguerreotypists, like T.R. Williams and Millet, used a black diamond-shaped embossed paper, suggesting an aesthetic trend. Others like W. Thompson would use a brownish- red finishing paper matching the color on his passepartout (Figure 53).

The majority of the original finishing papers are plain paper (Figure 54), and many have been removed and replaced with more modern papers in previous openings or restorations of the stereo daguerreotype packages.

Fig. 51: Close-up of diamond-embossed paper from Millet studio

Fig. 52: Diamond finishing paper from a London optician from

Fig. 53: Close-up of W. Thompson reddish brown finishing paper

Fig. 54: Plain black finishing paper with Duboscq's initials

Binding tape

The binding of the stereo daguerreotype primary package is either done by the finishing paper (as described above) or by four strips of paper tape. The texture of the binding is commonly a plain, faded black paper or the diamond-embossed paper (Figures 51 and 56-55).

The opening of the packages for study or restoration and rebounding with modern or contemporary papers or tapes has altered most of the studied stereo daguerreotypes in the collections.

Fig. 55: Diamond-embossed paper tape from Mayall's studio

Fig. 56: Close-up of plain tape

Plate description

Brewster's lenticular stereoscope determined the size of the commonly used stereo daguerreotype plates in the reverse painted passepartout style. Brewster designed his viewer for the already standardized pre-manufactured silvered copper plates. The choice felt on the sixth plate (2 5/8 x 3 1/4 inch (7 x 8,3 cm)), which would accommodate the average intraocular distance (2 1/2inch or 63mm) needed to obtain the three-dimensional effect when viewing the two plates. The sixth plates are however slightly too large when mounted side by side with a 2mm spacer in between, creating a distance of 72mm between two component images. This was accommodated for by the wedge-shaped lenses used in viewer, which would optically reduce the distance between the stereo plates (van Keulen, 1990). Figure 11 showed a stereo pair by Claudet, where the daguerreotype plates measure 6.6 x 7.2cm, suggesting Claudet had the plates specially cut. Figure 57 shows one pair of a collection of 7 un-mounted stereo pairs by unidentified daguerreotypist, with the standard sixth plate size of 7 x 8 cm.

Fig. 57: Left and right view of un-mounted stereo daguerreotype pair from unidentified daguerreotypist

Image format

The restriction to the size of the plates to be mounted and viewed in the Brewster viewer also influenced the image format, as obtaining the correct intraocular distance between the sixth stereo plates is only possible if the image format is vertical. The George Eastman House Collection holds a few exceptions with horizontal image format, which also dictated a smaller plate size.

Edges

Edges of the daguerreotype plates are usually flat to minimize the thickness of the primary package.

Corners cutting

The cutting or trimming of the plate corners was be done to prevent tearing and scratching of a mounting system, for example the corners on plates of Claudet are rounded, suggesting a concern for sharp edges inside the sink mat (Figure 48).

The plates studied by the author however, do not provide any direct clues to a standard practice among the daguerreotypist, proposing that it was an individual decision.

Polishing direction

Brewster's lenticular viewer was designed to control the light needed to see the stereo daguerreotypes by lighting the plates through a slot above the inserted stereo daguerreotype view. This meant that light would fall from the top down on the stereo daguerreotype package, requiring the polishing direction to be vertical in relation to the image format (Figure 58).

The 14 un-mounted stereo daguerreotype plates from the Guildhall collection (Figure 57) have interestingly all been polished horizontally, which might explain why these plates were never mounted and used. They were simply not suitable for viewing in the traditional mounts for the lenticular viewer, since the light would be scattered in the fine polish marks and obscure the images.

Fig. 58: Vertical polish marks on stereo daguerreotype plate

Plate Hallmark

More study of stereo daguerreotype plates is needed in order to express any informed knowledge on hallmarks on stereo plates. Since the pre-manufactured sixth plate standard format was used for the stereo daguerreotypes, it is fair to predict the presence of hallmarks. The plates in Figure 57 show, for example "*30*" for the silver contents in the lower right corner and an unidentified "*20B*" in the lower left corner of the right plate.

Handcoloring and coating

There were three main motives for coating the stereo daguerreotypes: to preserve the plates, to reduce the reflectivity of the daguerreotype plates, and to aid in the application of hand coloring (Lundgren, 2005). See Figure 59 for a close-up of a Claudet coated and hand-colored stereo daguerreotype

Applying color to the monochrome daguerreotype plates was a practice often conducted by hired skilled artists. Claudet, as well as other leading daguerreotypists, had engaged an artist named Mr. Mansion for handcoloring his daguerreotypes. Mr. Masion had as other high-end painters found a new lease of life by skilfully combining the old art with the new (Gernsheim, 1969).

An advertisement placed by Claudet on May 9, 1846 states that "Mr. Masion is attached to this establishment" and later in same publication on June 13, 1849: "The colouring of these portraits (which has become such an important feature) is executed by Mr. Masion, an artist of ability and by his skills they rendered equal to the most beautiful miniatures" (London Athenaeum, 1849).

Fig. 59: Close-up of Claudet coated and hand-colored stereo daguerreotype

Labels and notations

The labels and notations on the back of the stereo daguerreotype packages are often the only written proof of origin and provenance and are obviously an important part of the identification and registration of the objects.

The labels provide information about the name of the daguerreotypist, the address of the studio, and often direction: *Mayer F. res & Pierson, Boulevart des Capucines, 5.au 1er. Etage, entrée des voitures rue Louis-le-Grand 35* (Figure 60).

The major studios would announce information on achieved medals and prizes, which also will provide the important information of earliest possible date of production, here exemplified by first class medallion achieved by Mayer & Pierson in 1855: *expo n 1855, 1er Classe* (Figure 61).

The labels will also communicate the speciality or practice of the daguerreotypist, like Claudet announces on his label the making of *Plain and coloured stereoscopic daguerreotype portraits* (Figure 63) and Williams announces on his business label: *Portraits taken daily* (Figure 62).

Several stereo daguerreotypes were sold through a seller; often opticians and a seller's label would be attached to the back, like the Watkins & Hill in London (Figure 64). In this case it is a Duboscq stereo daguerreotype sold through Watkins & Hill, which is seen by the red stamp in upper left corner numbering the stereo daguerreotype as *19*, characteristic by Duboscq who also would stamp in the middle of the piece his initial *DJ* in red ink (Figure 65). In this case, the Watkins & Hill label is placed on top hiding the Duboscq initials, suggesting the name Duboscq was not of importance to the seller or buyer.

Fig. 60: Mayer & Pierson business label on the back

Fig. 61: Mayer & Pierson label close-up

Fig. 62: T. R. Williams business label on the back

Fig. 63: Claudet business label on the back

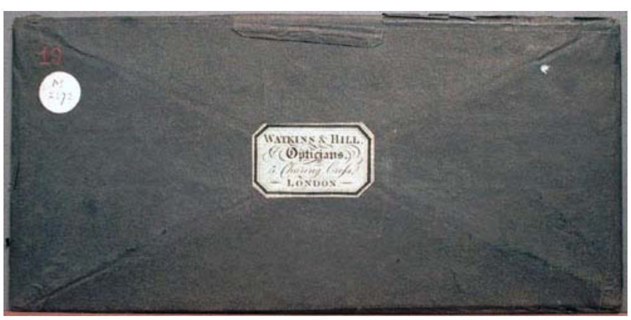


Fig.64: Watkins & Hill business label on the back

Fig. 65: J. Duboscq's red ink initials DJ

CHEMICAL STRUCTURE

The Advance Residency Program in Photograph Conservation at George Eastman House holds a small collection of original stereo daguerreotype passepartout. Replicas replaced the original passepartout during restoration of stereo daguerreotype from the George Eastman House Collection. The collection of passepartout is kept in the Conservation Department as part of a study collection.

Study of the glass under ultra violet light

Study under ultra violet light of several passepartout glasses from the study collection revealed no direct correlation between the choice of glass and the daguerreotypist in question. The study showed the use of a range of different glass, which might indicate that the daguerreotypist used whatever glass was available at the time of demand.

A. Claudet, as the only daguerreotypist in the study collection, was according to this study more particular with the choice of glass and used glass, which fluoresce blue under UV light suggesting the presence of small amounts of lead (Newton, 1996). Pane glass made with lead is fairly unusual, because of its comparatively high cost, and the lead glass found during the UV light study of the passepartout glasses might be explained by the recycling of glass and thereby the mix of components in the glass melt (Barger, 1989). This notion is supported by the fact that not all Claudet passepartout glass studied under UV light had the blue fluorescence (Figure 66). However, the possibility of Claudet using expensive lead glass should not be overlooked.

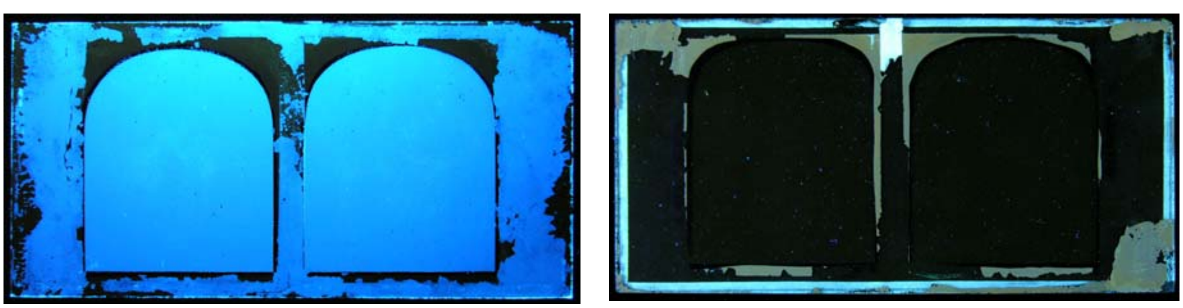


Fig. 66: Two different deteriorated Claudet passepartout glass

The passepartout from stereo daguerreotype taken by Warren Thompson, Lemaire and a few unidentified daguerreotypists were all made on glass, which fluoresce light yellow possibly suggesting soda fluxed glass (Figures 67-68). Soda is commonly used as the alkali ingredient of glass. It serves as a flux to reduce the fusion point of the silica when the batch is melted. Soda fluxed glass are the most common type of industrially produced glass.

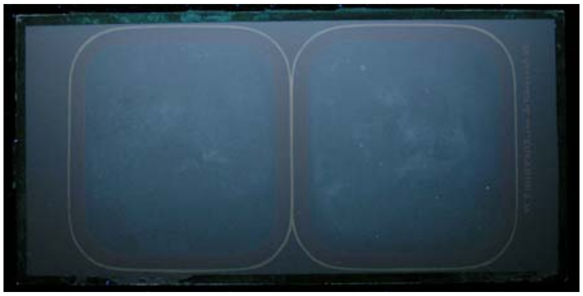


Fig. 67: Warren Thompson passepartout glass

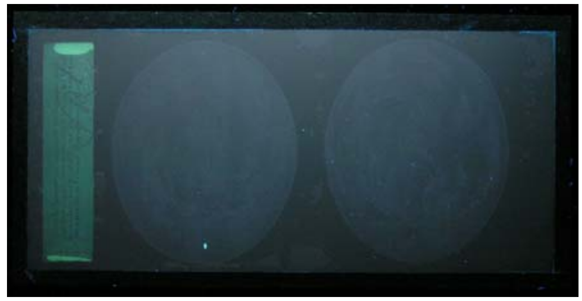


Fig. 68: Lemaire passepartout glass from the Crystal Palace Exhibition

XRF analysis of the glass

Five passepartouts from the study collection were selected for analytical study by x-ray fluorescence spectroscopy (XRF), conducted by Dr. Anikó Bezúr, Art Conservation Department, Buffalo State College. The chosen passepartouts are stylistically typical from the studios of Claudet, Duboscq, Lemaire, and Thompson, with black paints used on the Claudet, Duboscq and Lemaire passepartout and a brown paint on the Thompson passepartout. The Claudet passepartout has an additional grey paint on top of the black paint. The fifth passepartout is from an unidentified studio, where a black paint is coated with a matte white paint (Figures 69-73).

Fig. 69: Claudet passepartout (verso)

Fig. 70: Duboscq passepartout (verso)

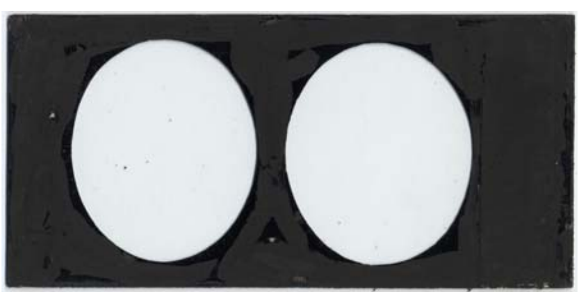


Fig. 71: Lemaire passepartout (verso)

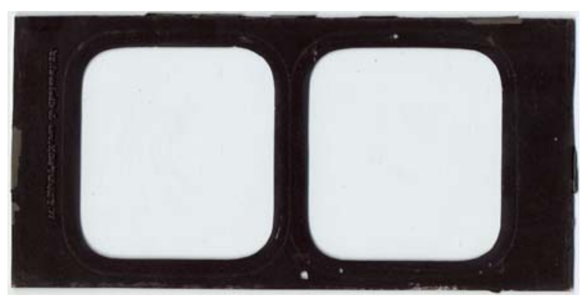


Fig. 72: Thompson passepartout (verso)

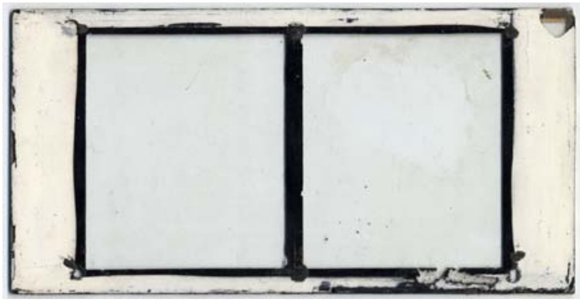


Fig. 73: Passepartout by unidentified daguerreotypist (verso)

The XRF results of the glass give strong indications that 4 out of 5 glasses are of the same type of glass. (See Appendix 3: “XRF Results on Paint and Glass on Stereo Daguerreotype Passepartouts from the Study Collection of Advanced Residency Program in Photograph Conservation.”) The analysis indicates the presence of calcium, arsenic, lead, and iron.

Glass is an amorphous matrix of negatively charged silicate ions and metal cat-ions. The main refractory component is silica (SiO_2), to which alkaline substances such as potash (K_2CO_3) or soda ash (Na_2CO_3) are added as fluxes, together with lime (CaO) or magnesium oxide (MgO) as stabilizer (Bretz, 2005).

Calcium is present as a network modifier in glass, whereas iron ions dissolved in the glass network are responsible for its green tone. The melting point of pure iron is about 2795°F, so originally it was used as element to create glassmaking tools or molds. Due to the potential of contaminating glass with iron oxide on contact with the mol surface, iron is no longer used for molds where completely transparent glass is desired.

Arsenic oxide (As_2O_3) is added to glass batches as a refining aid to keep the glass above the liquidus temperature so that gas bubbles rise to the surface, thereby reducing blisters in the final product. Lead oxides are commonly added to the batch to lower the melting temperature and the hardness, and also to raise the index of refraction of the glass. Lead oxides are widely used in modern glasses, particularly in the production of high-quality crystal glass. However, as mentioned above, the presence of lead could be the result of recycled glass mixed together in the glass melt. The analysis of the glass from the Claudet passepartout suggests the presence of magnesium, which is a decolorant to remove the green tone due to the presence of iron.

In summary, the XRF results indicate a similarity in the glass used among the five different daguerreotype studios, regardless of origin. It seems possible that the glass was common soda-fluxed glass with addition of several chemicals for a more neutral and blister-free product.

It seems unlikely that Claudet would have used leaded glass for his passepartouts, but without further research, it cannot be rejected that Claudet would use a more expensive material for his stereoscopic experiments and business.

A historical reference on the selection of glass for daguerreotype housing indicates a lack of explicit protocol and suggests the decision was based on plain assumptions of what was the best glass to use. Physical factors such as transparency and few blisters seem however to be the most important issues in the choice of glass:

> To preserve daguerreotypes they must be well sealed and secured in a case, or frame…Most daguerreotypists prefer the white French plate glass- and many thinks, very erroneously, that none is good unless it is thick – but the great desideratum is clearness and freedom from blisters; even glass a little tinged with green or yellow is to be preferred to the French plate when cloudy or blistered, and there is very little of it comes to this marked that is not so… (Snelling, 1849).

Passepartout paint

Extensive research has not uncovered any historical references pertaining to the paint materials used in reverse painted glass passepartouts. This might be explained by the fact that stereo daguerreotypes were a novelty, not manufactured in large numbers, unlike the later and much more readily available stereo wet-collodion images on glass. A sales catalogue for stereoscopic collodion images shows the terminology used. A terminology, which most likely originated from terms, used for stereo daguerreotype passepartouts as well. For example: “Stereoscopic Passe Partouts; Stereoscopic Passe-partouts, dark ground, and gold line for positives or negatives on glass, per dozen 40 Shilling” (Bland & Long, 1863). The term “dark ground” refers to a paint or varnish creating the matting with a gold line or border surrounding the window opening.

When turning to historical references describing the procedures in reverse painting on glass, the same lack of information and strict rules for the choice and use of materials are found. However, early documents indicate the use of drying linseed or nut oil as the binding media, with lead, cobalt or manganese compounds as drying accelerators. Oils of turpentine or spike were used as paint thinners, as well as fatty acids from linseed oil as stabilisers on the paint. In addition to oil, egg-, gum-, and casein tempera, gum and natural glue were used to produce reverse paintings on glass. In other words, any kind of paint available on the market was used (Bretz, 2005).

The same five passepartout from the study collection studied by XRF were selected for analytical study of the paint by Fourier transform infrared spectroscopy (FTIR) also conducted by Dr. Anikó Bezur, Art Conservation Department, Buffalo State College

Black paint layers

FTIR spectra of the black paints on the Claudet, Lemaire, Thompson and the unidentified passepartout are very alike and show similar features to reference spectra of asphaltum and bitumen. The spectra indicate the possible mixture of dammar or other resins, and perhaps even an oil, with the asphaltum. (See Spectra in Appendix 4.)

The pigment used for the black paint was not detected, though historically carbon black or lampblack was commonly available for the painters of reverse painting on glass at the turn of the 18th Century (Bretz, 2005), and is widely found in recipes for paints.

Asphaltum was commonly used in the 19th Century in waterproofing agents, anti-corrosive coatings, paints, and later as a varnish on the verso of wet-collodion positives more commonly known as Ambrotypes (Child, 1995 and Towler, 1864). Recipes for asphaltum paint contained asphaltum, oil of turpentine, copal and linseed oil and some with the addition of rosin, benzene, coal tar oil, lampblack and binoxide of manganese (Henley's, 1924). A very popular recipe used for the black varnish on the verso of the wet-collodion positives consists of oil of turpentine, asphaltum, and Canada balsam, often with the addition of lampblack (Towler, 1864).

XRF spectra indicate the presence of iron; however, some of the signal may originate from the glass below the black paint layer.

Grey over-coat on Claudet passepartout

XRF analysis of the grey over-coat on the Claudet passepartout detected barium (Ba), lead (Pb), and calcium (Ca), which suggest the presence of baryta ($BaSO_4$), lead white ($2PbCO_3 \bullet 2Pb(OH)_2$) and calcium carbonate of sulfate ($CaSO_4$ or $CaCO_3$).

A small sample of the grey paint was crushed in a diamond compression cell and FTIR analysis in transmission mode resulted in a complex spectrum, which can be interpreted to confirm the presence of lead white, chalk (calcium carbonate), barium sulfate and an organic component.

Finally, a small sample of the grey paint was placed on a glass slide with infrared reflective coating (MirrIR by Kevley Technologies) and extracted with dimethyl formamide (DMF) separating pigment from binder. The DMF was subsequently evaporated under vacuum. The resulting infrared spectrum of the film of material left on the MirrIR suggests two components: an oil binder and lead soaps of fatty acids (possible added as driers to oil).

The combined results from the XRF and the FTIR analyses suggest the grey paint to consist of a lead-dried, oil-based paint mixed with chalk and barium sulfate. The paint is most likely a linseed oil mixed with carbon black and the chalk and barium sulfate to obtain the grey color and a certain viscosity and opacity.

White over-coat on unidentified passepartout

A small sample of the white paint was crushed under the diamond compression cell and a FTIR spectrum was obtained through transmission mode. The spectrums suggest chalk or calcium carbonate ($CaCO_3$) in a proteinaceous binder, perhaps a glue or casein.

It is highly likely that casein has been used for the purpose of extending the opacity of the reverse painted glass passepartout and has also been used as a final, white-matte over-coat on a cover glass in a French paper passepartout frame for a wet-collodion positive (Kilde, 1999), a framing style also used for daguerreotypes.

Casein is a milk-based product that forms a strong adhesive when mixed with an alkali (e.g. lime, borax, ammonia, etc.), which is what historical references often refer to: “Braconnot’s Glue of Caseine. Dissolve caseine in a strong solution of bicarbonate of soda” or “Wagner’s Glue of Caseine. Dissolve caseine in a cold saturated solution of Borax. Superior to gum” (Dick’s, 1872).

Casein is furthermore the base in some coldwater paints with a very dry, velvety surface, of which an over-coat would not dissolve the primary paint, oil, or asphaltum. Casein does however dry up to become insoluble in water.

Brown paint on the W. Thompson passepartout

A small sample of the brown paint was taken and crushed in the diamond cell, which revealed a heterogeneous material. A transmitted FTIR spectrum of one portion of the sample where multiple components were present suggests similarity to the black asphaltum paint found in the four previous tested passepartout.

Another small sample was taken and dissolved in DMF, which was evaporated and the remaining crystals crushed in the diamond cell and analyzed by FTIR in transmission mode. The particles analyzed suggest a mixture of inorganic and organic components. The spectra suggest the presence of kaolinite ($Al_2O_3 \cdot 2SiO_2 \cdot 2H_2O$) and calcium carbonate ($CaCO_3$).

XRF spectrum of the brown paint layer reveals the present of iron, most likely from the red/brown pigment iron oxide (Fe_2O_2).

Golden border on W. Thompson passepartout

The XRF reading of the golden lines around the window opening suggest the presence of the inorganic elements copper and zinc. Copper and zinc create the alloy brass, which also can contain lead and iron. The percentage of zinc determines the color of the brass, e.g. 10% zinc makes a red brass color, whereas 15% makes a more golden color.

To sum up the above written results from the analytical studies, all five passepartout, made by five different daguerreotypist studios in London and Paris, indicate after all some common procedures in the use paint materials. The analysis suggests some kind of asphaltum paint was used on all the passepartouts, with or without addition of resins or oils. The pigment used in the black asphaltum paint is most likely carbon black and red iron oxide for the passepartout made by the Duboscq studio.

The black paint can have an over-coat of, for example, white casein or a grey oil based paint to ensure opacity of the passepartout.

Backing paper and the binding tape

The author has not analysed the adhesive used on the binding tape, often incorrectly called sealing tape. Historical reference suggest a common use of gum and isinglass:

> To make sealing paper.- Dissolve one once of gum Arabic, and a quarter of an ounce of gum tragicanth in a pint of water; then add a teaspoonful of benzoin. Spread this evenly on one side of good stout tissue paper; let it dry, and then cut it up in stripes, about half or three quarters of an inch wide, for use. If it becomes too soft for summer use, add gum Arabic; if too hard and cracking, add benzoin or gum tragicanth; if it get too thick, add water (Snelling, 1849).

And a later version from the same author:

> There are many ways of making sealing paper; the following will be found as good as any. In three pints of water dissolve 1-2 oz., isinglass; 1-2oz.; of gum tragicanth and 2 oz. Gum Arabic, over gentle flame. Boil it down to the required consistency and apply it to any paper not too thick. A little gum benzoin, or sugar may be added, as they are thought by some to improve mixture (Snelling, 1879).

The ultra violet studies of the glass used for the passepartout showed blue fluorescence from the remaining stripes of binding tape along the edges suggesting the presence of gelatin or glue (Figure 66).

Hand coloring and coating on stereo daguerreotypes

The materials reported to be used for coating of daguerreotypes are dextrin, copal, gelatin, isinglass, starch, gum-arabic, and gum-mastic varnish.

The hand coloring was either dusted under or on top of a coating or the pigments were grinded into a binder (like isinglass) and applied onto the coated plates (Lundgren, 2005).

DETERIORATION

Damage of stereo daguerreotype is characteristically related to the deterioration of the passepartout. Any physical deterioration of the mount will affect the daguerreotype plates inside. Typical damages can be divided into two categories: those caused as a result of damages to the glass and those associated with the changes to the paint in the reverse painted glass passepartout (Bretz, website 2005).

The following sections will explain the most common types of deterioration of the reverse painted glass passepartout, and a few examples of the deterioration of the daguerreotype caused by the deterioration of the passepartouts.

Glass

The breaking of the glass is the most obvious and frequent cause of damage to the passepartout. The broken primary package will leave the daguerreotypes extremely vulnerable to chemical and physical deterioration, such as tarnishing (Figures 74-75) and physical damages from handling.

Fig. 74: Example of tarnished area on daguerreotype due to previous broken cover glass

Fig. 75: Close-up of tarnished area at lower left corner on the left stereo plate

Glass deterioration (also known as glass disease) is a threat to the cover glass of the passepartout, if stored in uncontrolled humid condition (more than 42% relative humidity.)

The overall causes for glass disease are, first of all, the trapping of air containing moisture inside the passepartout. Secondly, glass produced in the 19th Century was more alkaline and less stable compared to later glass products (Bretz, 2004).

In short, glass disease occurs when the glass is exposed to high humidity. The alkali components in the soda lime fluxed glass matrix will migrate to the surface of the glass where they are replaced with the hydrogen ions present in the water vapor. The result is an alkali-deficient, hydrogen- rich layer with low reflectance on the inside of the surface of the cover glass. Secondly, potassium and sodium hydroxides on the glass surface will react with carbon dioxide and sulfur dioxide from the air, resulting in a highly corrosive alkali-rich film. Droplets of this corrosive film can in extreme cases form on the surface of the glass, a phenomenon known as weeping glass. Droplets of this film will etch the daguerreotype surface.

Placing an object affected by glass disease in the recommended 42% relative humidity will slow down the progression of the deterioration (Koob, 2004), although a white precipitate of sodium and potassium carbonate will form on the surface of the glass (Bretz, 2005).

Figures 76 and 77 show good examples of a cover glass affected by glass disease. The matting of the stereo plates was in this case a paper mat board, which might have contributed to the decay by holding moisture inside the primary package.

Fig. 76: Extreme case of glass deterioration

Fig. 77: Close-up of glass deterioration

Very little glass deterioration was found on the stereo daguerreotypes studied in this research. This might partly be explained by the mat board construction of the passepartout, which allows for a higher degree of air change inside the package, compared to primary packages in Turkey Morocco daguerreotype cases, where glass disease is more frequently found.

Secondly, proper care of the objects by previous owners might also have contributed to the relatively good condition of the stereo daguerreotype.

Paint on reverse painted glass passepartout

The main problems with the paint layer on reverse painted passepartout glass are the lack of adhesion of the paint to the glass surface, the deterioration of the glass, and most of all the drying out of the binding media in the paint.

Delamination of the paint from the glass is a problem innate to the reverse-glass painting technique. The paint layers do not bond very well to smooth vitreous surfaces and begin to separate as the binding media deteriorate (Bretz, 2005).

The delamination is a serious visual obstructive damage to the passepartouts, with cracking and curling paint layers creating patterns of triangles and rectangles (Figures 78-79).

Another very typical visual distortion to the passepartout is caused by air pockets (called blind cleavages) between the glass and paint layer, which when seen from the front of the passepartout will appear as greyish, less saturated areas of paint.

The effect of UV light and heat will cause drying and oxidation of the binding medium in the paint and results in the delamination. The seasonal cycles of heating and cooling of storage rooms also course serious surface strain on the paint layers; particularly paint media not soluble or permeable to water (Caldararo, 1997).

Thick or multiple layers of paint will also promote cracking of the paint layer. This could be part of the reason why the paint on many of the double coated Claudet passepartout have delaminated, as opposed to very few of the single coated W. Thompson passepartouts.

Furthermore, pigments used in most of the reverse painted glass passepartout will alter over time, due to a combination of exposure to light and potassium hydroxide, a glass deterioration product (Bretz, 2004).

Fig. 78: Paint delamination on unidentified passepartout

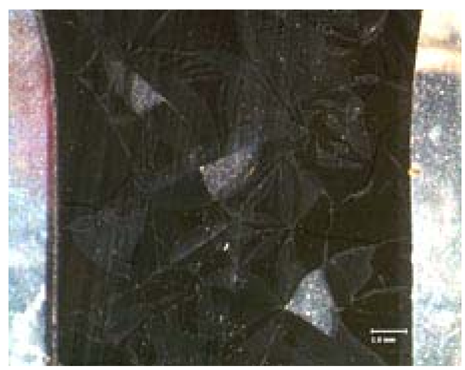


Fig. 79: Close-up of delamination

Debris on the plate from delaminated paint or adhesive

Delaminating paint often results in detached paint fragments, which then are found loose inside the primary package and on the surface of the daguerreotypes (Figure 80). Though coating often will protect the daguerreotypes, there is the potential risk of the plates to become scratched, as well as being tarnishing by the fragments.

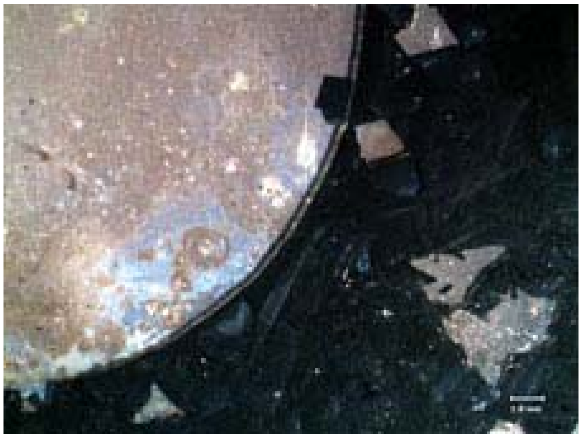


Fig. 80: Loose paint fragments on daguerreotype

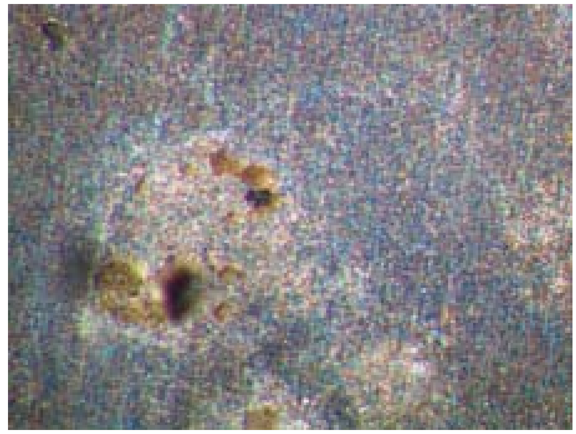


Fig. 81: Adhesive debris on daguerreotype surface. and the tarnishing of the surrounding area

Like the paint fragments, debris from the adhesive used for the plate securing system and binding of the passepartout can also be found on the surface of the daguerreotypes (Figure 81). The tarnishing of the daguerreotype often seen under and around the debris is caused by the accumulation of moisture and sulphuric acid.

Retouching of delaminated paint

Retouching of areas with delaminated paint or blind cleavage is often seen on the passepartouts. The retouching is usually identified as darker or more saturated areas of the paint, as thin lines or even larger painted areas (Figure 82).

The retouching of delaminated paint due to glass deterioration is not a long-term solution, as adhesion of any paint medium to the surface of the affected glass will be poor. Attempts to wash the corrosive alkali-rich film from the surface of the glass before retouching will only provide temporary adhesion of the retouching paint. Any restoration of the paint will only last 10-15 years, as the glass disease cannot be stopped. Proper storage conditions will, however, slow down the deterioration (Bretz, 2004).

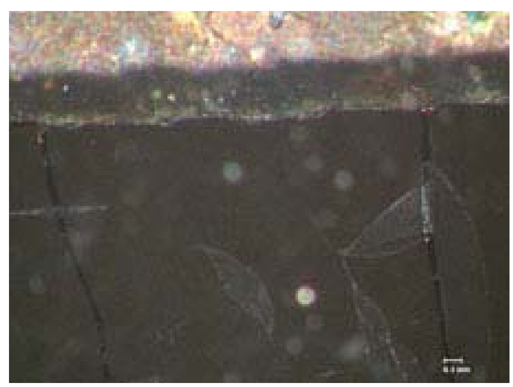


Fig. 82: Black lines of retouching

Failing of the mounting system

Failed or broken tape binding the passepartout, as well as plate-securing tape failing to hold the daguerreotype plates inside the primary package, are very common physical damages to the stereo daguerreotypes. Not only will handling of the plates become a major concern, but the viewing of the stereo effect is also jeopardized.

Fig. 83: Failed binding tape

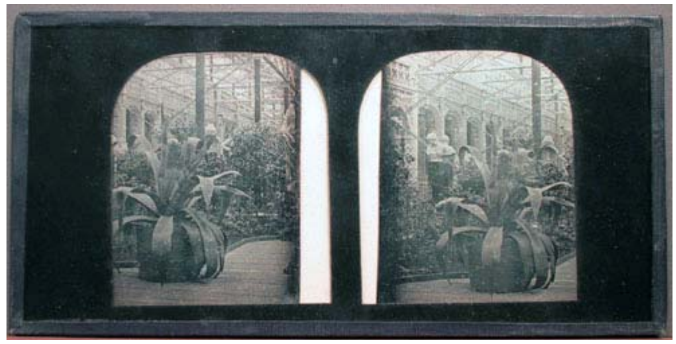


Fig. 84: Loose plates in the package

The binding tape is often broken at the corners and along the edges of the cover glass (Figure 83). This will weaken the housing structure and promotes serious danger of the heavy glass to slide and rip the remaining binding tape during handling. The daguerreotypes are furthermore in great risk of being scratched by a moving cover glass because of the direct contact between many of the stereo daguerreotype plates and their cover glass.

Failing plate-securing systems are a great concern as the plates are able to move during handling or vertical storage. The displacement of the plates will alter the intraocular distance between the images in the daguerreotypes, and the stereo effect will be lost (Figure 84).

Alterations through restoration

Though alteration is not a conventional category under the deterioration, it can result in serious modification of the aesthetics of the object, as well as remove the stereo function of the object.

The two collections used in this study revealed several cases of intervention, where preservation of the daguerreotypes obviously had been the priority with little attention to the original aesthetics of the passepartout and the stereoscopic function of the object. Figure 85 shows an example of a remounting of the stereo pair with no adjustment of the plate (according to the principals) for the ability to see three-dimensionally. This as the plates have been mounted both vertically and horizontally outside the intraocular distance.

Fig. 85: Remounting resulting in no stereo effect

Fig. 86: Tarnished left side plate mounted upside down

Figure 86 shows an extreme case of incorrect intervention of the object. The heavy tarnish on the left side plate has resulted in the upside down mounting of the plate relative to the right side plate.

Finally, Figure 88 shows the replacement of the original passepartout. Compared to the typical style of the particular daguerreotypist (Figure 87), the incorrect selection of color and saturation of the paint material used to create the replica has altered the aesthetic appearance of the object.

Fig. 87: Alteration of passepartout aesthetics (original Goüin passepartout)

Fig. 88: Alteration of passepartout aesthetics (replaced Goüin passepartout)

OUTLINES FOR TREATMENT PROPOSAL

Restoration of stereo daguerreotypes will typically include treatment of broken binding tape, failing plate-securing systems, and partly or overall delaminated paint on reverse painted glass passepartout.

The following steps provide the rough outlines for a typical treatment proposal:

Objective

The treatment is supposed to stabilize the objects physical integrity, to restore the aesthetic appearance, and to re-establish the objects intended use.

Identification

Follow the Protocol for Examination of Stereo Daguerreotype. (See Appendix no. 2).

Condition rapport

Examination and documentation of the characteristics using the Protocol for Examination of Stereo Daguerreotype. (See Appendix no. 2).

Proposed treatment

1. Removal of the binding tape from the cover glass by reactivating the adhesive with distilled water. The operation is done safest from the front of the passepartout with the daguerreotypes facing up, in case the plates are loose inside the package.

2. Using magnification, loose paint fragments are removed mechanically from the daguerreotypes and plate-securing system.

3. The position of the daguerreotype is measured and documented and the plates are removed and safely housed during treatment of the passepartout.

4. If the daguerreotypes are hand-colored and coated, no cleaning and removing of tarnish is considered. If the plates have neither applied color nor coating a washing in ammoniated water might be discussed with the curator or owner of the object.

5. Deteriorated passepartout glass might be replaced by a replica, if the curator or owner of the object concurs.

6. If a remounting of the original passepartout is decided, small loses of paint might be visually retouched by placing tailored paper behind the passepartout. The paper must be tinted with watercolor to obtain the same color as the passepartout paint. It will not be possible to diminish blind cleavage between glass and delaminated paint.

If a replacement of the original passepartout is decided, the original is analyzed.

A replica should be made using known stable and Photographic Activity Test (PAT) approved materials. The author has tested six traditional and contemporary paints by the PAT; asphalt, casein, oil and shellac, as well as acrylic and alkyd paint. (See Appendix 5: “Photographic Activity Test of six Traditional and Contemporary Paints for Replication of Reverse painted Glass Passepartout.”)

The selection of materials for the replication of passepartout was based upon information on previously used paint materials gathered from available treatment rapports and by personal communication with photograph conservators and collectors. The results of the PAT suggest acrylic Paraloid B-72 with carbon black pigment as being the only safe paint of the tested to use in close contact with photographs. Though it has yet to be researched if the PAT is a reliable test method for daguerreotypes, it is the only thorough and approved researched test available for now.

A stencil of the original window opening design is placed on a clean pre-cut piece of glass of similar thickness to the original. The Paraloid B-72/pigment paint is mixed in acetone or toluene, depending on preferred drying time. The paint can be applied on the glass by air gun for thin application or by brush. Bronze powder mixed in Paraloid B-72/acetone or toluene solution will make acceptable gold lines. The stencil is removed and the replica is left to dry.

7. Stabilization of the plate-securing system with special attention to sustain correct and accurate mounting of the stereo pair to ensure the stereo effect.

8. The original binding tape is lined onto a lightweight paper, and the visible area of the modern paper is toned to the color of the original binding tape

9. The daguerreotypes are remounted into the plate-securing system and covered with the replica of the passepartout glass

10. The primary package is rebound using first a Photographic Activity Test approved modern paper tape, which is covered with the original reinforced tape.

11. A housing system is designed to hold both the restored stereo daguerreotype and the original reversed painted glass passepartout. A horizontal storage box will be the ideal solution.

CONCLUSION

The stereo daguerreotypes are extremely vulnerable to the risk of being altered by uninformed decisions during treatment or replacement of the complex housing system. This research is intended to provide more information and some guidelines on the original passepartout housing system to ensure preservation of the aesthetic look and the intended use of the stereo daguerreotype.

The complexity of the stereo daguerreotypes derives from the specific demands set by the designated stereoscopic viewer and the housing system. The specific viewer dictates the design of the stereo daguerreotype passepartout package, as well as the specific mounting the daguerreotype plates inside the housing system in order to obtain optimum stereo effect while viewing the stereo pair.

The commercially available Brewster stereoscopic viewer set the standard dimensions and form of the stereo daguerreotypes in the passepartout style, as the passepartout was to be inserted through a narrow slot at the side of the viewer. The size of the passepartout is 17.3 x 8.4 x 0.2 cm, with variations within a few millimeters. The thickness of the cover glass is between 1-3mm and is commonly soda-fluxed window glass produced to be neutral in color and blister free.

The stereo daguerreotype pair commonly consists of two individual sixth plate daguerreotypes, but single rectangular plates with two images are also found. The direction of the polish marks of the plates is always vertical, as the plates were to be illuminated from above. Many stereo daguerreotypes were coated and hand-colored.

The plates are mounted in a plate securing system, either a sink mat system or simply taped to a backing board or a four-flap jacket system. The plates are mounted and aligned next to each other so that the distance between two corresponding point in the image on the plates is close to the optimal intraocular distance of 6.3 cm. The plates are then masked out by a passepartout of paper or reverse painted glass passepartout, and bound with a finishing paper. The finishing paper will often contain business labels.

The styles of the passepartout were limited to shape and decoration of the window opening, as well as the color of the passepartout. The variations are surprisingly few, which might be explained by the limited numbers of active stereo daguerreotypist. The color of the passepartout is most often black, with a few exceptions in reddish brown, red or blue.
The shapes of the window openings are most commonly oval, elliptical, double elliptical and square formats, with single or double golden borderlines.

The XRF and FTIR analysis of the historical materials used to create the reverse painted glass passepartout suggest the use of commonly available materials. Typically the paint would be asphalt with a binding media of resin like dammar or Canada balsam, perhaps even oil. (It is interesting to note that the use of asphalt continued as backing material on wet-plate collodion positive (ambrotypes).)

The pigment used to color the black paint would most likely be lamp black or carbon black, or the red/brown pigment iron oxide for the brown paint used for on the W. Thompson passepartout.

Several passepartout have additional paint coatings to enhance the opacity of the glass passepartout. The paint have not been specifically identified, but FTIR analysis suggest it could consist of a binder like casein or be oil based, often in a light color like white or grey.

The golden lines around the window opening in the passepartout is commonly brass powder, though gold leaf or silver powder can be found on a few stereo daguerreotypes. The binding media for the brass powder was not identified in this research. Gelatin and isinglass was, however, a traditional media for gold leaf decoration on glass.

Though historical references to the original techniques used in crafting the reverse painted glass passepartout for stereo daguerreotypes have yet to be discovered it is very likely that the painting technique originated from the traditional use of stencils in glass painting. Visual studies and practical experiments of possible techniques also suggest the use of stencils, with paint application by brush or even some kind of airbrush.

The complex combination of materials found in the housing of stereo daguerreotype predicts several deterioration and preservation issues. Stereo daguerreotype are commonly affected by failing of the binding and plate securing system, delaminated paint on the reverse painted glass passepartout, or simply broken passepartout glass. Glass disease is also a problem, though the previous mentioned problems are more common.

The preservation and treatment of stereo daguerreotypes will therefore involve the need to make decisions in regards to several types of material, all of which are equally important for the integrity of the objects.

Passepartout replicas can be used when a passepartout is deteriorated beyond acceptable from a conservation and aesthetic point of view. The Photographic Activity Test or its equal should be used to test all of the materials used to create the replicas. In this research several historical and contemporary paints were tested by the PAT, and only the acrylic Paraloid B-72 passed. Secondary, attention should be made to the choice of pigment to ensure correct color and aesthetic look of the replica passepartout. Finally, a housing system should be created to hold both the original passepartout, as well as the stereo daguerreotype package with the replica passepartout. This to ensure that the original passepartout glass is not separated or lost, but kept for future documentation and research possibilities.

Placing objects affected by glass disease and delaminated paint in the recommended 42% relative humidity will slow down the progression of the deterioration.

Most of the stereo daguerreotypes studied in this research need conservation treatment by a photograph conservator, as well as a better storage system. More research is needed into proper storage, handling, and display conditions.

APPENDIX No. 1:

A Short History of the Study of Binocular Vision and the Stereo Daguerreotype

The word Stereoscope is derived from the Greek words for "solid"; stereos and " to look at"; skopein (Coined by Sir Charles Wheatstone.)

Third Century BD
Euclid explained that each eye sees different vision of the world in the *"Treatise on Optics"* (Buerger, 1989).

Late Second Century AD
Claudius Galen of Pergamum (129-202 AD), a celebrated physician, wrote about the same theories as Euclid noted in his 12th chapter of the 10th book of his work *"De Usu Partium Corporis Humani" (eng.: Use of different Parts of the Human Body)* (Brewster, 1856 and Buerger, 1989)

Late Sixteenth Century
Jacopo Chimenti (1554-1640), a painter of the Florentine School, drew two almost identical pen and ink drawings of a boy on a bench (Figure 1). These drawing were thought to be the first attempt in creating binocular images, since they presumably appeared to be three-dimensional when viewed in a stereoscopic viewer (Eder, 1945).

Later, Professor E. Emerson rejected this interpretation claming the two pictures were simply copies of the same drawing (Wade, 1983).

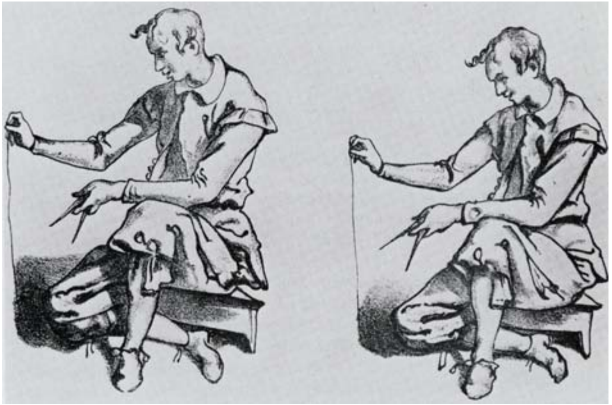


Fig. 1: Woodcut by Jacopo Chimenti (The Photographic Journal, 1862)

1584
Mr. Leonardo da Vinci (1452-1519) wrote in his *Trattato della pittura, Scultura ed Architettura,* Milan on the subject of

> a painting, though conducted with the greatest art, and finished to the last perfection, both with regard to its contours, its lights, its shadows, and its colours, can never shew a relievo equal to that of the natural objects, unless these be viewed at a distance and with a single eye.

1838
Sir Charles Wheatstone (1802-1875), an English physicist, wrote *Contributions to the Physiology of Vision – Part the first: On Some Remarkable and Hitherto Unobserved Phenomena of Binocular Vision*, in which he presented the theory that the eye and mind combine two dissimilar images taken from different angles and horizontal distance, as the eye would see, and form the illusion of a three-dimensional image. He demonstrated this theory by the use of a stereoscopic device, a reflecting stereoscope, in which central mirrors were reflecting images from the right and left toward the viewer in front.

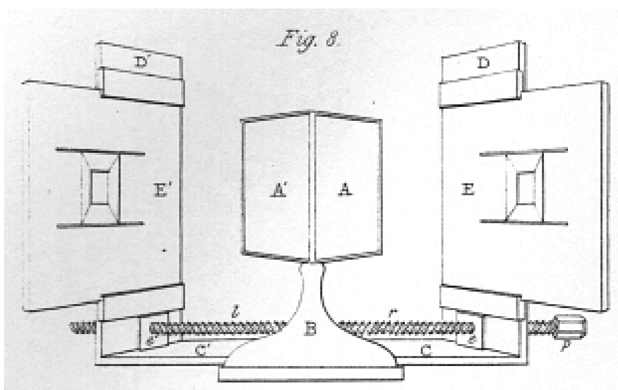


Fig. 2: The Wheatstone Reflecting Stereoscope (side and top view)

Wheatstone described his stereoscope in his letter to the Philosophical Transactions of the Royal Society, 1838; “Contributions to the physiology of vision – Part the first. On some remarkable, and hitherto unobserved, phenomena of binocular vision” (see Figure 2):

> *..AA’ are two plane mirrors, about four inches square, inserted in frames, and do adjusted that their backs form an angle of 90° with each other..CC’ are two sliding boards, to which are attached the upright boards DD’, which may thus be removed to different distances from the mirrors…by turning the screw pin p...it is necessary that each upright board shall be at the same distance from the mirror which is opposite it…EE’ are panels, to which the pictures are fixed in such a manner that their corresponding horizontal lines shall be on the same*

> level: these panels are capable of sliding backwards and for wards in grooves on the upright boards DD'.
>
> The observer must place his eyes as near as possible to mirrors, the right eye before the right hand mirror, and the left eye before the left hand mirror. The pictures will indeed coincide when the sliding panels are in a variety of different positions, but there is only one position in which the binocular image will be immediately seen single, of its proper magnitude, and without fatigue to the eyes.. (Wade, 1983).

The illustrated viewer from Wheatstone's patent shows the panels holding two images in dissimilar perspective of a square pyramid; one of Wheatstone's many simple stereographic sketches to demonstrate and study the stereo phenomena.

Sir David Brewster was introduced to Wheatstone's binocular vision theories and saw the reflecting stereoscope. He orders the stereoscope through Mr. Andrew Ross and advanced on his own theories on vision.

1844
Professor Ludwig Moser from Königsberg, Germany announced that it is possible to produce stereoscopic pictures by taking two views of the same object with the same distance or angle to the left and the right from the median line or the centre line in the image (Eder, 1945).

Brewster used a reflecting stereoscope of Wheatstone's design (Wade, 1983) in his demonstrations of studies "On the knowledge of distance as given by binocular vision", but found the viewer of little service (Brewster, 1856).

1849
Five years later, in front of the audience of the Royal Scottish Society of Arts on March 26, 1849, Brewster revealed his "description of several new and simple stereoscopes for exhibiting, as solids, one or more representations of them on a plane" (Wade, 1983). His new version of the stereoscope; the lenticular stereoscope viewer had "the additional advantages of cheapness and portability" to the Wheatstone stereoscope and became the first commercial stereoscope (Figure 3).

The lenticular stereoscopes were made by optician Mr. Loudon in Dundee, Scotland of japanned tin, brass, rosewood, or mahogany and sold for 50 shillings. The lenticular stereoscope was a pyramidal box-like instrument, which was blackened inside. At the top of the box were two double convex lenses attached. The lenses would magnify and optically reduce the distance between the two mounted daguerreotype plates, making it easier for the brain to experience the three-dimensional effect. On one side of the box was a hinged lid for admission of light on the stereo image, and at the bottom of the box a slot, where the stereo view was inserted. A special passepartout was designed to house the stereo plates, fitted for the lenticular stereoscope.

Lithographic drawing by Mr. Schenck, Edinburgh were first used in the viewer, but soon Brewster proposed the application of the stereoscope to portraiture or sculpture. For this, the application of the daguerreotype and calotype was obvious (Brewster, 1856). Brewster requested from Dr. Adamson of St. Andrews two self-portraits of Adamson by the calotype process.

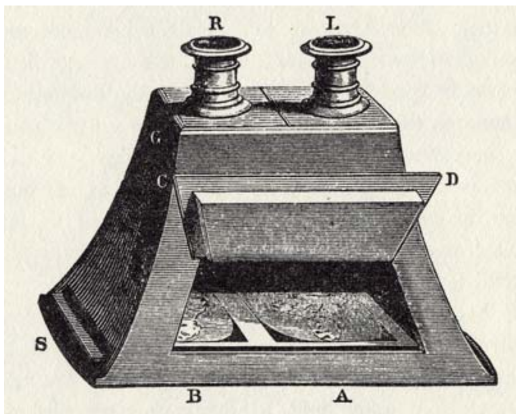


Fig. 3: The Brewster lenticular stereoscope

Despite Brewster's effort in generating interest for "this successful application of the principle to portraiture among" the public and recommending it "as an art of great domestic interest", he had little success in England (Brewster, 1856).

1850
Brewster traveled to Paris with his stereoscope and the two calotype-portraits and presented it to Abbé Moigno, M. Soleil and his son-in-law Louis-Jules Duboscq (1822-1886).

Brewster's frustration over his countrymen's lack of interest is read in his description of the Frenchmen's response to his stereoscope: "These gentlemen saw at once the value of the instrument, not merely as one of amusement, but as an important auxiliary in the arts of portraiture and sculpture" (Brewster, 1856).

Immediately Mr. Duboscq began the production and sale of the lenticular stereoscope along with "a series of the most beautiful binocular Daguerreotypes of living individuals, statues, bouquets of flowers and objects of natural history (Figure 4), which thousands of individuals flocked to examine and admire," all captured "with the ordinary Daguerreotype apparatus" (Brewster, 1856).

Fig. 4: Stereo daguerreotypes by Duboscq

1851

During the following year Mr. Duboscq presented the lenticular stereoscope at the Great Exhibition in London, where he was rewarded a first prize medal and particular attention from the Queen of England.

After the order of a stereoscope and a set of images from the Queen,

> the demand, however, became so great, that opticians of all kinds devoted themselves to the manufacture of the instrument, and photographers, both Daguerreotype and Talbotype (calotype), found it a most lucrative branch of their profession, to take binocular portraits of views to be thrown into relief by the stereoscope (Brewster, 1856).

Many daguerreotypists (for example Antoine Jean Francios Claudet[1], Alexie Gouin[2], Warren Thompson[3], and John Jabez Edwin Mayall[4]) discovered the stereo daguerreotypes

---

[1] Mr. Antoine Jean Francois Claudet, French (1797-1867), but lived and worked in London. Opened his first studio in London in 1841. Claudet was one of the first to learn about
Daguerre's invention and immediately bought the license from Daguerre, since England was the only country in which Daguerre patented his invention. He was also one of the earliest to propose a method of hand-coloring daguerreotypes and was considered one of the best. His work was of such a good quality that it was considered as art.

[2] Mr. Pierre Ignace Alexis Gouin (1816-1894) was Antoine Claudet only other real rival. Gouin was a train traditional painter and was consisted to make art like Claudet. He was *"the Parisian Claudet"* and was also a master in hand-coloring daguerreotypes.
Nude stereo daguerreotype or as they also were called academies, are known to be produced in Gouin's firm, even though it was considered too natural and too real.

[3] Mr. Warren Thompson, American (active about 1840-about 1860), but practiced in Paris. Thompson was known for his skilled handling of oversized plates, which enabled him to obtain the most successful pictures of an eclipse of the sun together with Italian astronomer Ignazio Porro.

[4] Mr. John Jabez Edwin Mayall (American, 1810 - 1901) owned a daguerreotype studio in Philadelphia before he moved to London in 1846. In 1847, he opened the American Daguerreotype Institution in London. He became an established portraitist and photographed important British figures such as Sir John Herschel, Sir

at the Great Exhibition, and quickly adopted the techniques thereafter.

1852

In Boston, Southworth and Hawes improved the Wheatstone stereoscope by first of all boxing in the Wheatstone viewing devise to control the light and the distracting and unwanted reflection of the plates. They patented their stereoscope and called it the Grand Parlor and Gallery Stereoscope.

Fig. 5: Front and inside view of the Grand Parlor and Gallery Stereoscope

The stereoscope in the collection of George Eastman House consists of three compartments made of mahogany with figured mahogany in front of the main compartment. The front side of the main compartment has the viewing lens in a brass mount and what is left of an original crank (Figure 5). The backside of this main compartment is a panel of painted glass, with a window admitting light onto each of the daguerreotype plates at the right and left side of the viewer. At each side of the main compartment are two rectangular boxes containing the devise for moving and changing the stereo pairs. A fitted wooden lid closes up the three compartments. Inside the main compartment are, first of all, the two reflecting mirrors placed behind the viewing lens, and at each side of the compartment, the opening for the stereo pairs, and finally the device for moving the plates, which is mainly in a lower compartment, consisting of a set of cogwheels connected to the crank in front of the stereoscope. Southworth & Hawes filed on June 19, 1855 a patent No. 13.106: Moving Stereoscopic Pictures, describing the mechanism that moved the plates.

The most brilliant improvement of the Grand Parlor and Gallery Stereoscope was the moving devise, which could rotate 10 stereo pairs. The pictures in the Wheatstone and Brewster viewers had to be introduced and taken out by hand, where as Southworth and Hawes's "invention consists in giving to the pictures a panoramic motion into and out of the field of vision by means of machinery" (Patent No. 13.106, 1855).

The stereo daguerreotype plates were mounted in molded brass frames (16,9 x 22,9 x 1,2 cm) with a rack with notches at the bottom. The notches were connected to a set of

David Brewster, and Louis Jacques Mande Daguerre. Mayall sold his Institution in 1855 and began producing cartes-des-visite photographs.

cogwheels, which will turn and thereby move the frame by a turning the crank in front of the viewer.

The stereoscope was also changes to fit whole plates (6 1/2 x 8 1/2") daguerreotype plates. The original size of the plates used in the Wheatstone viewer is unknown. A set of stereo daguerreotype made for the Wheatstone viewer can, however, be seen at the National Museum for Photography, Film & Television in Bradford, England (Figure 6). The stereo pair is from the collection of Sir Charles Wheatstone and portrays Michael Faraday (1791-1865). The size of the plates is 5x4 inches.

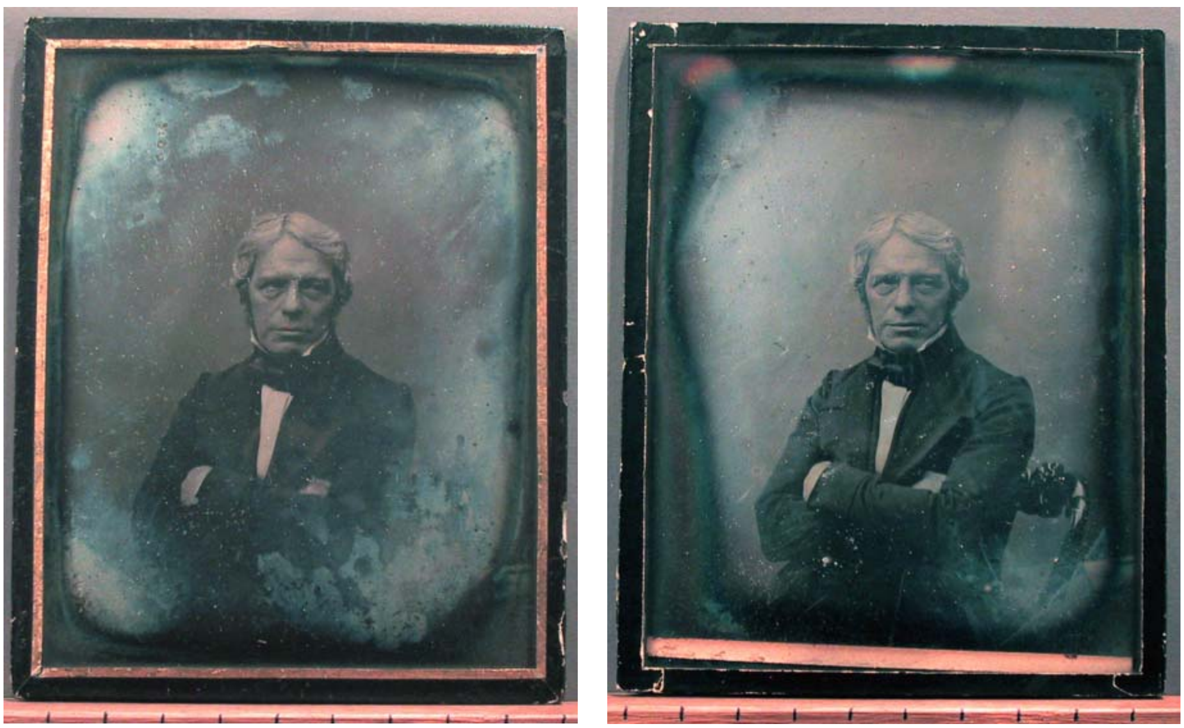


Fig. 6: The left side perspective and the right side perspective view of Michael Faraday for the Wheatstone stereoscope

Where the lenticular stereoscope was not compensating for the camera's reversing of the captured images, the Grand Parlor and Gallery Reflecting Stereoscope would. The viewing of the daguerreotypes through the mirrors would re-reverse the image. This also meant that the pair had to be positioned in the stereoscope, so that the left perspective of the stereo pair went into the plate holder at the right side of the stereoscope and vice-versa.

1853

Major stereo daguerreotypists such as Claudet and Kilburn patented collapsible cases, with built-in stereoscopic viewing device for stereo daguerreotypes in passepartout style (Wing, 1996).

There was general interest in producing stereoscopic viewing cases and small quantities of cases varying very little from the patented Claudet and Kilburn cases were made by a number of individuals (Figures 7 and 8).

The Baker stereoscopic case is constructed to accept the stereo daguerreotype passepartout into a recess in the lid of the case. A pair of convex lenses mounted 2 1/2 inch apart in a figure eight-shaped holder is fitted into a flap, which is hinged to the front bottom of the case. The lenses are mounted in a folding system, which will allow the person operating it to adjust the viewing distance for optimum focus (Wing, 1996).

Fig. 7: Baker leather case in Claudet style

Fig. 8: French leather case in Kilburn style

Figure 8 shows an early French stereoscopic viewing case. The wooden case has two short focus lenses mounted directly into a lens board, which is hinged into the lid of the case. The lens board has sidepieces attached, which spring to the side of the lid when the case is opened. This forms a solid boxlike stereoscopic viewer, which is open at the top and darkened in the interior.

Mr. John F. Mascher from Philadelphia, Pennsylvania was inspired by the Brewster viewing devise and patented his invention on March 8, 1853 (Patent No. 9611) in which he wrote:

> …The nature of my invention consists in constructing a daguerreotype case with an adjustable flap or supplementary lid, said flap or lid being within the case and…having two pictures or daguerreotypes. A daguerreotype being placed opposite each of the lenses in the flap or lid, when the lid is properly adjusted. By this arrangement a perfect stereoscope is obtained and the daguerreotypes by binocular vision are apparently formed into solid figure like life.. (Schimmelman, 2002).

Fig. 9: Mascher Viewers in "one-sixth" and "one-quarter" size

When the stereo craze swept America in the mid-1850, he held a near-monopoly on the manufacture of viewer in cases.

Mr. Edward Anthony's Daguerreian Manufactory, New York City carried Masher's cases in stock in three different sizes, "one-sixth", "one-quarter" and "one-half" (Figure 9).

1855

John Stull from Philadelphia, Pennsylvania patented on February 27 (Patent No. 12.451) a new improved stereo viewer (figure 10):

> ….The nature of my intention consists in so constructing a stereoscope case, that the part containing the two figures, and that containing the two lenses, may be caused to preserve their parallelism in respect to each other, as they are moved or adjusted to suit the vision of different persons, and at the same time be adapted to close up into a small thin case (like, or resembling the common daguerreotype cases)… (Berg, 1995)

The case would either be heavily decorated, on both the lid with the lenses and the back piece containing the daguerreotypes, with the gilded imposed inscription *United States of America. Patented by John Stull, Feb. 27th 1855. Orders furnished to any part of the United States or in Europe. By the patentee S. W. Corner 6th & Chestnut St., Philadelphia, PA.*

The case could also be embossed on the lid with the inscription *Stull's* over the left lens, *Patent* over the right lens and a rooster in the middle of the lid, just below the lenses and the inscription *Philada 1855* underneath. The brass hinges that hold the top and the bottom together are so-called butterfly hinges situated at the sides and in the front. The hinges will bend towards the centre of the case when adjusting the focus of the stereoscopic image and when closing the case.

Fig. 10: Stull's stereoscopic viewer

Late 1850's

Even though the excitement for the stereo daguerreotype was large, it was for a sort period and popularity diminished quickly. The costs of the cases were high and the introduction of the collodion negative positive process in 1851 gave possibilities to make copies of the images and thereby mass-produce the stereo images on albumenized paper.

In 1859 The Anthony Company in New York City launched the manufacturing and sale of stereoscopic view card with a series of 175 views, which immediately made it the leading manufacturing company of stereo viewing cards in the USA (Jenkins, 1975).

Masher continued to produce novelty daguerreotype cases and patented in 1857 a process for decoration cases with ornament of stained or tinted paper to simulate tortoiseshell, wood grains, marble, or similar finishes (Kenny, 2001).

Mr. Antoine Claudet produced daguerreotypes well into the early 1860's, and because of his talent in carefully composing the image and the exquisite handcoloring of the image, he was very successful among the upper-middle classes and aristocracy of London (Buerger, 1989)

APPENDIX No. 2:

Protocol for Examination of Stereo Daguerreotypes

Identification

Identification number
Database number
Collection
Provenance: (name, year, related objects)
Photographer: (name, nationality, year of birth and death, related objects)
Title
Date of photograph
Number of plates: (one/two)
Intended stereoscopic viewer: (reflecting/lenticular/other)
History of application: (architecture/ erotic/ science/ sculpture/ still life/ portrait)
History of storage
Last known price

Secondary package description

Case / slipcase

Size: (Length x Width x Thickness (mm))
Structure
Materials
Closing style
Access

Case

Size: (Length x Width x Thickness (mm))
Type: (Mascher/Stull/Strezeh/Schneider/other)
Size internal lid:(Length x Width x Thickness (mm))
Size internal tray: (Length x Width x Thickness (mm))
Shape: (rectangle/other)
Existing parts: (lid/ tray/ stereoscopic viewing device/ other)
Locking system: (hook(s)/ snap/butterfly hinges)
Body (substratum): (wood/ papier-mâché/ thermoplastic)

Covering: (Turkey Morocco leather/ velvet/ lined/ tortoise shell/ mother of pearl)
Stereoscopic viewing devise: (lenses attached to: flap/spring flap/lid/other)

Frame (image recto and verso)

Recto: (Length x Width x Thickness (mm))
Recto window opening: (Length x Width (mm))
Shape of the opening
Verso rabbet opening: (Length x Width x Depth (mm))
Material: (wood/ metal/ thermoplastic/ other)
Color
Decorative elements
Hanging system
Retention system: (paper/ cardboard/ wood/ tape/ nails/ paper/other)

Primary package

Passepartout style (larger than plate(s) format)

Size glass: (h x w x d) mm.
Size passepartout: (h x w x d) mm.
Glazing: (glass/plastic)
Spacer (mat) material: (paper/ paint/ metal)
Spacer material color: (black/ brown/ red/ blue/ other)
Spacer window shape: (circular/elliptic/double-elliptic/oval/square/other)
Spacer decoration: (painting/stamped/gilded/other)
Window edges: (straight/bevel gilded)
Border line: (yes/no)
Border line: (single/double)
Border line: (brass/gold/other)
Plate securing method: (sink/ compound/ tape/other)
Backing board: (one piece/four-flap jacket)
Binding: (tape/ paper)
Binding texture: (diamond/leather/non/other)
Binding color
Binding technique: (paper jacket/four-strips/other)
Finishing paper: (diamond/leather/non/other)
Finishing paper color

Cased style (same as plate(s) format)

Size: (h x w x d) mm
Glazing: (glass/ plastic)
Metal foil preserver: (yes/no)
Spacer (mat) material: (brass/paint/paper/other)
Spacer material color: (black/ brown/ red/ blue/ other)
Spacer window shape: (circular/elliptic/double-elliptic/oval/square/nonpareil/other)
Spacer decoration: (stamped/fire-gilt/etched/embossed/paint/paper/other)
Window edges: (straight/bevel)
Border line: (yes/no)
Border line: (single/double)
Border line: (brass/gold/other)
Plate securing method: (sink/ compound/ tape/other)
Backing board: (one piece/four-flap jacket)
Binding: (tape/ paper)
Binding texture: (diamond/leather/non/other)
Binding color
Binding technique: (paper jacket/four-strips/other)
Finishing paper: (diamond/leather/non/other)
Finishing paper color

Plate description

Size format: (h x w x b) mm
Weight g
Image format: (vertical/ horizontal)
Verso: (copper/ silvered)
Edges: (bent/flat)
Edges (bent towards): (recto / verso)
Edges (bent): (4 sides/3 sides/two sides/one side)
Corners cutting: (non/regular/ irregular)
Polishing direction: (horizontal/ vertical/ diagonal)
Polish marks: (fine/ rough)
Polish holder marks: (yes/no)
Polish holder marks (location)
Plate Hallmark (location/ describe)
Inscription: (incised/ ink/ pencil)
Inscription: (verso/ recto)
Verso accretions: (binding (tape)/ adhesive/ processing)
Planarity: (very flat/ warped/ bent)
Cleaned /treated: (yes/no)
Hand colored: (yes/no)

Coatings: (yes/no)
Gilding: (yes/no)
Other physical signs

Image description

Stereoscopic perspective
Identification of left and right stereo plate
Subject

Labels and notations

Location: (backing frame/case exterior/case interior/ back plate/ back package/ other)
Size: (h x w) mm
Shape: (oval/ circle/ rectangle/ hexagon/ octagon/ other)
Text: (handwritten/ printed/ other)
Text: (pencil/ ink/ other)
Wording:

Chemical composition

Glass: (XRF/ UV/ other)
Paint layers: (XRF/ FTIR/ other)
Pigments: (XRF/ FTIR/ other)
Paper materials: (fibre analysis/ filler analysis/ other)
Case materials: (shrink temperature of the leather/ wood/ other)

Deterioration

Glass disease
Paint delamination
Plate securing system
Binding tape
Case structure

APPENDIX No. 3:

XRF Results on Paint and Glass on Stereo Daguerreotype Passepartouts from the Study Collection of Advanced Residency Program in Photograph Conservation

X-ray Fluorescence Spectroscopy

X-ray fluorescence spectra were collected using a Röntec ArtTAX energy dispersive x-ray spectrometer system. The excitation source was an x-ray tube with a molybdenum (Mo) target and a 0.2 mm thick beryllium (Be) window, operated at 50 kV voltage and 600 mA current. The x-ray beam was directed at the artifact through a beam-limiting device with an aperture of 0.65 mm in diameter. X-ray signals were detected using Peltier cooled XFlash 2001 silicon drift detector (SDD). Spectral interpretation was performed using the ArtTAX Control software.

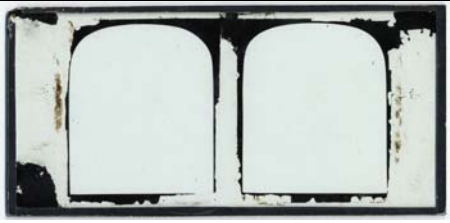
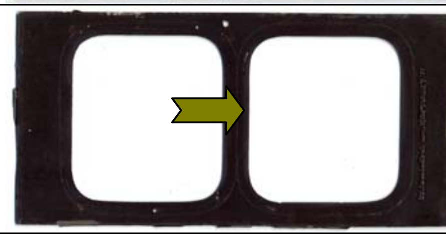
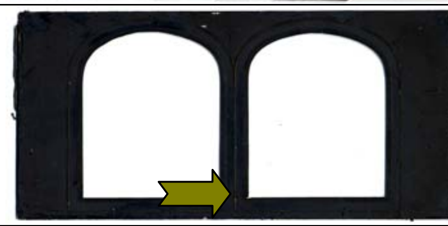
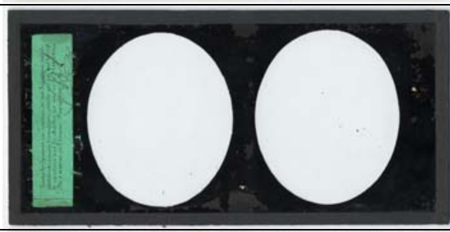
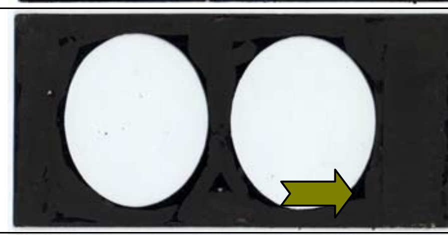
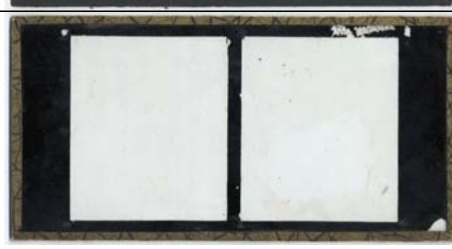
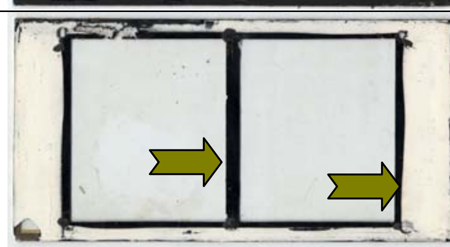
The test material

The Advance Residence Program in Photograph Conservation at George Eastman House holds a small collection of original stereo daguerreotype passepartouts. The passepartouts were replaced by replica passepartout during restoration of stereo daguerreotype from the George Eastman House Collection. The collection of passepartouts is kept in the conservation department as a part of a study collection.
Five different passepartout were chosen to represent the most common materials used to create stereo daguerreotype passepartout; an A. Claudet passepartout, a W. Thompson passepartout, a Duboscq passepartout, a Lemaire passepartout from the Great Exhibition in the Crystal Palace, and a passepartout with a final white paint coat from an unknown daguerreotype studio.

List of passepartout and XRF testing spots

The tested area are marked by green arrow in the following chart:

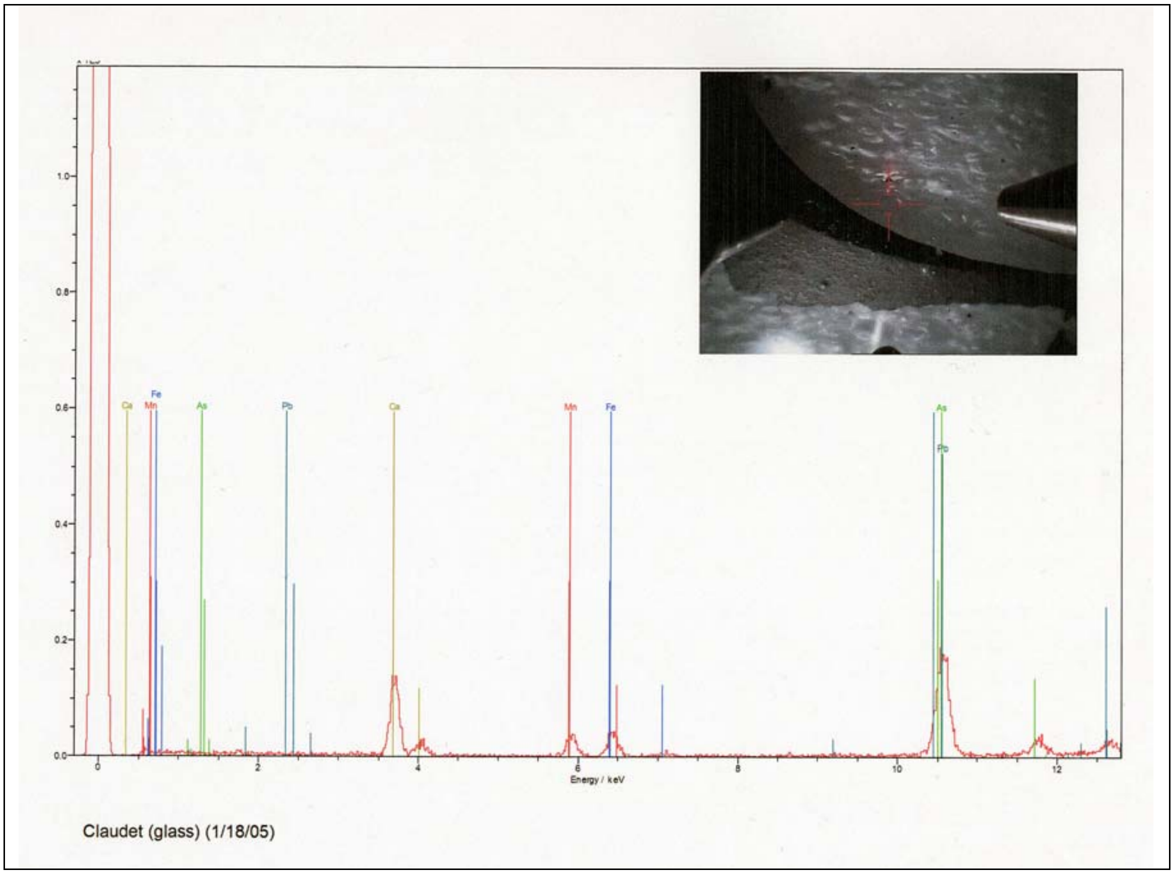
Appendix 3: XRF Results on Paint and Glass on Stereo Daguerreotype Passepartouts from the Study Collection of Advanced Residency Program in Photograph Conservation

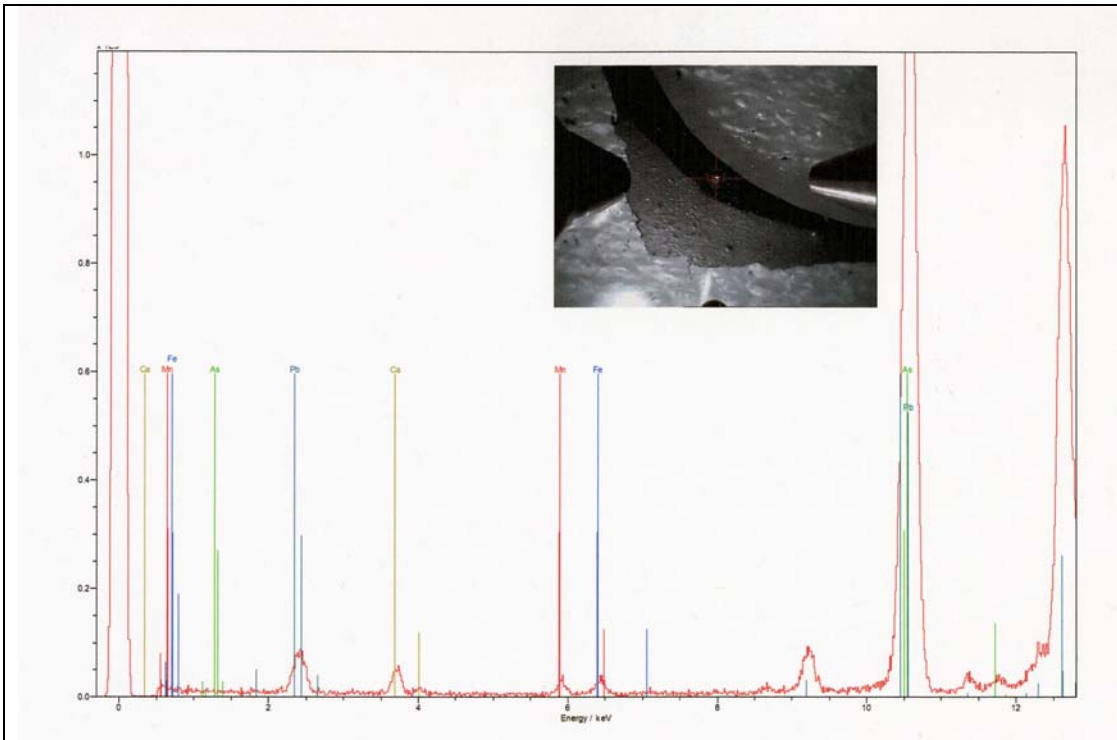
No.	*Photographer/ description:*	*Front view*	*Back view*
1	A. Claudet (Three paints: grey and black)		
2	W. Thompson (Brown paint)		
3	Duboscq (Golden line)		
4	Lemaire: Crystal Palace Exhibition (Glossy black paint)		
5	Unknown (White and black paint)		

The test results

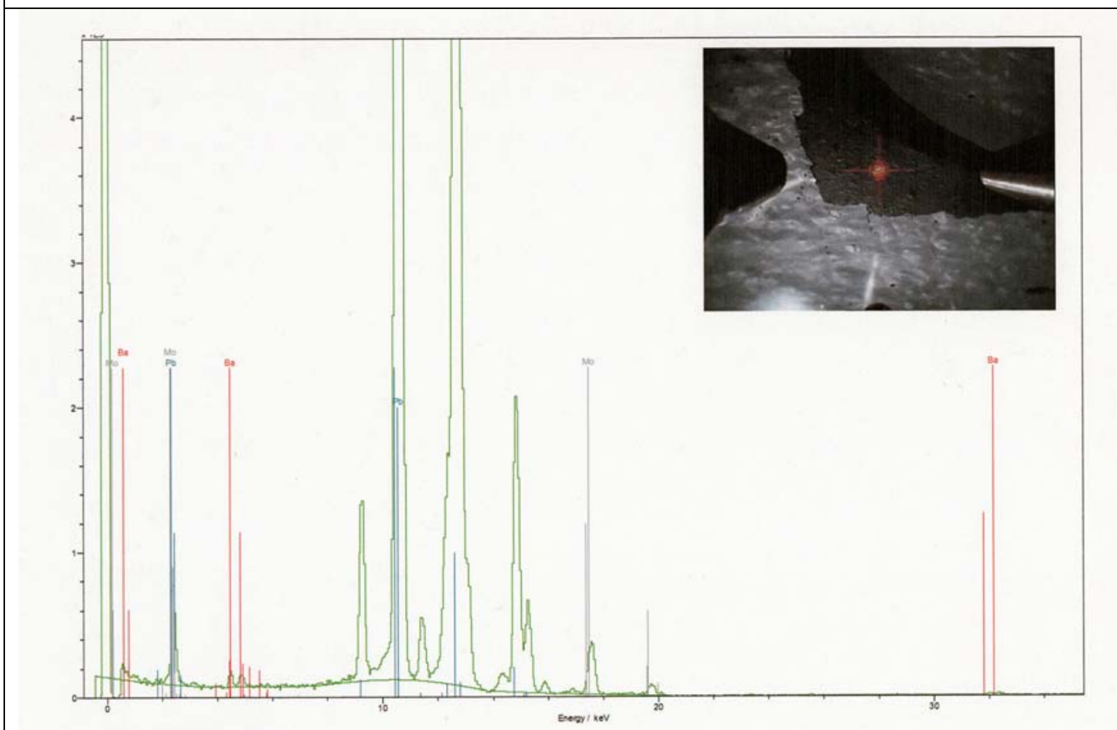
No.	Paint	Golden borders	Glass
1	Gray: Pb, Ba Black: Fe?	N/A	Mn, Ca, As, Pb, Fe
2	Dark Brown: Fe	Cu, Zn	Ca, As, Pb, Fe
3	N/A	Cu, Zn	Ca, As, Pb, Fe
4	Black: Fe?	N/A	Ca, As, Pb, Fe
5	Black: Fe? White: Ca	N/A	Ca, As, Pb, Fe

The spectra

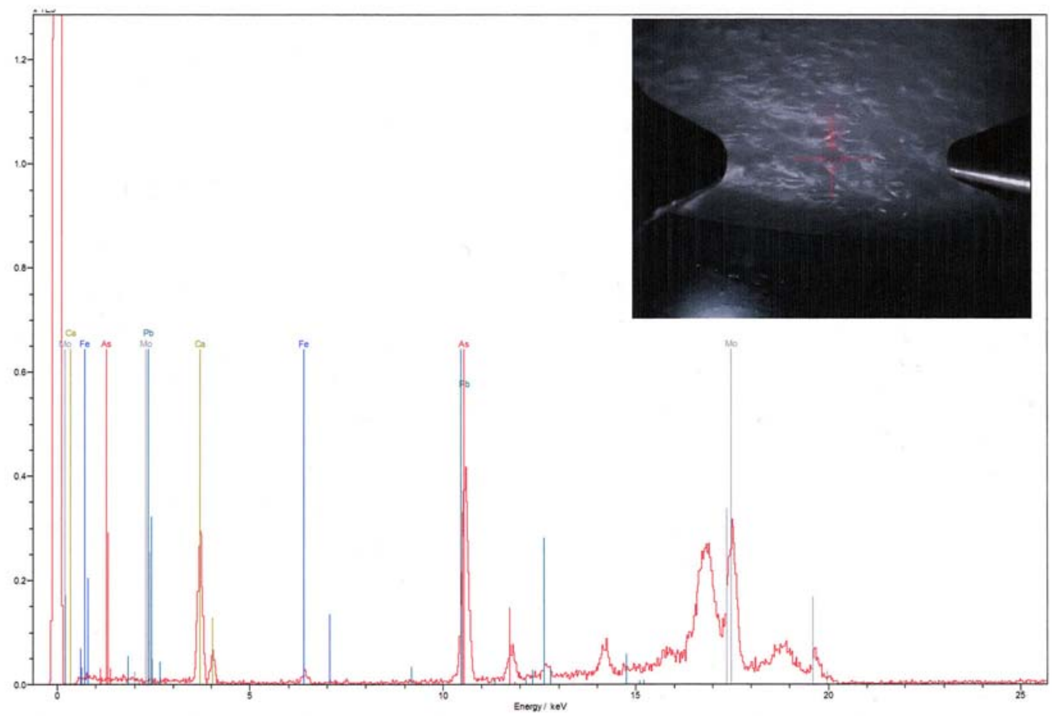




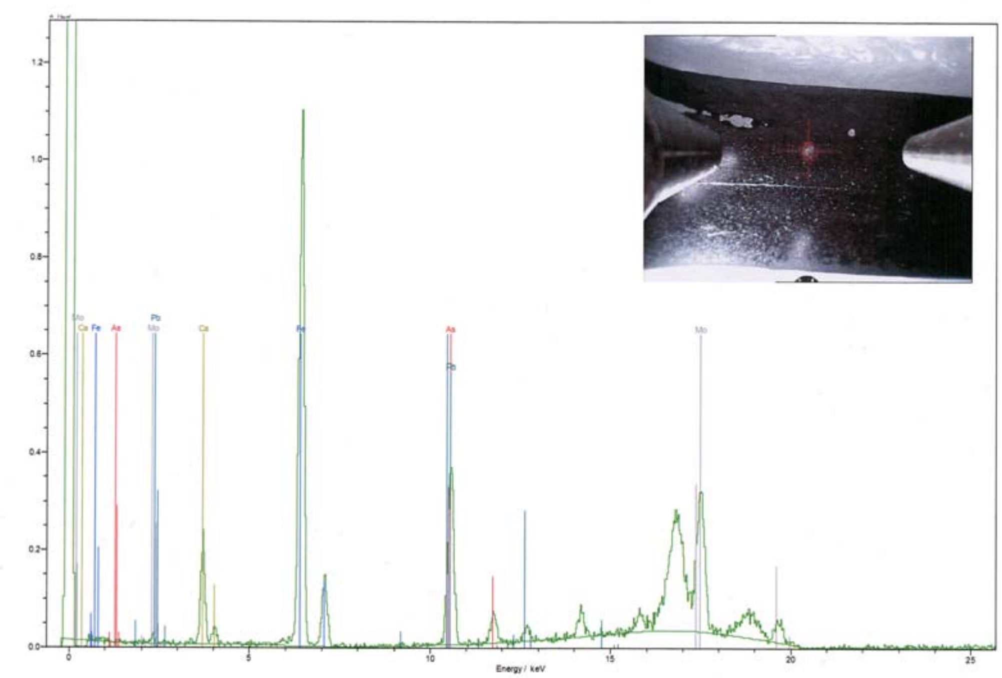
Claudet (black) (1/18/05)



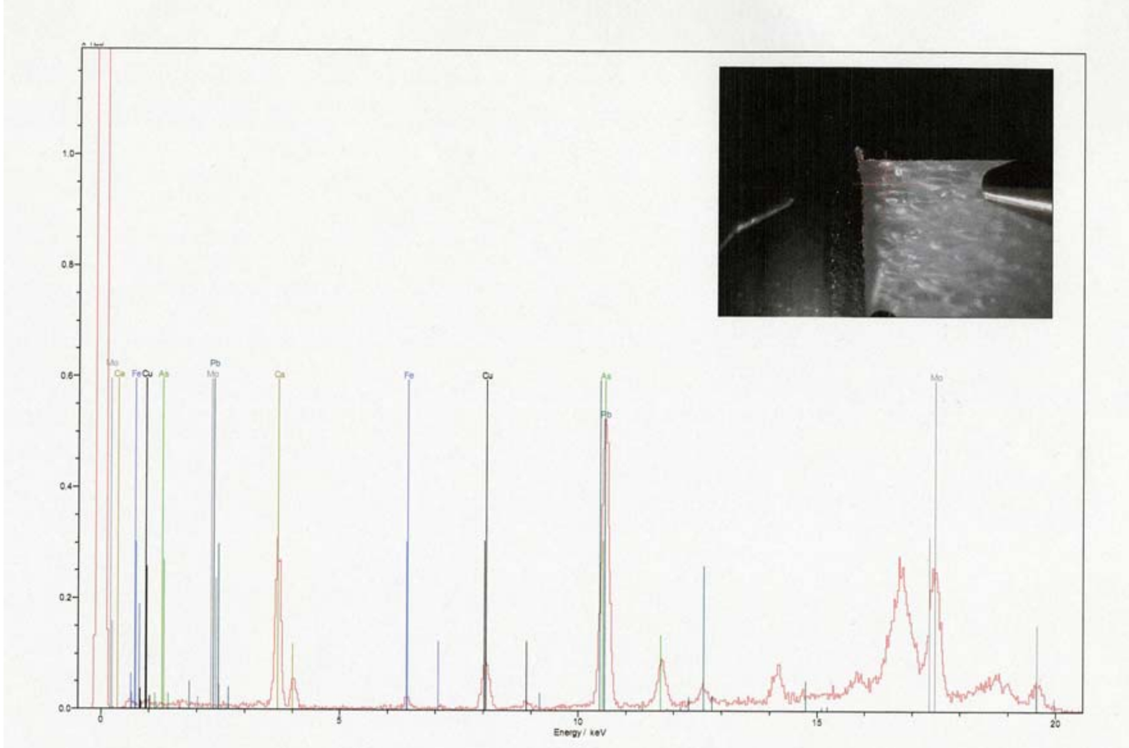
Claudet (gray) (1/18/05)



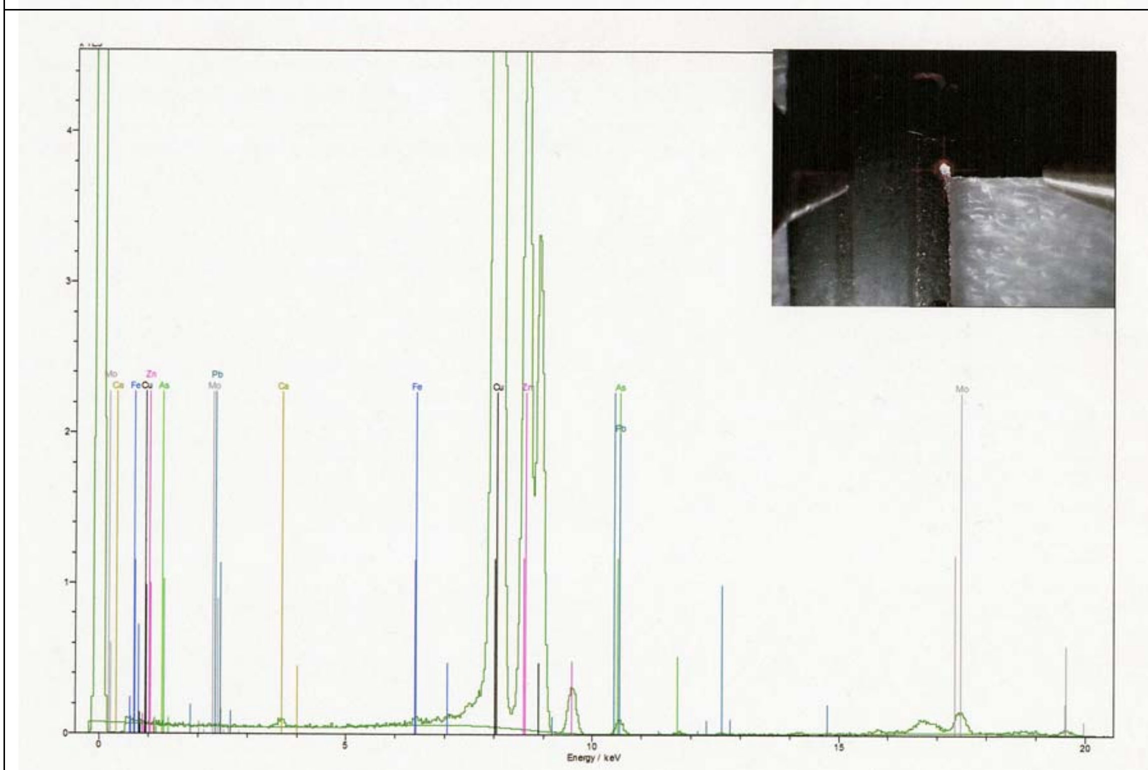
Thompson glass (1/18/05)



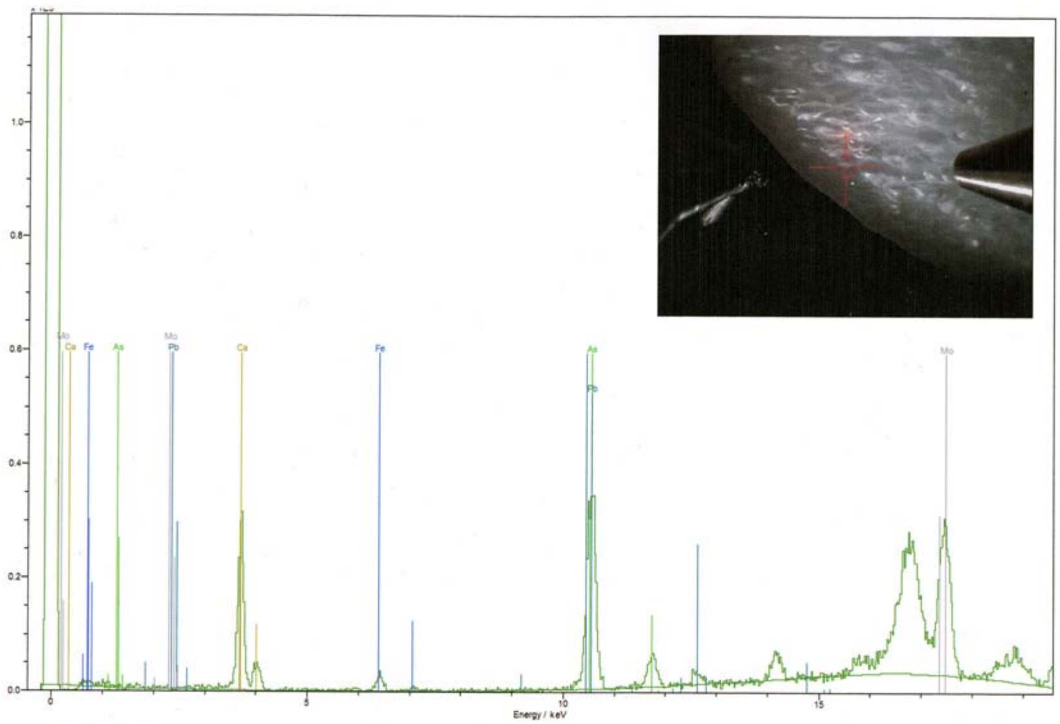
Thompson B1 (1/18/05)



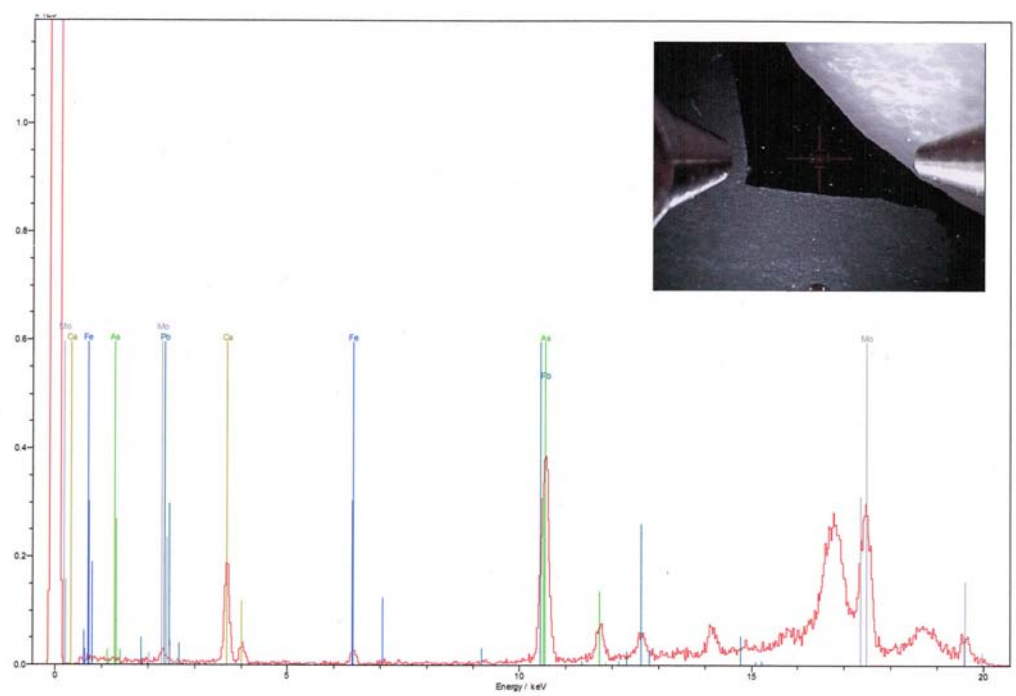
Gold line (glass) (1/18/05)



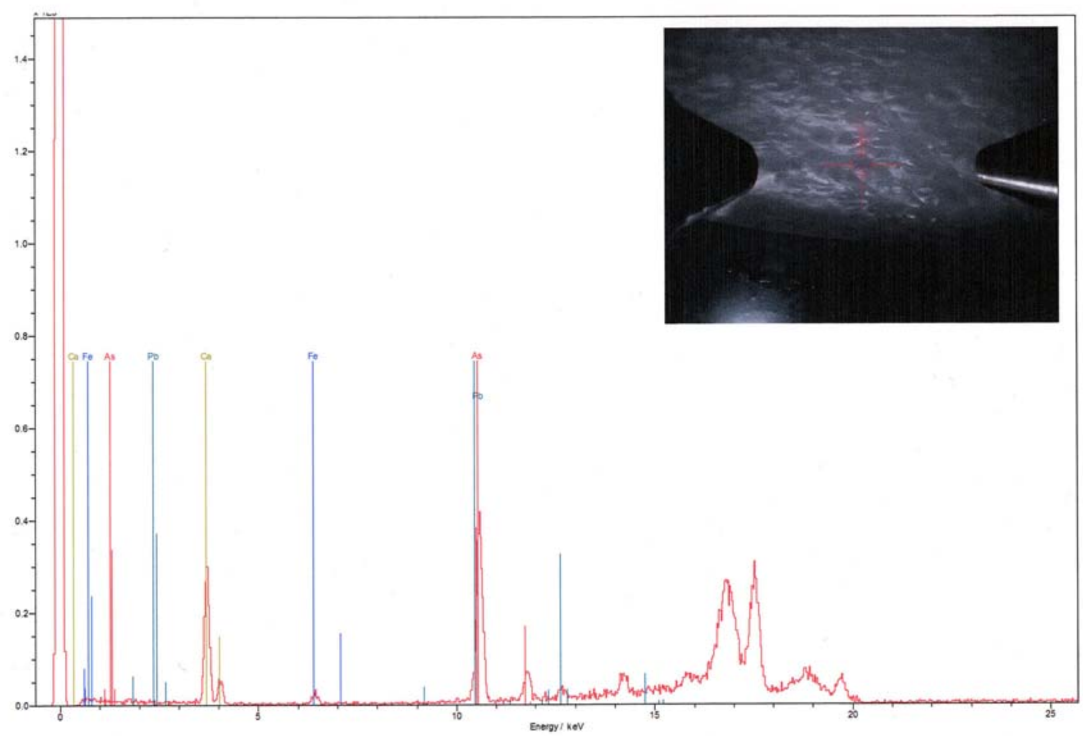
Gold line metal (1/18/05)



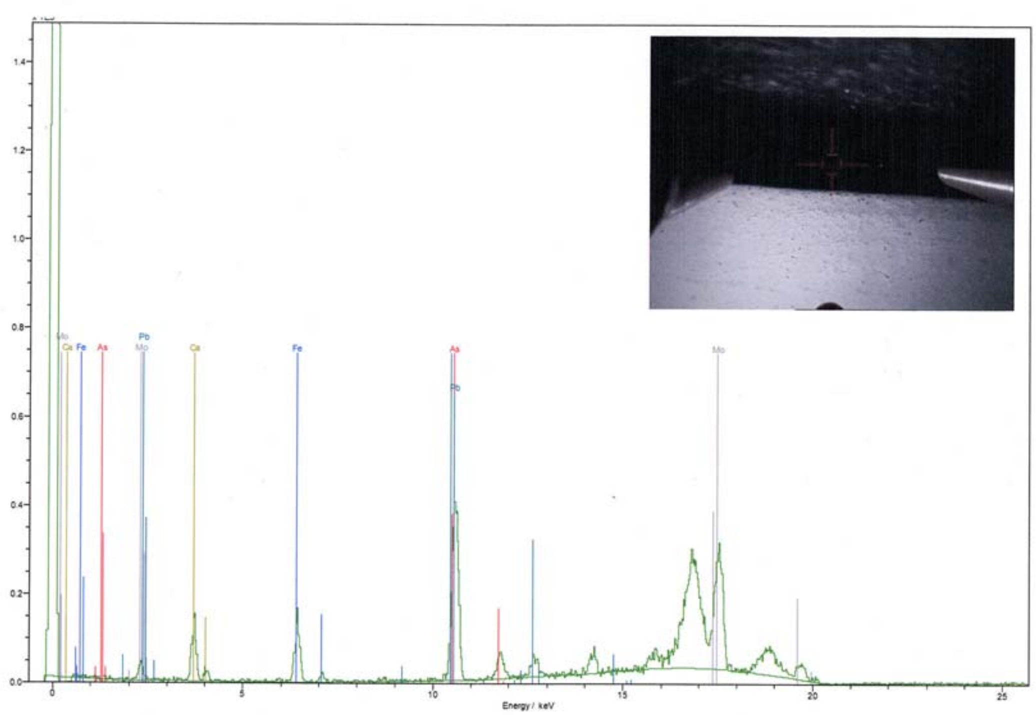
Crystal (glass) (1/18/05)



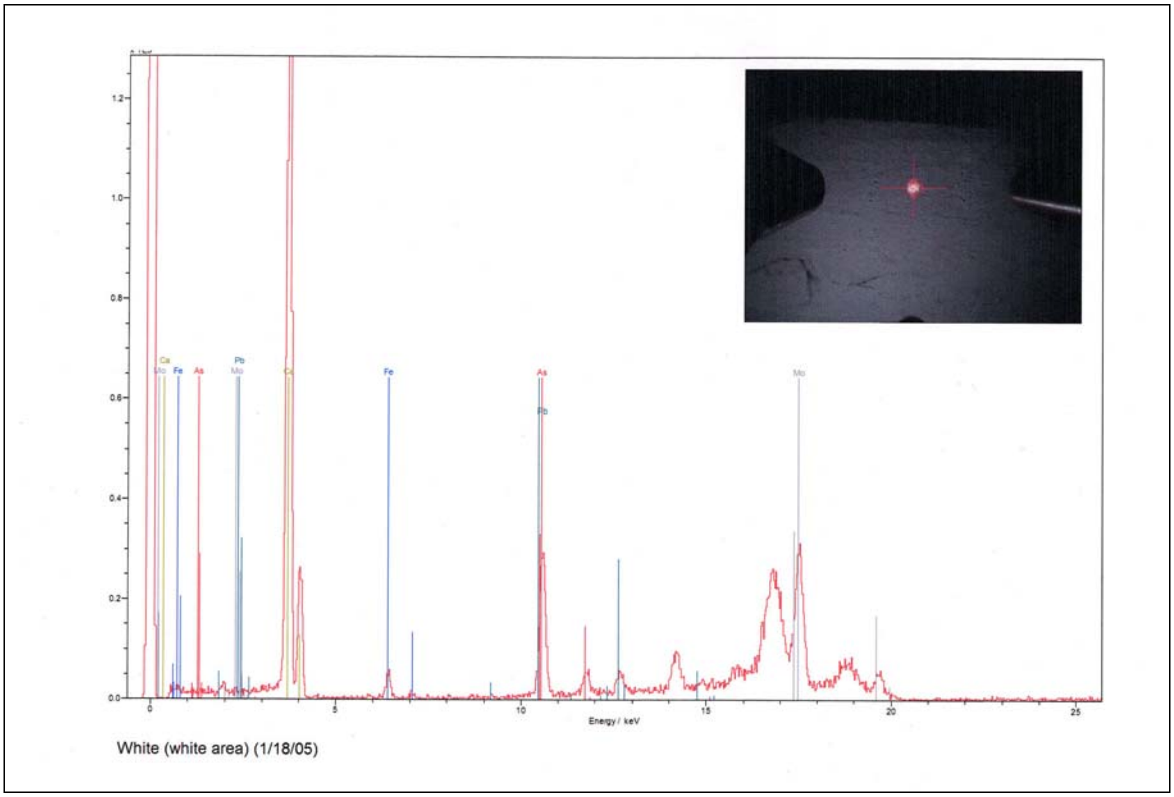
Crystal (black) (1/18/05)



White (glass) (1/18/05)



White (black area) (1/18/05)


Ca
Mo
Fe
As
Pb
Mo
Ca
Fe
As
Pb
Mo
Energy / keV
White (white area) (1/18/05)

APPENDIX No. 4:

FTIR Results on Paint on Stereo Daguerreotype Passepartouts from the Study Collection of Advanced Residency Program in Photograph Conservation

Transmission FTIR Microscopy

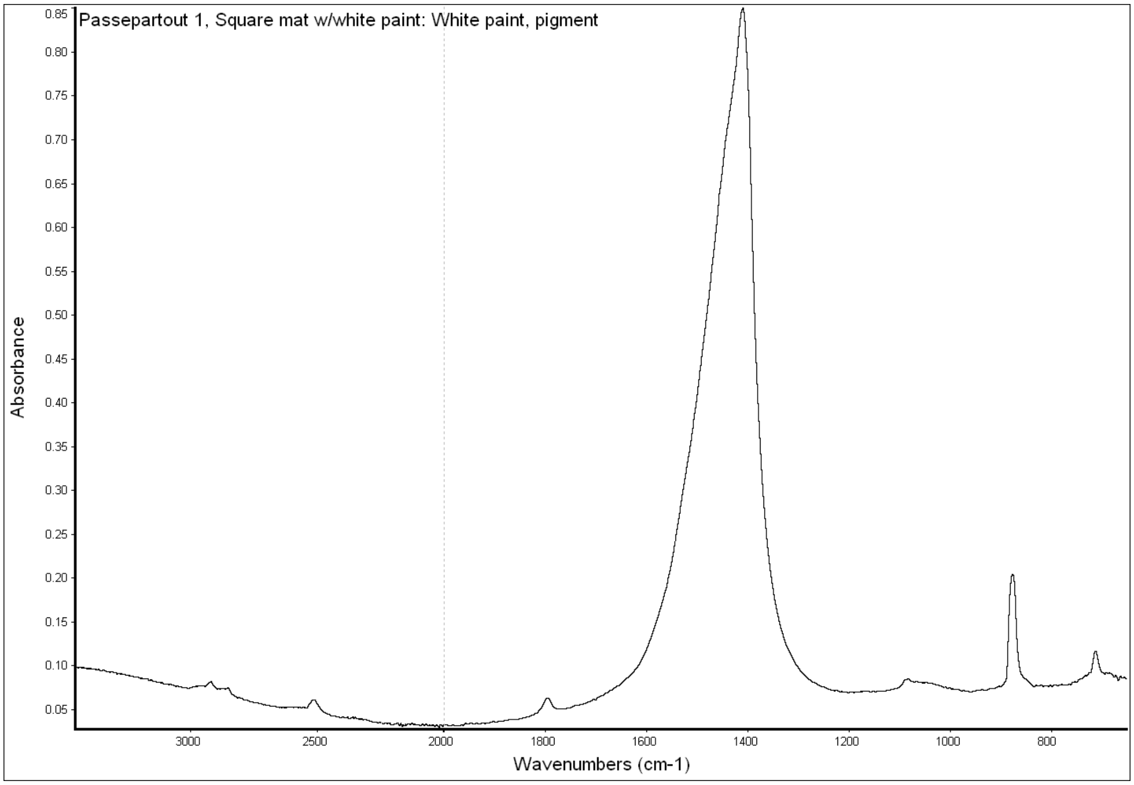
Infrared spectra were collected using a Continuum microscope coupled to a Magna 560 FTIR spectrometer (Nicolet). Samples were prepared by flattening them in a diamond compression cell (Thermo Spectra Tech), removing the top window, and analyzing the thin film in transmission mode on the bottom diamond window (2 mm x 2 mm surface area) using an approximately 100 μm x 100 μm square microscope aperture. The spectra are the average of 64 scans at 4 cm^{-1} spectral resolution. Correction routines were applied as needed to eliminate interference fringes and sloping baselines. Sample identification was aided by searching a spectral library of common conservation and artists' materials (Infrared and Raman Users Group, http://www.irug.org) using Omnic software.

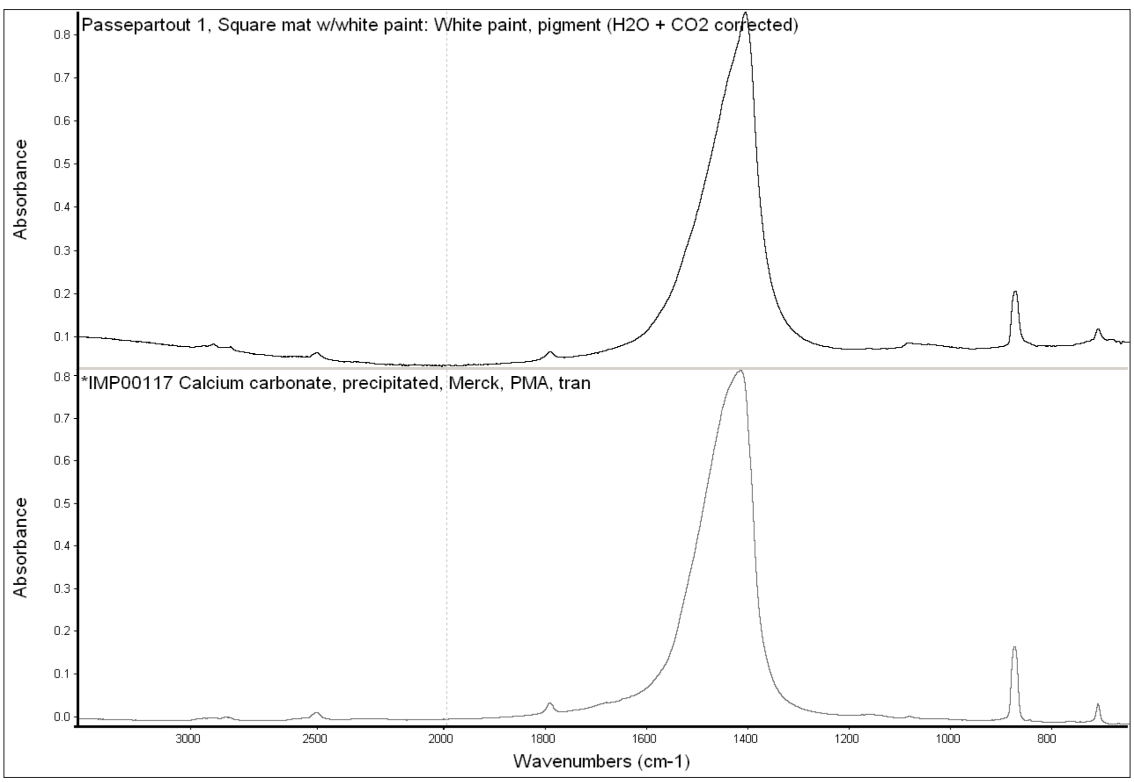
Test materials

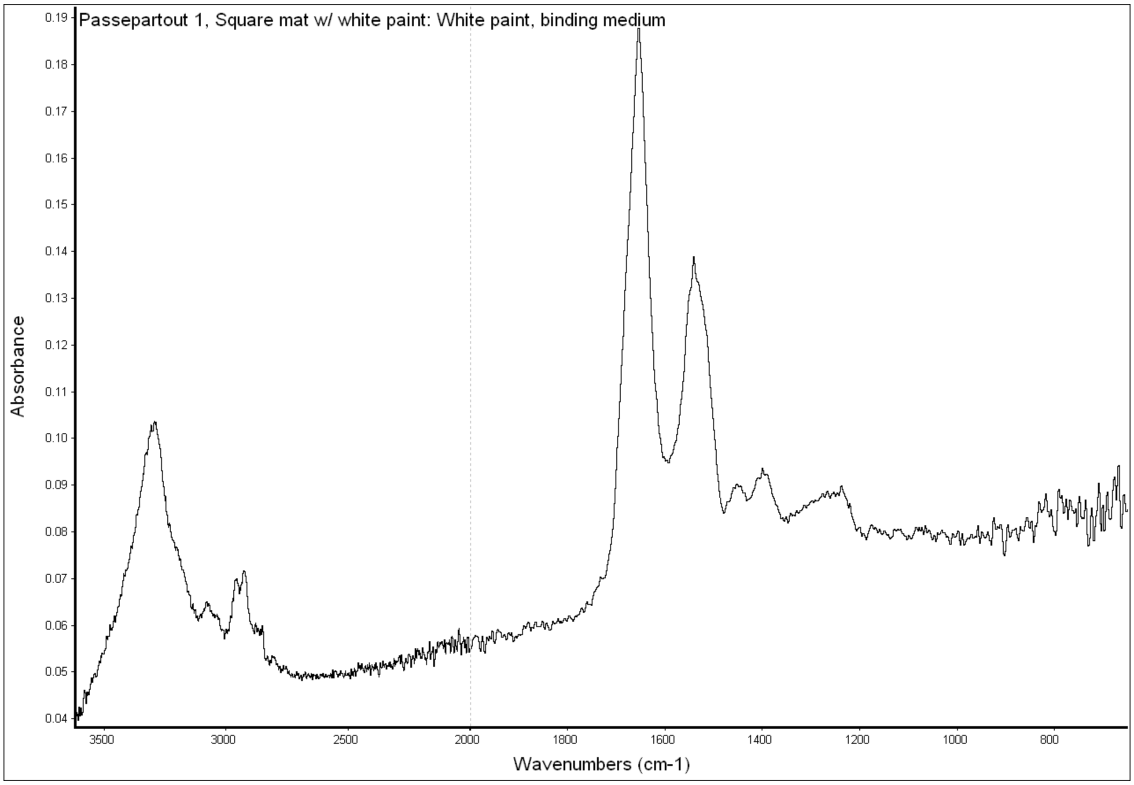
Same as listed in Appendix no. 5: Photographic Activity Test of Six Traditional and Contemporary Prints for Reverse Painted Glass Passepartouts.

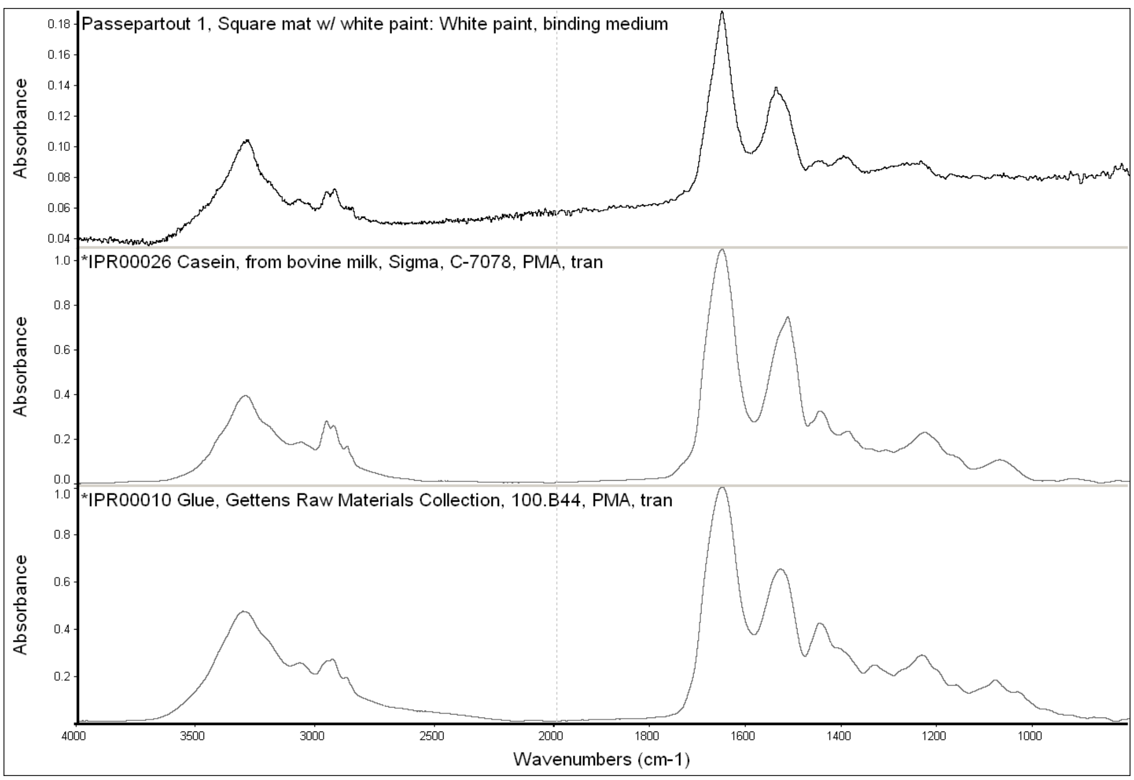
FTIR spectrums

See the next pages.

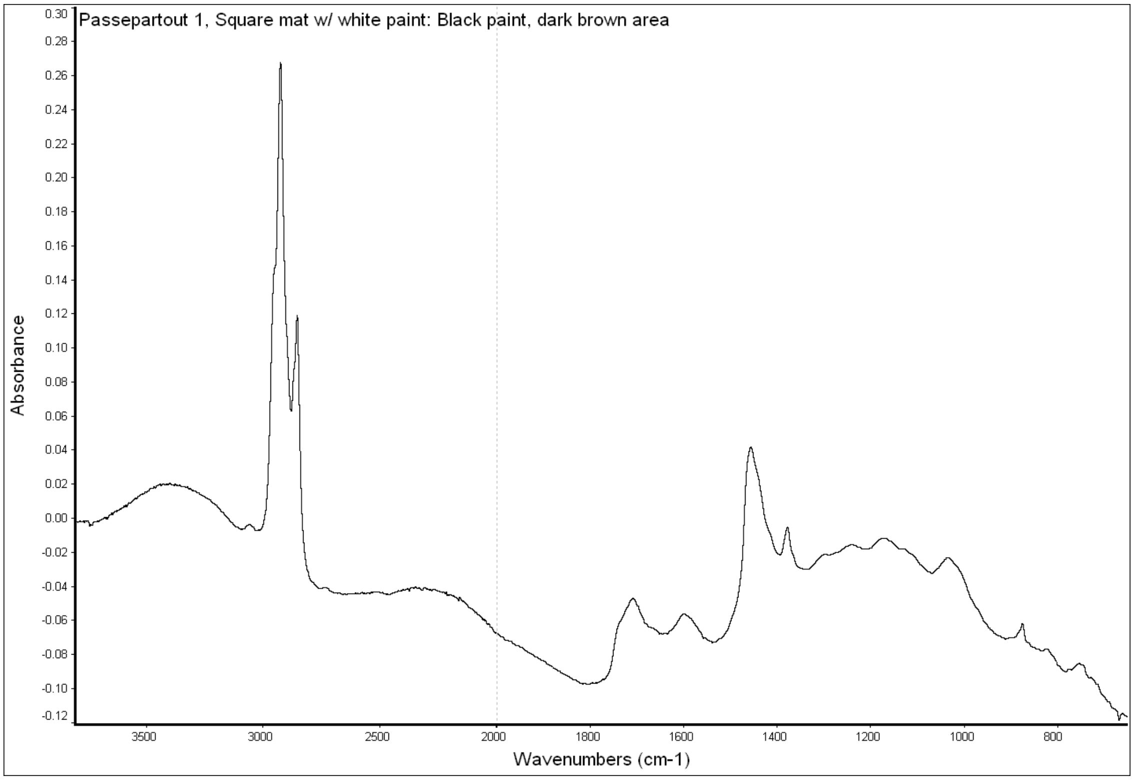

Passepartout 1, Square mat w/white paint: White paint, pigment
Absorbance
0.85
0.80
0.75
0.70
0.65
0.60
0.55
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
3000
2500
2000
1800
1600
1400
1200
1000
800
Wavenumbers (cm-1)

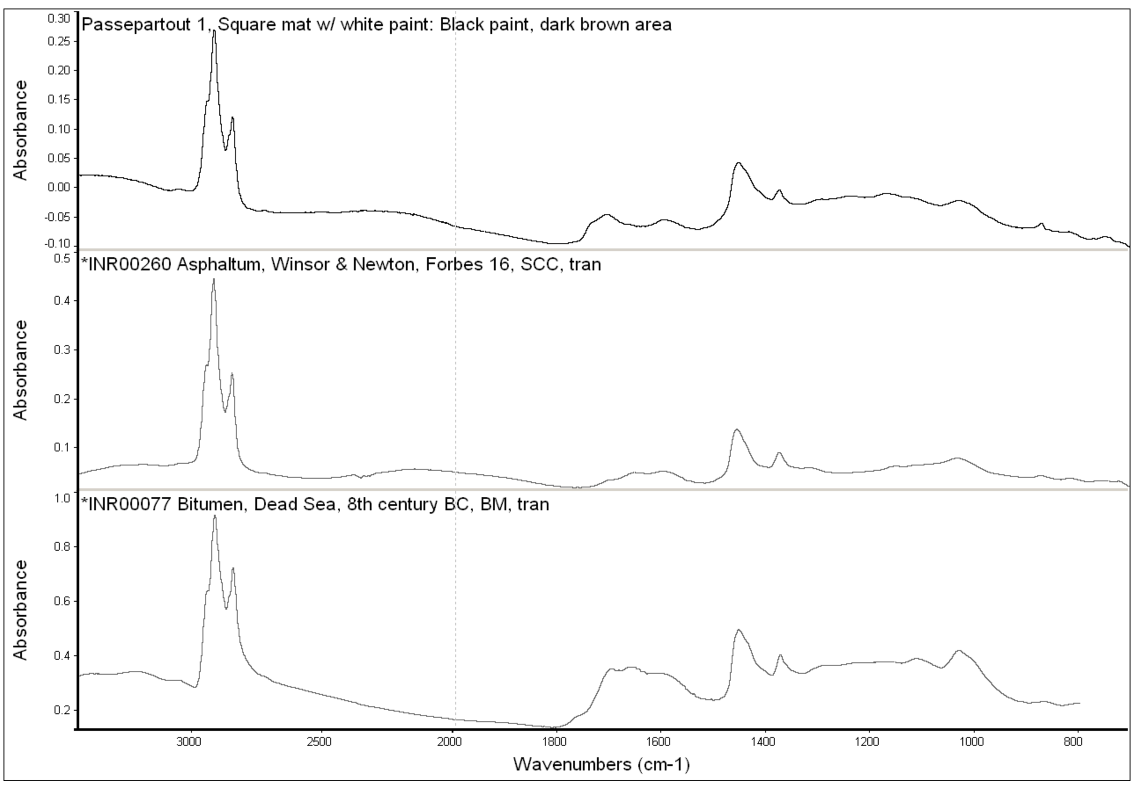

Passepartout 1, Square mat w/white paint: White paint, pigment (H2O + CO2 corrected)
*IMP00117 Calcium carbonate, precipitated, Merck, PMA, tran
Absorbance
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
3000
2500
2000
1800
1600
1400
1200
1000
800
Wavenumbers (cm-1)

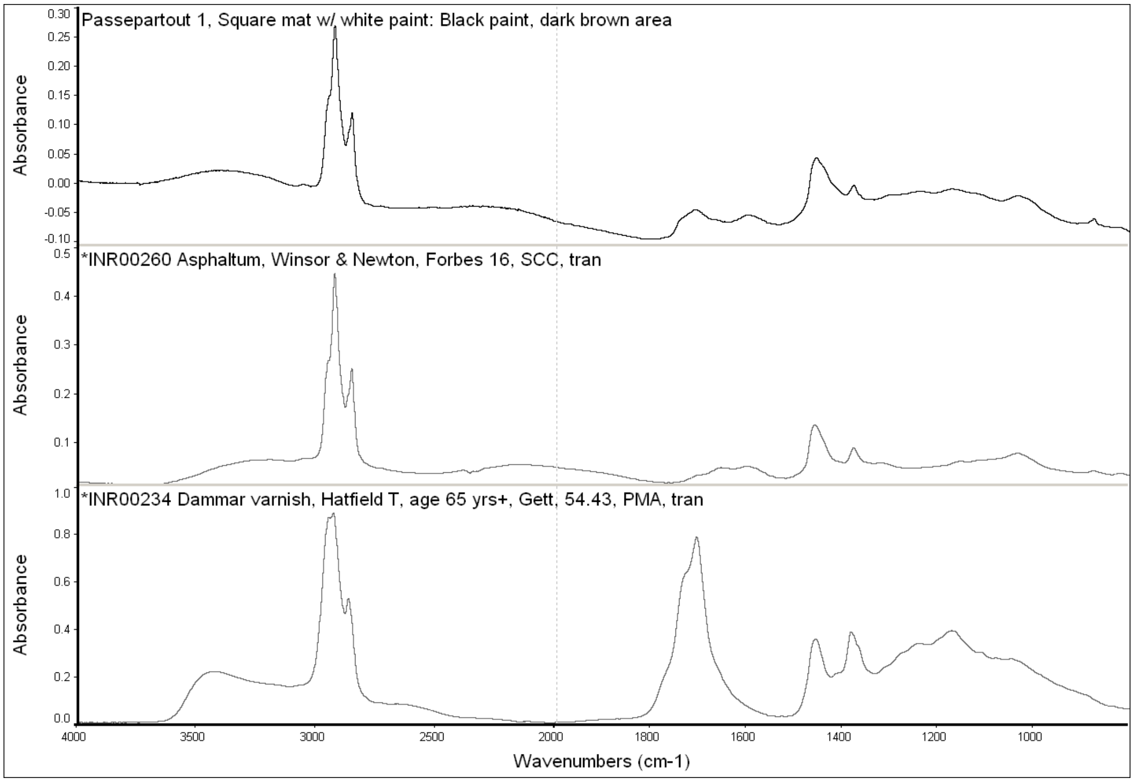

Passepartout 1, Square mat w/ white paint: White paint, binding medium
Absorbance
Wavenumbers (cm-1)

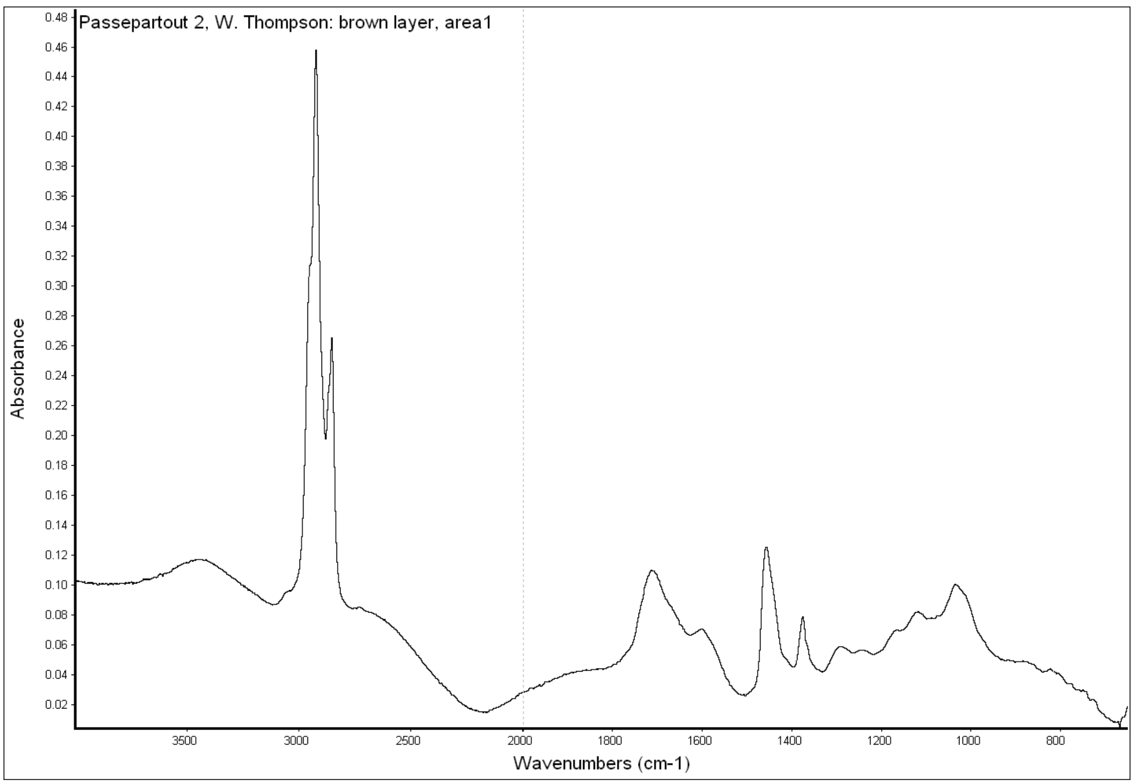

Passepartout 1, Square mat w/ white paint: White paint, binding medium
*IPR00026 Casein, from bovine milk, Sigma, C-7078, PMA, tran
*IPR00010 Glue, Gettens Raw Materials Collection, 100.B44, PMA, tran
Absorbance
Wavenumbers (cm-1)

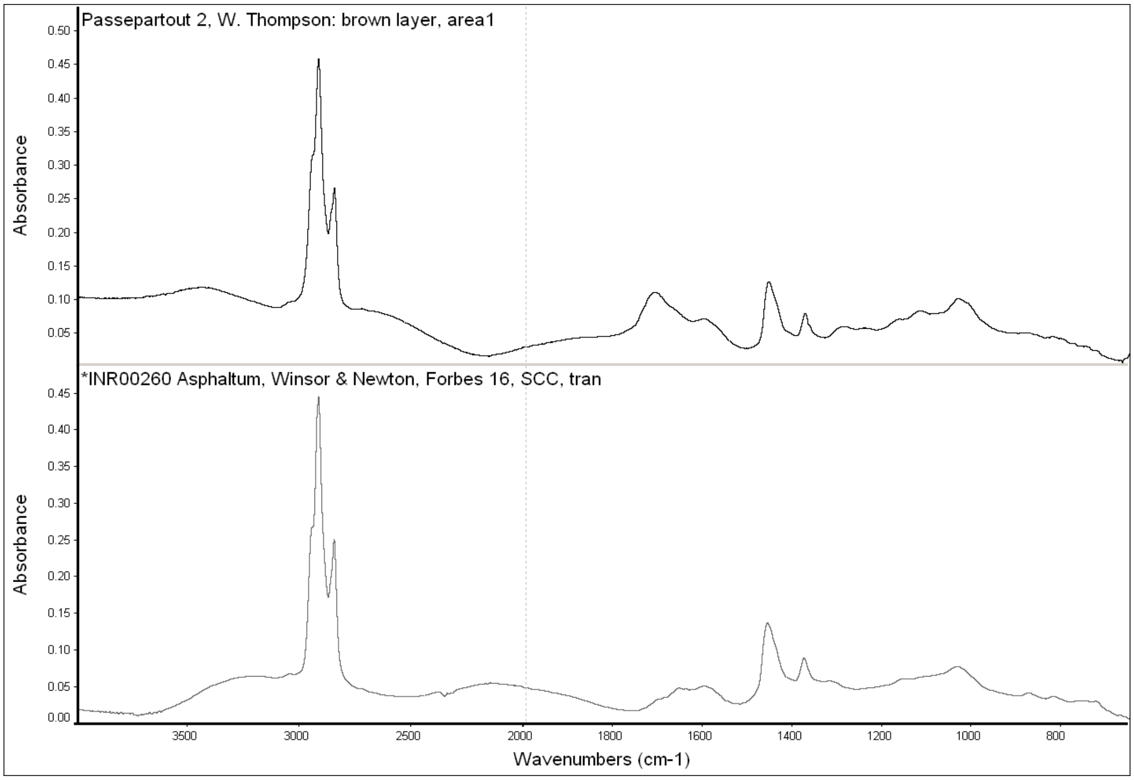
Appendix 4: FTIR Results on Paint on Stereo Daguerreotype Passepartouts from the Study Collection of Advanced Residency Program in Photograph Conservation

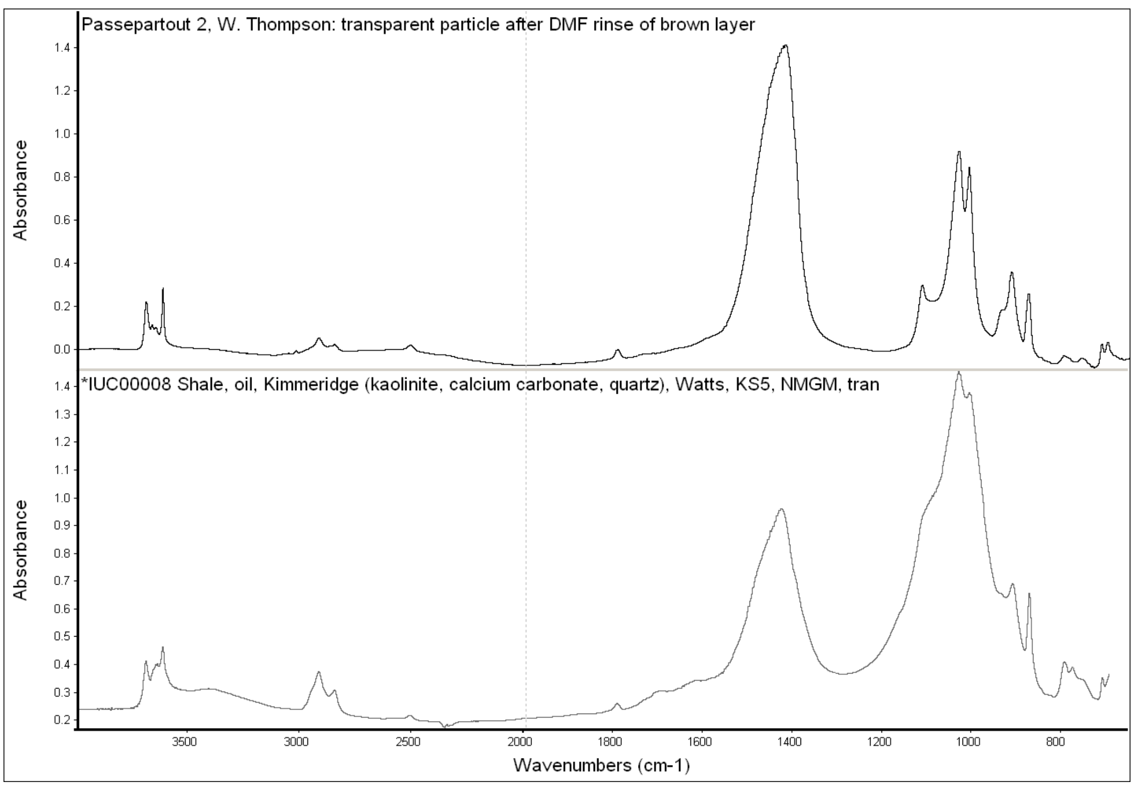


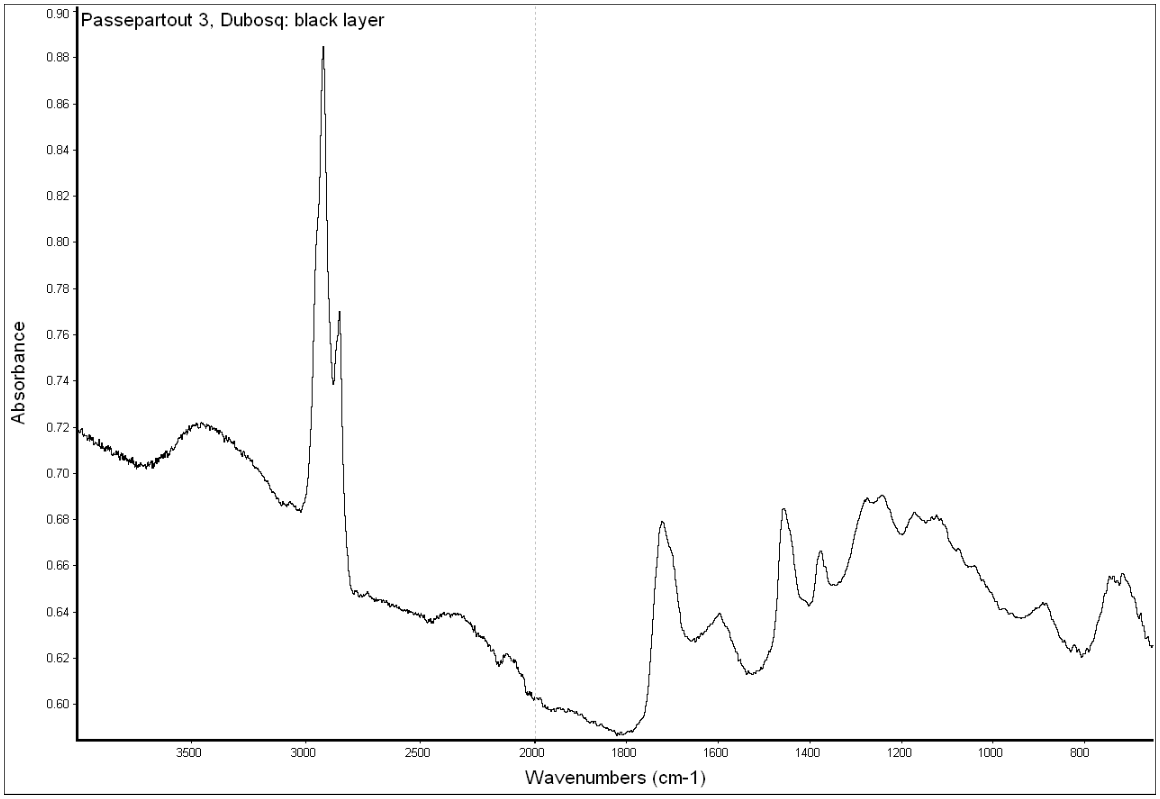


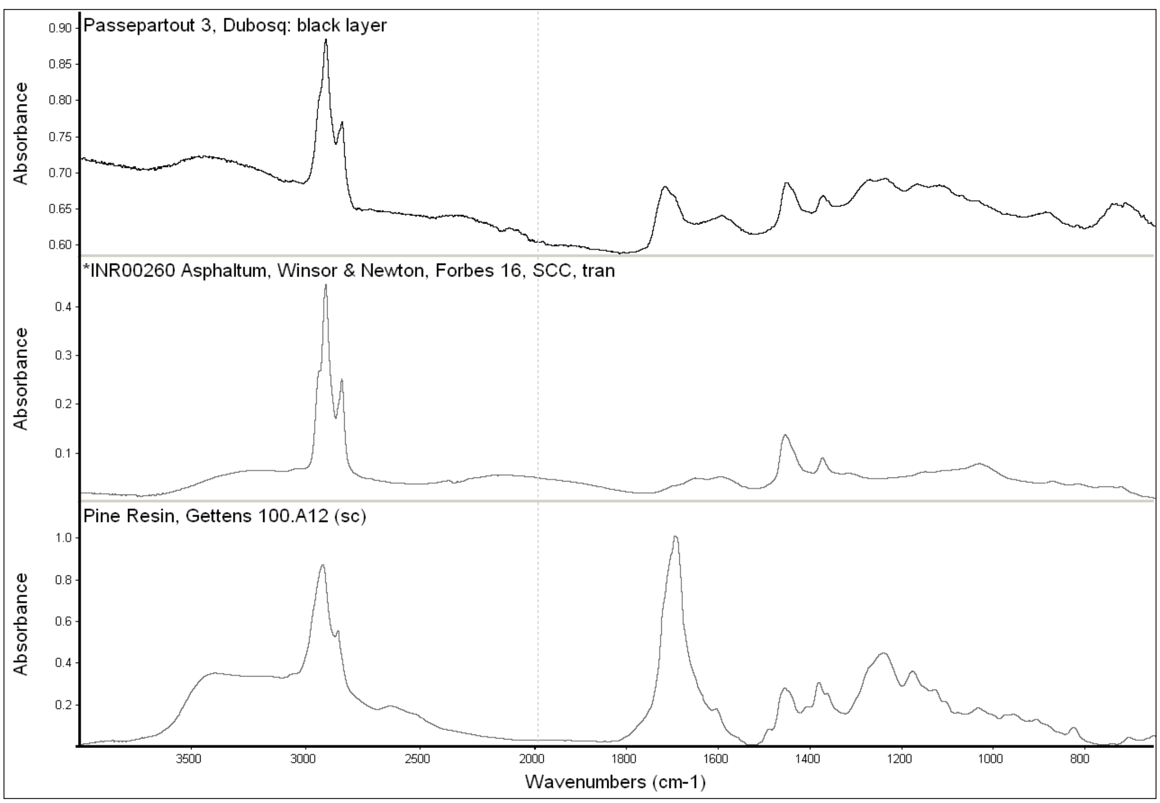

Passepartout 1, Square mat w/ white paint: Black paint, dark brown area
*INR00260 Asphaltum, Winsor & Newton, Forbes 16, SCC, tran
*INR00234 Dammar varnish, Hatfield T, age 65 yrs+, Gett, 54.43, PMA, tran
Absorbance
Wavenumbers (cm-1)

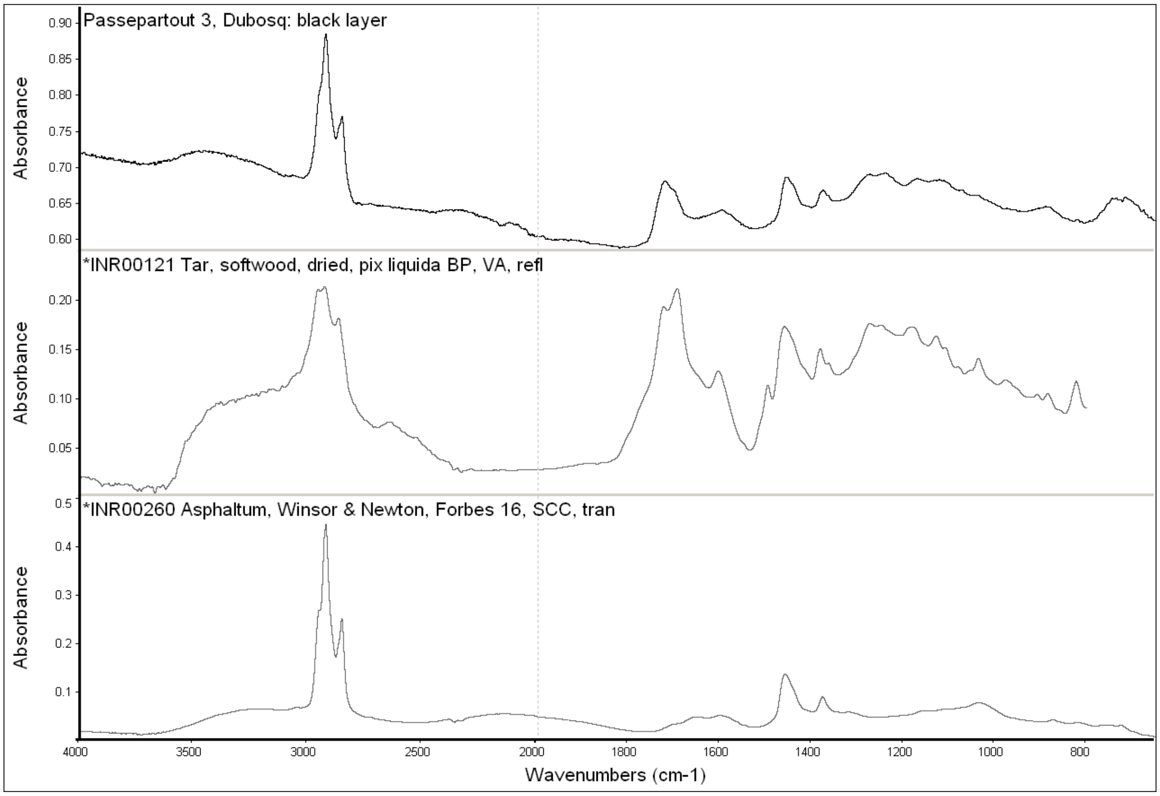

Passepartout 2, W. Thompson: brown layer, area1
Absorbance
Wavenumbers (cm-1)

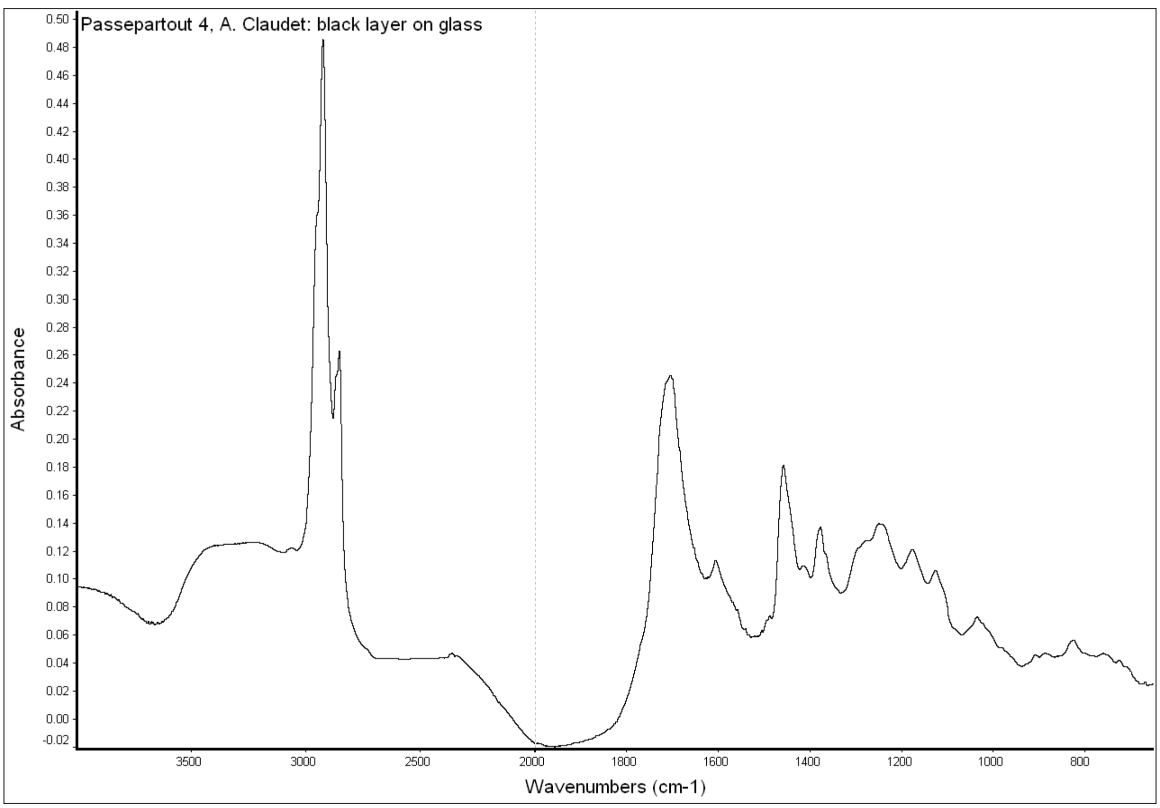

Passepartout 2, W. Thompson: brown layer, area1
*INR00260 Asphaltum, Winsor & Newton, Forbes 16, SCC, tran
Absorbance
Absorbance
Wavenumbers (cm-1)


Passepartout 2, W. Thompson: transparent particle after DMF rinse of brown layer
*IUC00008 Shale, oil, Kimmeridge (kaolinite, calcium carbonate, quartz), Watts, KS5, NMGM, tran
Absorbance
Absorbance
Wavenumbers (cm-1)

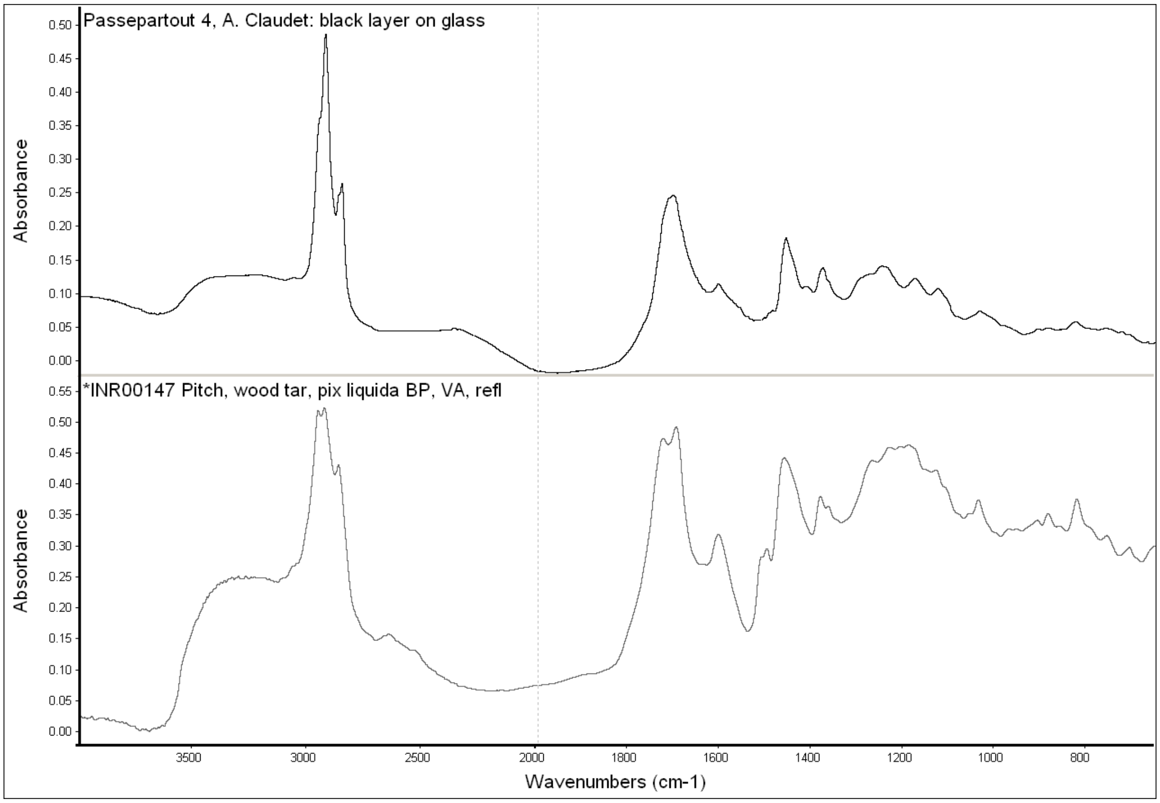

Passepartout 3, Dubosq: black layer
Absorbance
Wavenumbers (cm-1)

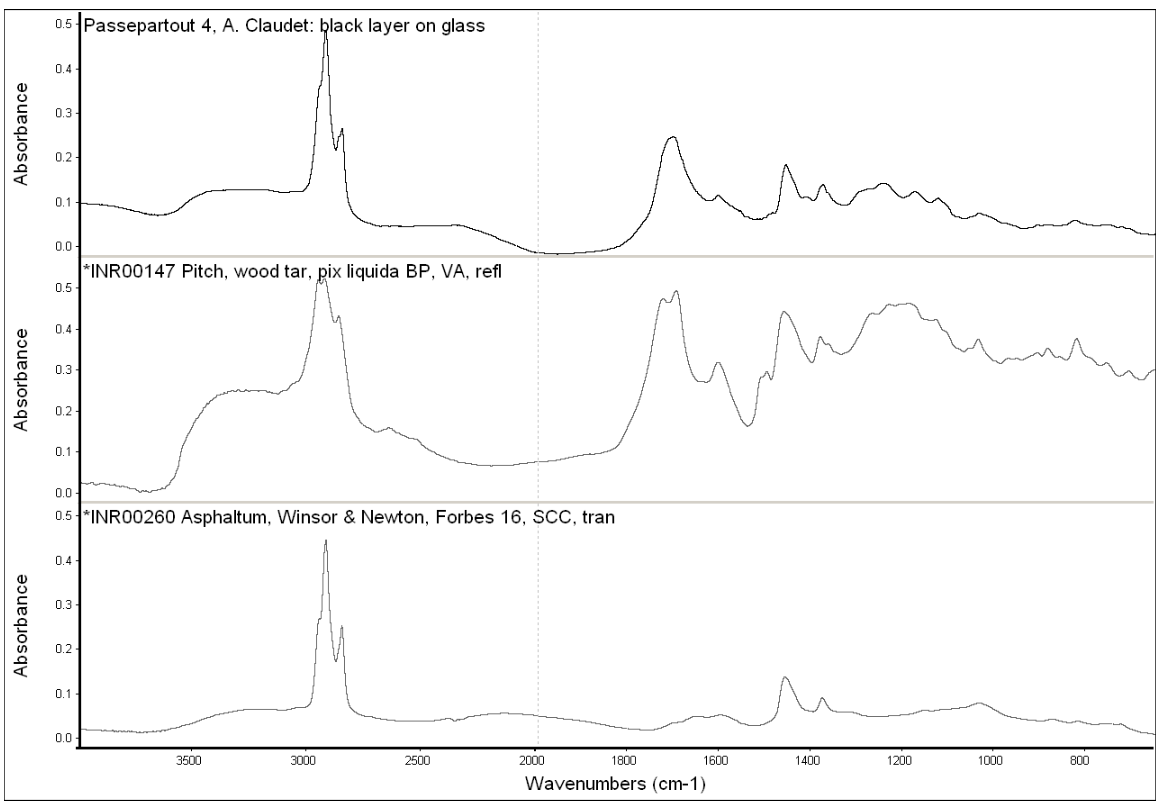

Passepartout 3, Dubosq: black layer
*INR00260 Asphaltum, Winsor & Newton, Forbes 16, SCC, tran
Pine Resin, Gettens 100.A12 (sc)
Absorbance
Wavenumbers (cm-1)

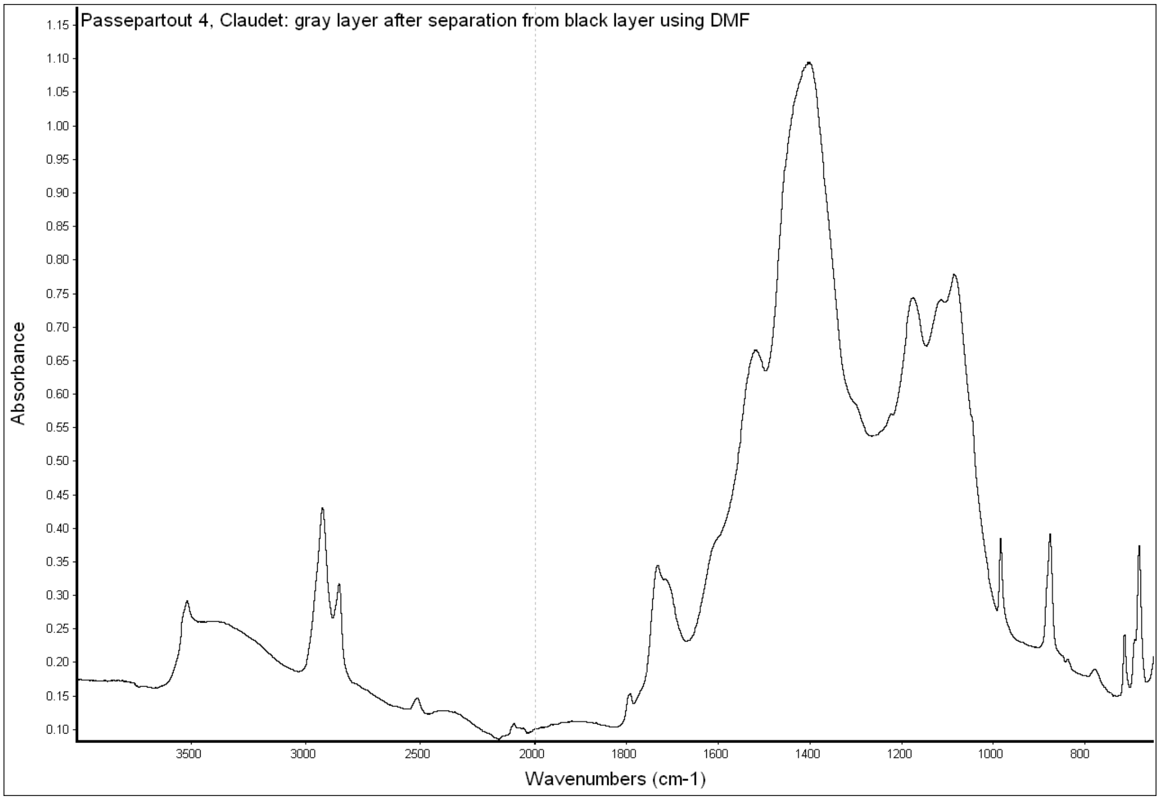

Passepartout 3, Dubosq: black layer
*INR00121 Tar, softwood, dried, pix liquida BP, VA, refl
*INR00260 Asphaltum, Winsor & Newton, Forbes 16, SCC, tran
Absorbance
Wavenumbers (cm-1)

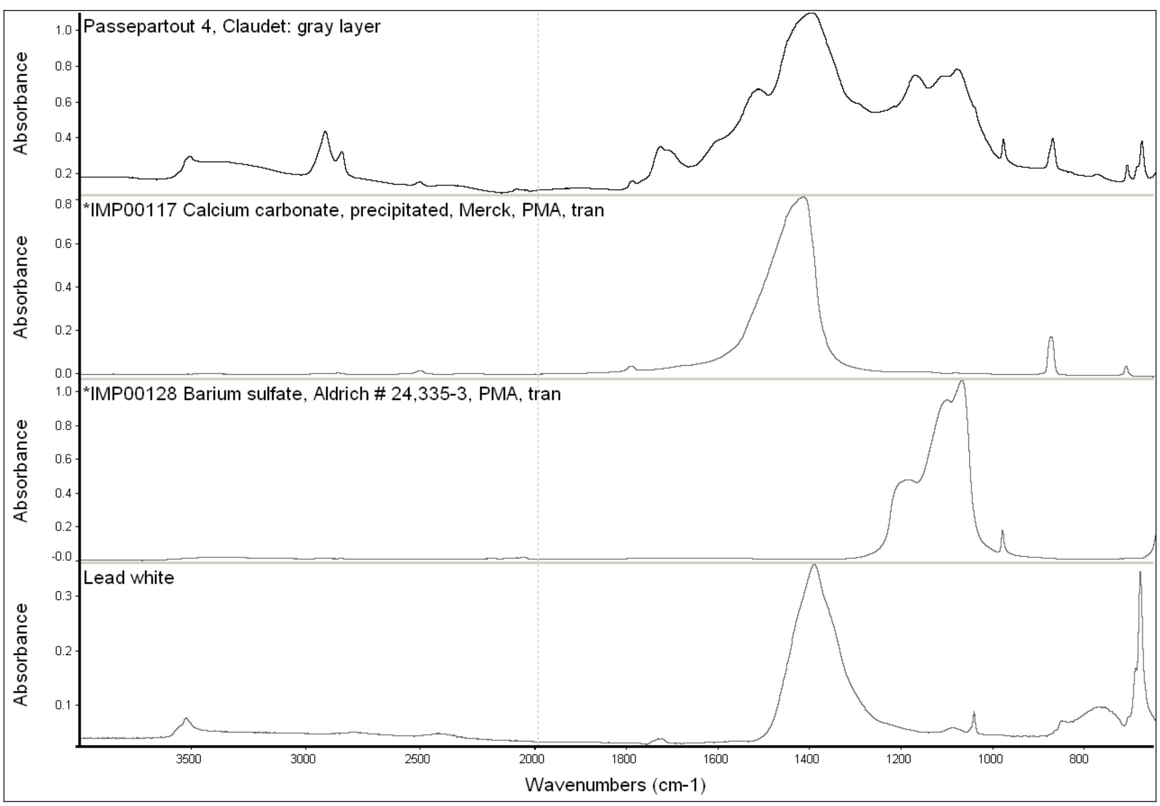

Passepartout 4, A. Claudet: black layer on glass
Absorbance
Wavenumbers (cm-1)

Appendix 4: FTIR Results on Paint on Stereo Daguerreotype Passepartouts from the Study Collection of Advanced Residency Program in Photograph Conservation

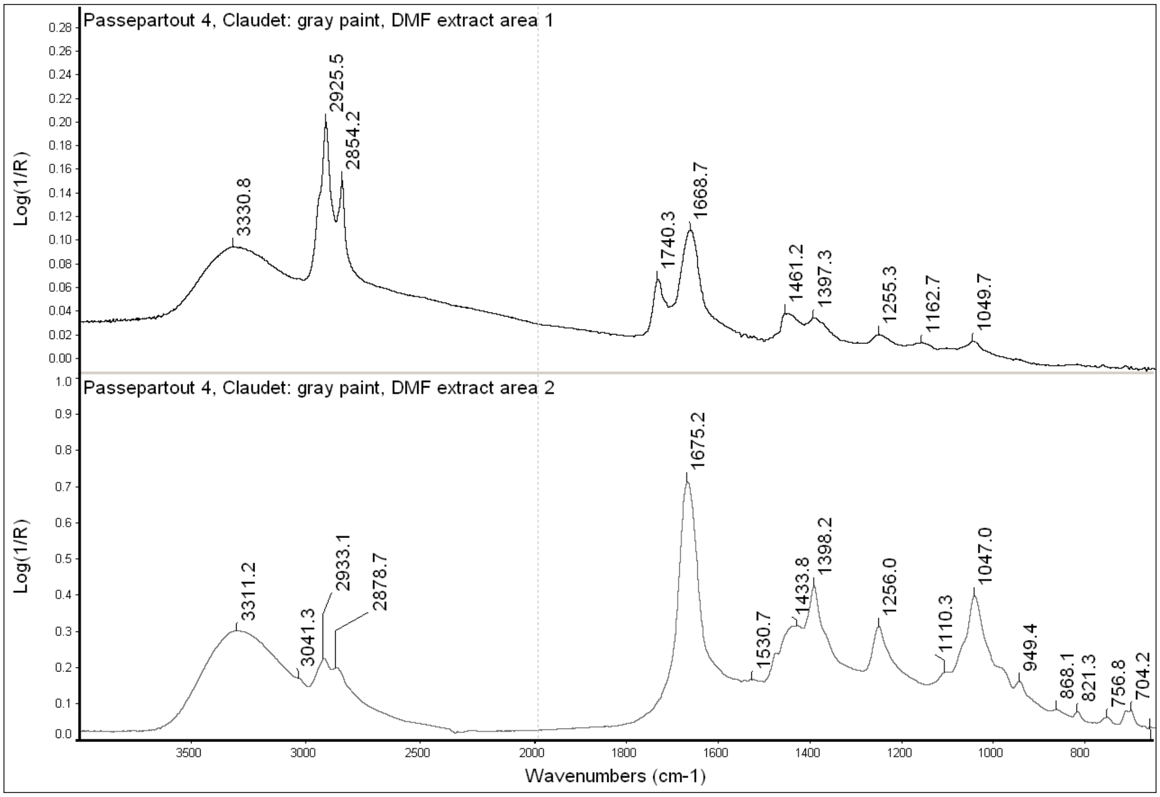


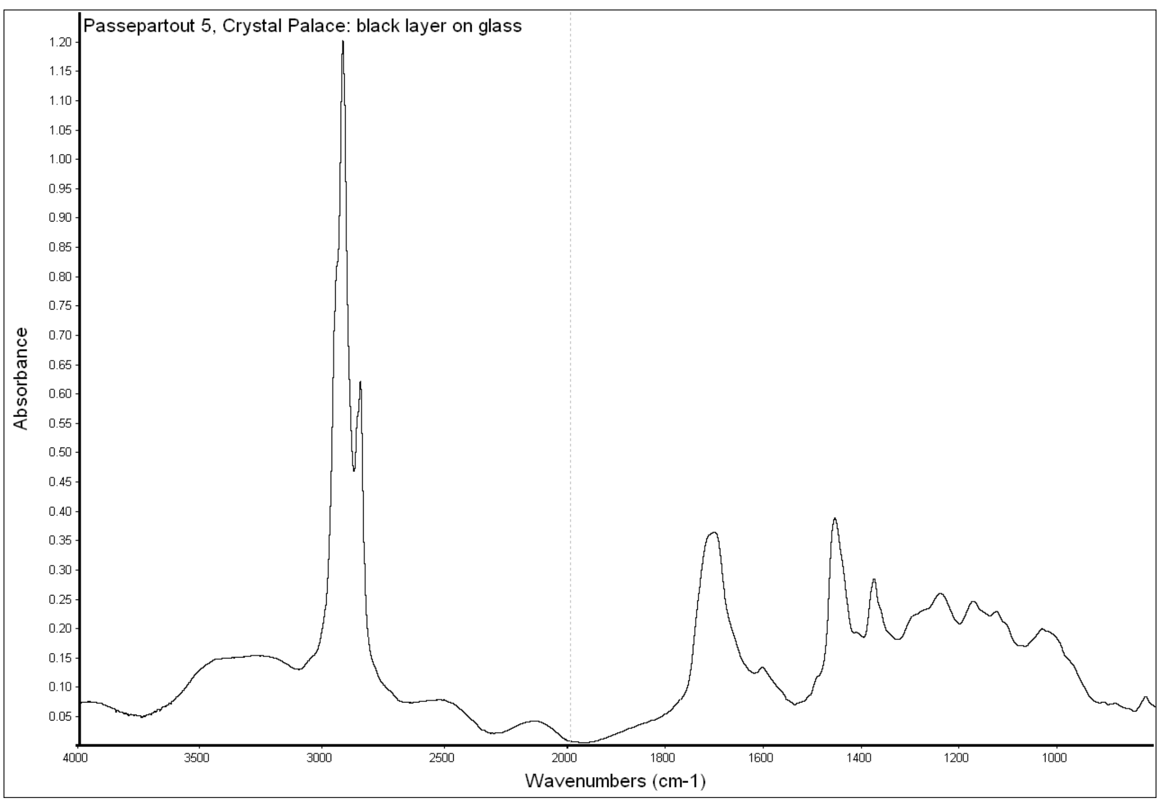



Passepartout 4, Claudet: gray layer after separation from black layer using DMF
Absorbance
Wavenumbers (cm-1)

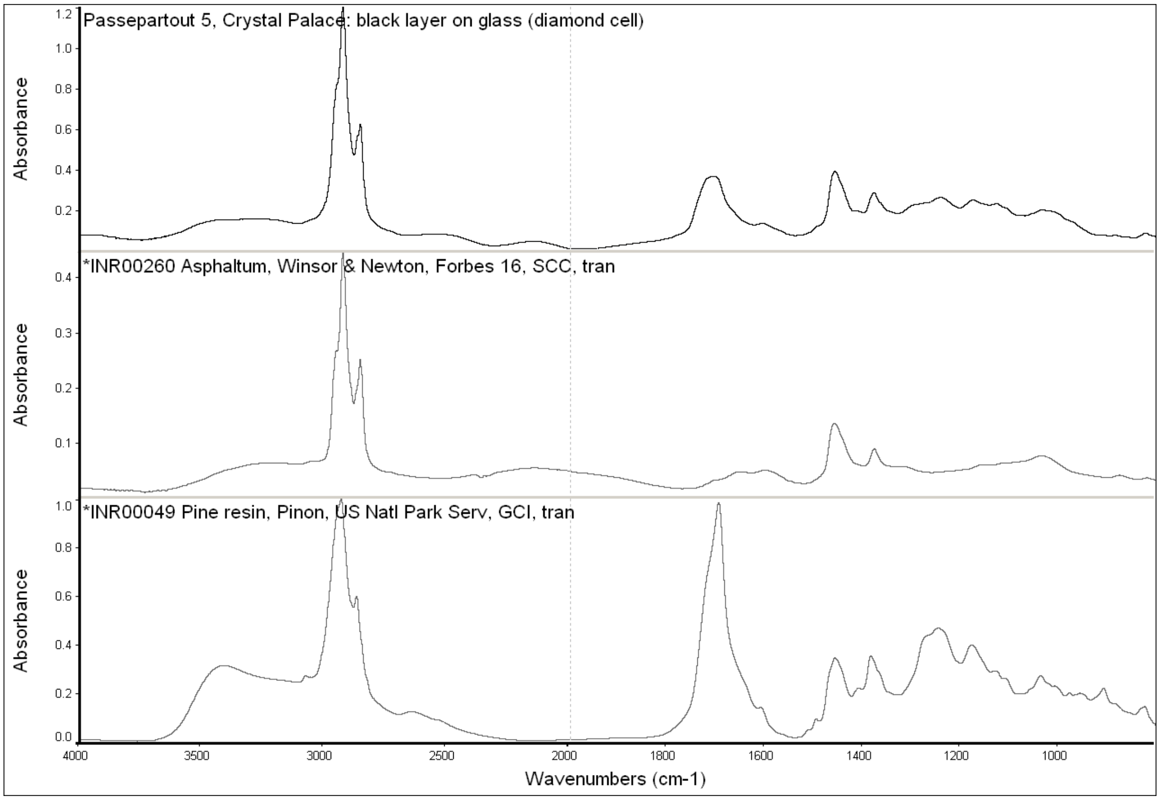

Passepartout 4, Claudet: gray layer
*IMP00117 Calcium carbonate, precipitated, Merck, PMA, tran
*IMP00128 Barium sulfate, Aldrich # 24,335-3, PMA, tran
Lead white
Absorbance
Wavenumbers (cm-1)

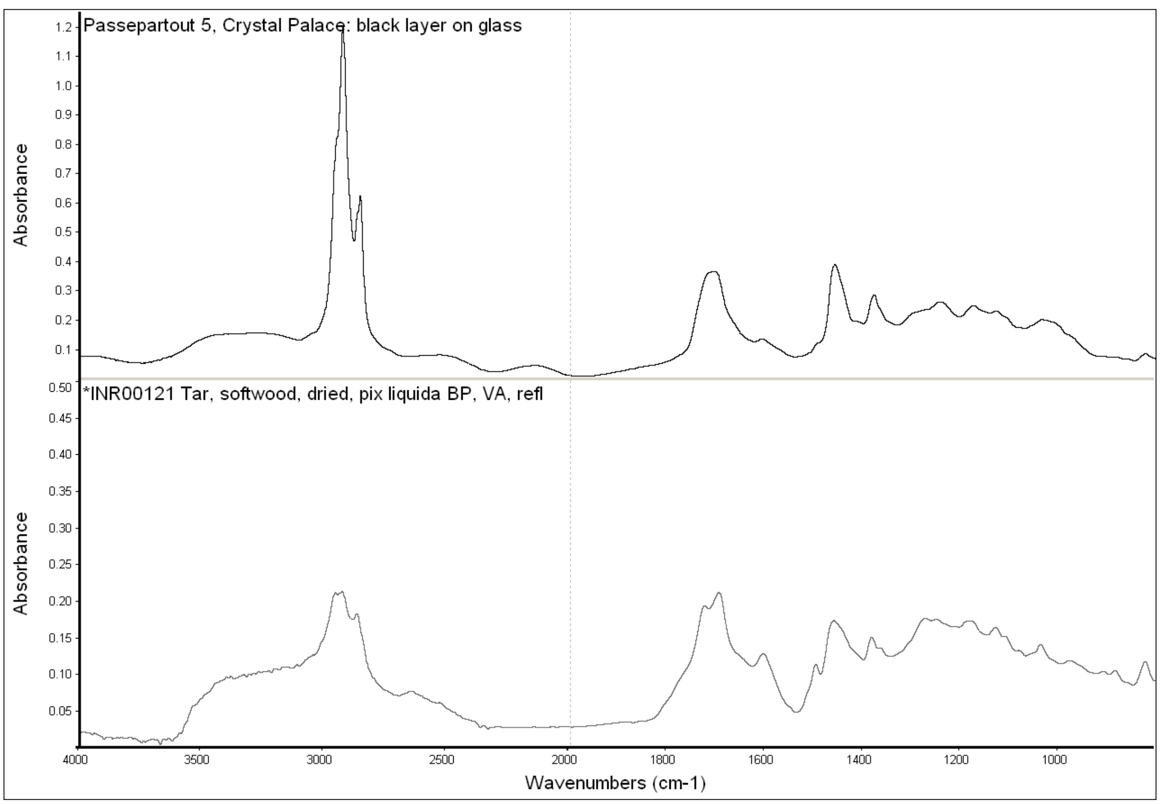
Appendix 4: FTIR Results on Paint on Stereo Daguerreotype Passepartouts from the Study Collection of Advanced Residency Program in Photograph Conservation

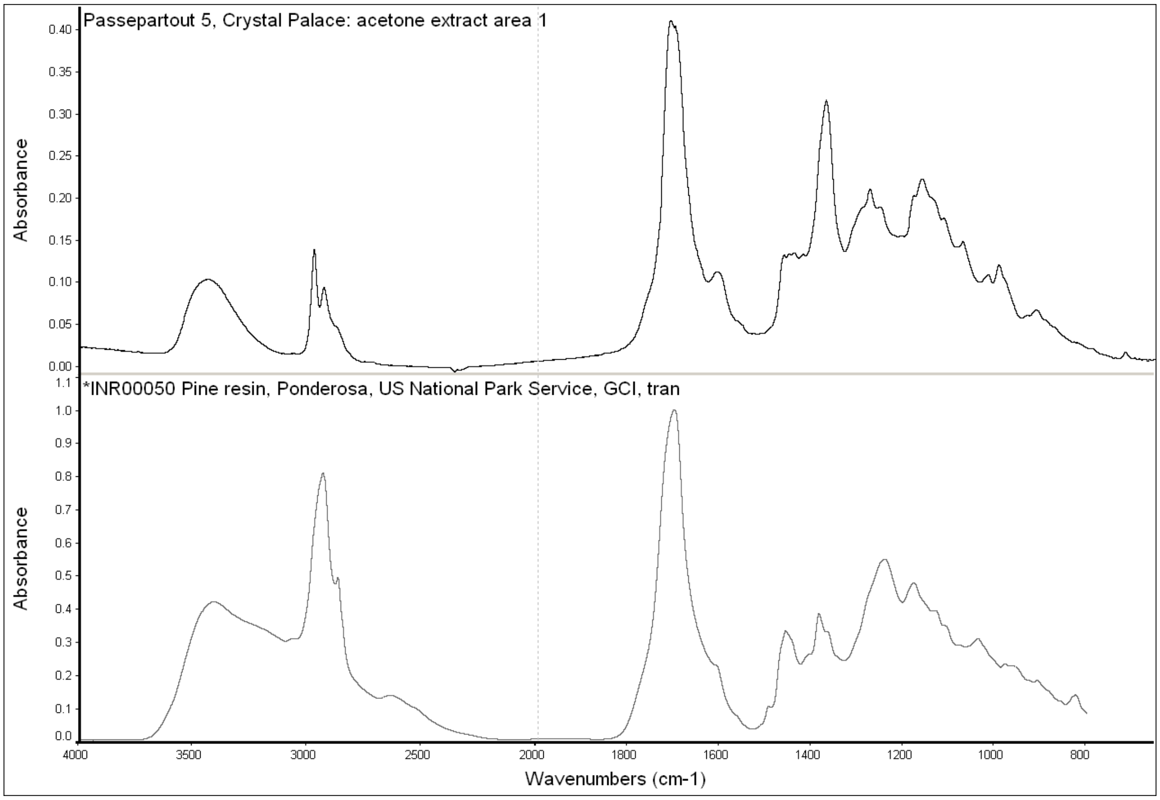


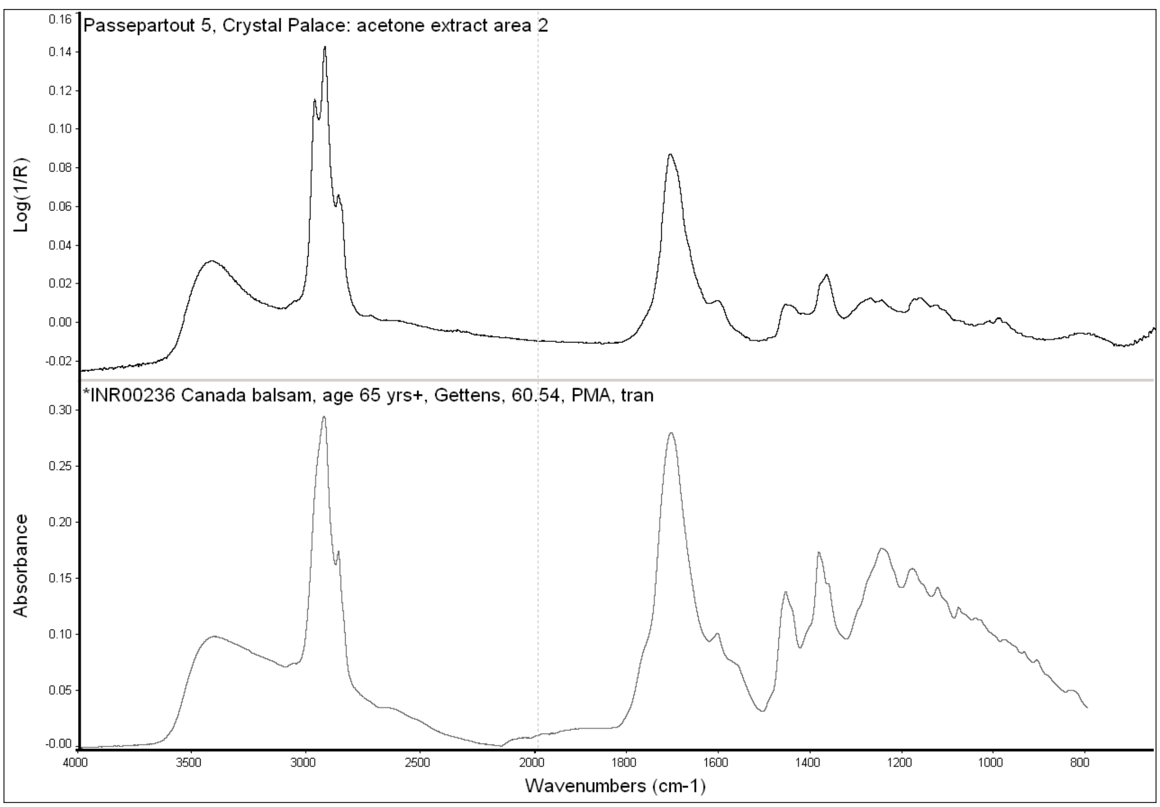


Appendix 4: FTIR Results on Paint on Stereo Daguerreotype Passepartouts from the Study Collection of Advanced Residency Program in Photograph Conservation

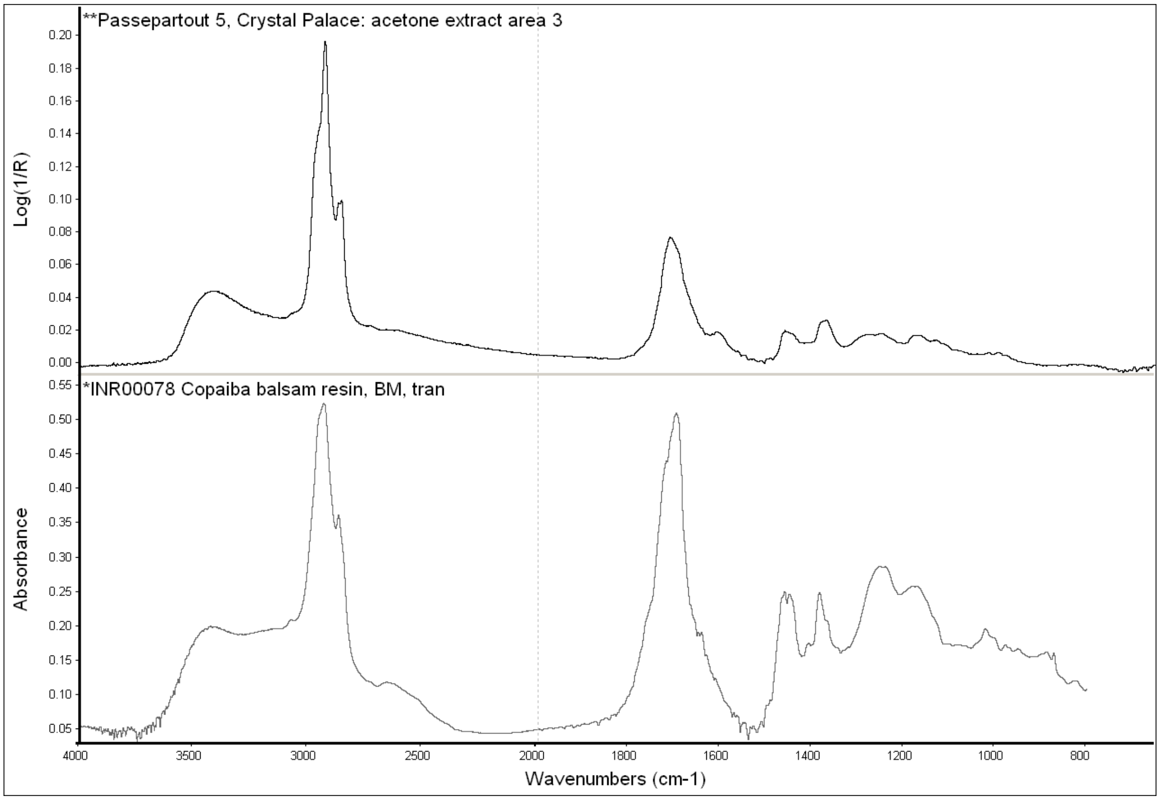


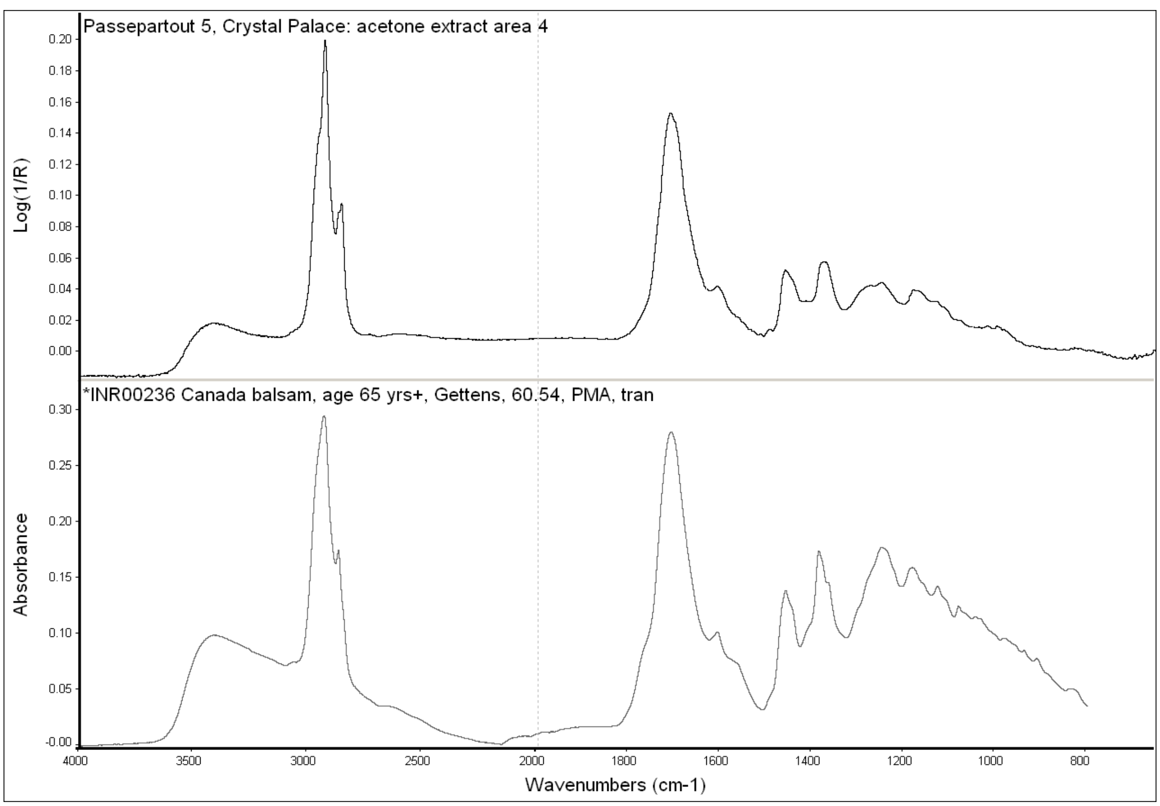



Passepartout 5, Crystal Palace: acetone extract area 1
*INR00050 Pine resin, Ponderosa, US National Park Service, GCI, tran
Absorbance
Absorbance
Wavenumbers (cm-1)

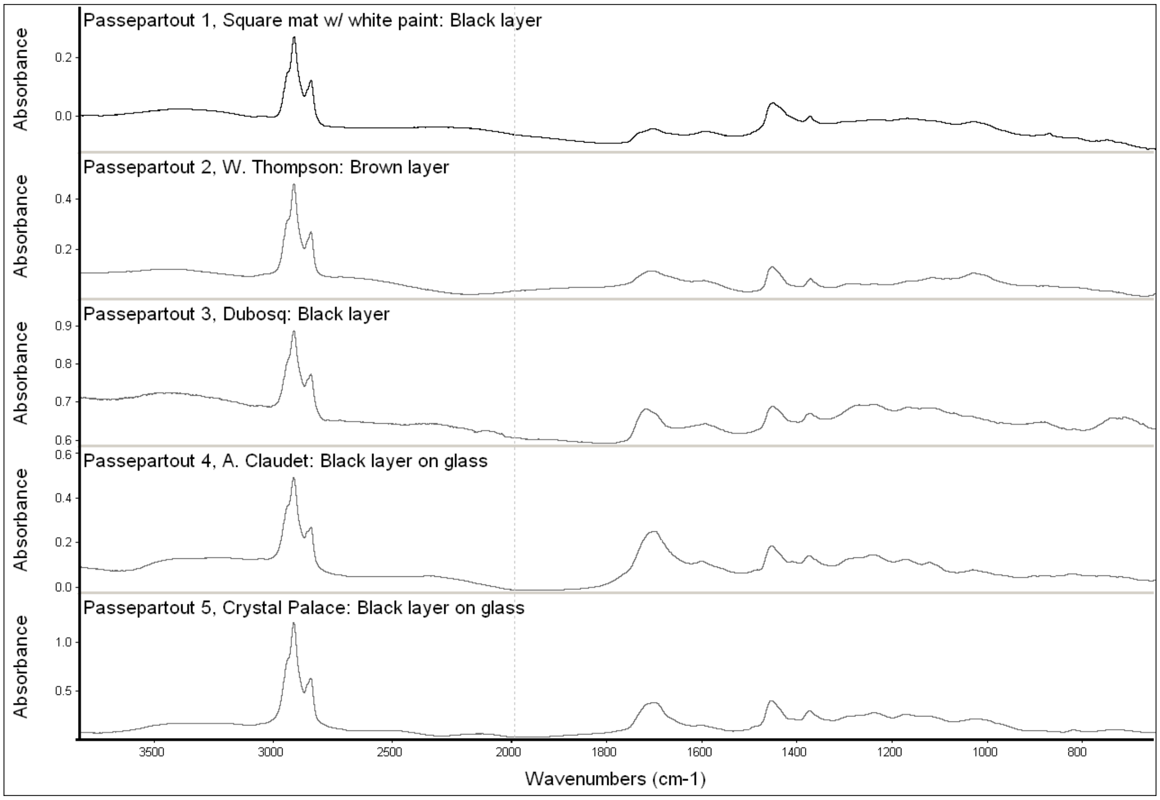

Passepartout 5, Crystal Palace: acetone extract area 2
*INR00236 Canada balsam, age 65 yrs+, Gettens, 60.54, PMA, tran
Log(1/R)
Absorbance
Wavenumbers (cm-1)

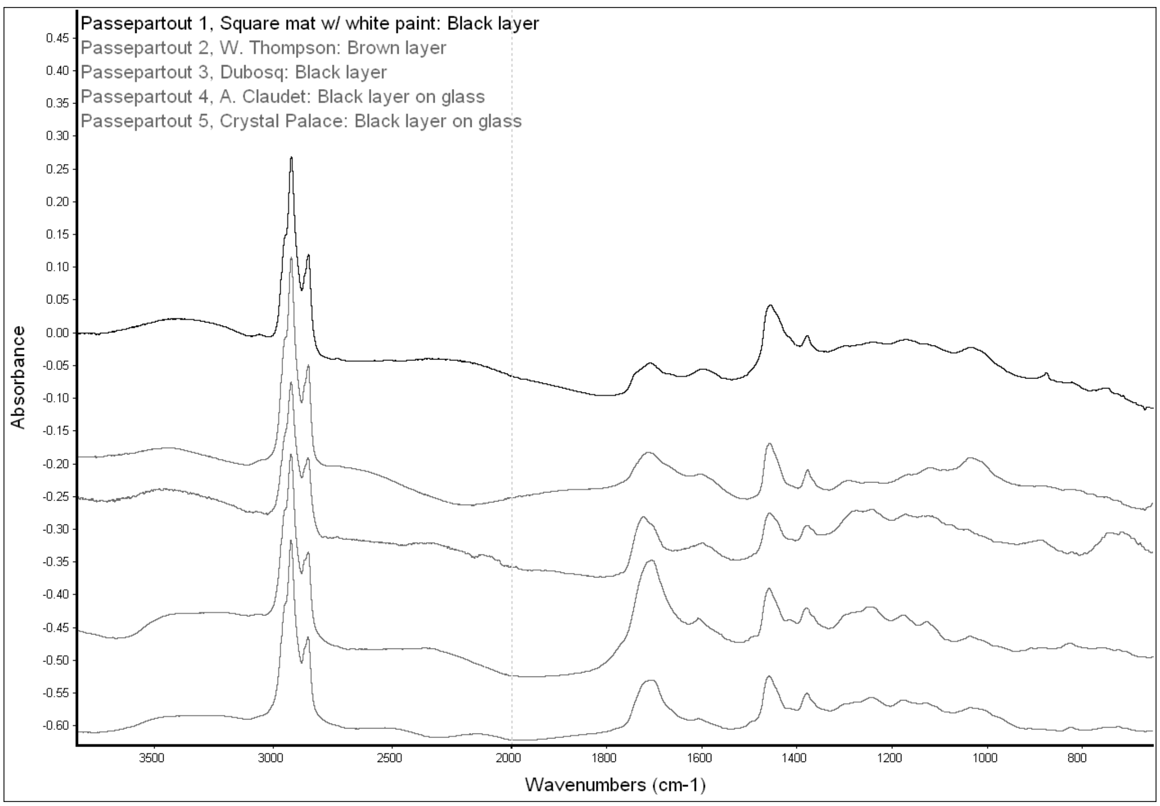
Appendix 4: FTIR Results on Paint on Stereo Daguerreotype Passepartouts from the Study Collection of Advanced Residency Program in Photograph Conservation



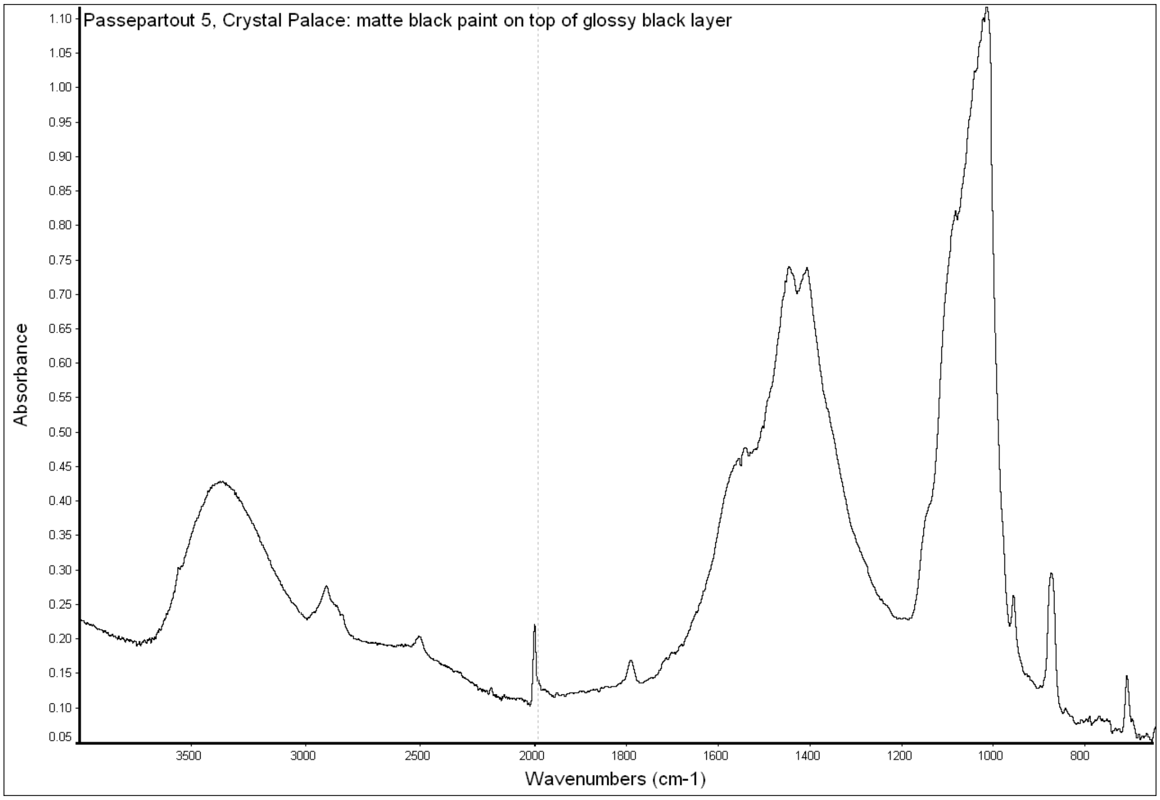


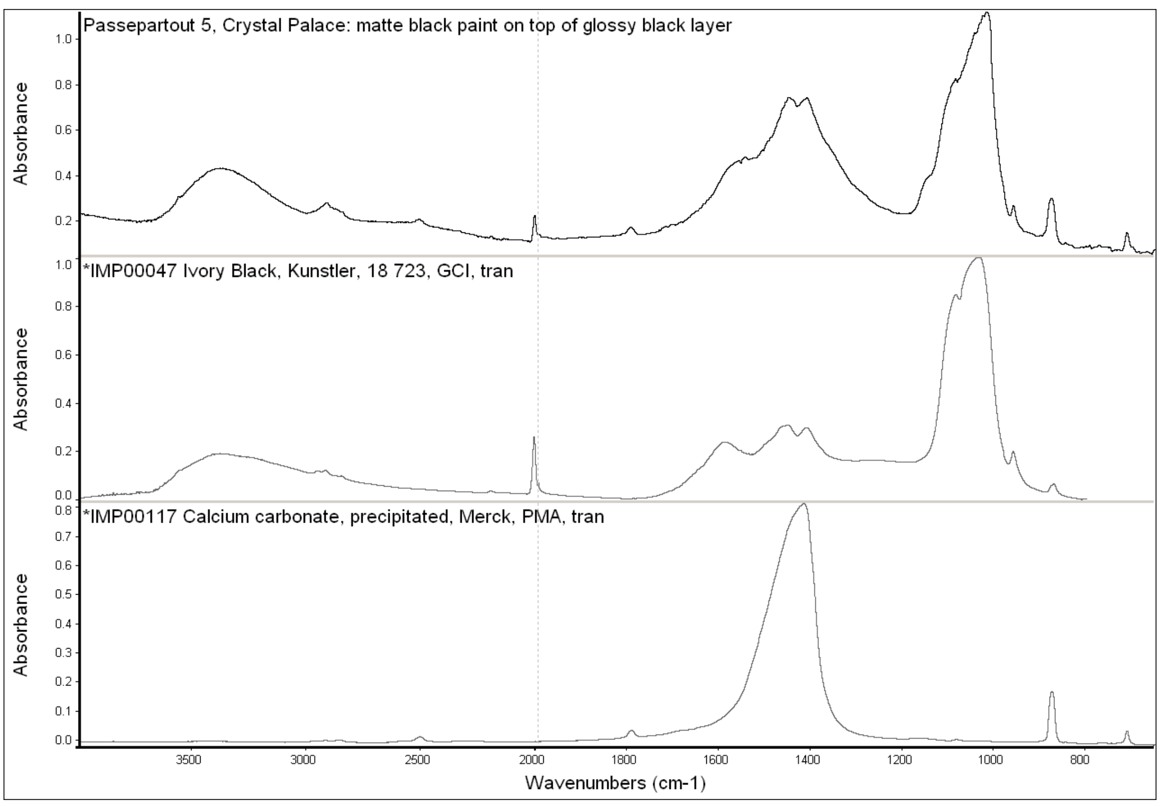
Appendix 4: FTIR Results on Paint on Stereo Daguerreotype Passepartouts from the Study Collection of Advanced Residency Program in Photograph Conservation





Appendix 4: FTIR Results on Paint on Stereo Daguerreotype Passepartouts from the Study Collection of Advanced Residency Program in Photograph Conservation





APPENDIX No. 5:

Photographic Activity Test of six Traditional and Contemporary Paints for Reverse Painted Glass Passepartout.

Test material (painted on 2mm window glass)

1. Casein paint; casein/borax/water/carbon black pigment
2. Asphalt paint; asphalt/turpentine/Canada balsam/ carbon black pigment
3. Oil paint; linseed oil/Japan Black/ carbon black pigment
4. Shellac paint; shellac/ ethanol/ oil of lavender/ carbon black pigment
5. Acrylic paint; Paraloid B-72/toluene/ carbon black pigment
6. Alkyd paint; Winton & Newton ivory black alkyd paint

See list of recipes at the end of the appendix.

Test results

Material	II	II P/F	Stain	S. P/F	Mottling	Overal
Casein paint; casein/borax/water/pigment	-0,54	Fail	0,10	Pass	Fail	Fail
Asphalt paint: asphalt/turpentine/Canada balsam/pigment	-1,18	Pass	0,39	Fail	Pass	Fail
Oil paint: linseed oil/Japan black/pigment	-1,15	Pass	0,36	Fail	Fail	Fail
Shellac; shellac/ethanol/oil of lavender/pigment	-1,21	Pass	0,21	Fail	Pass	Fail
Acrylic: Paraloid B-72/toluene/pigment	-1,15	Pass	0,12	Pass	Pass	Pass
Alkyd paint: Winton & Newton ivory black alkyd paint	-1,02	Pass	0,23	Fail	Pass	Fail
Image Interaction Control (II)	-1,04					
Upper Limit	-0,83					
Lower Limit	-1,25					
Stain Control	0,12					
Stain Limit	0,20					

Fig. 1: Photographic Activity Test results on painting for passepartout.

Fig. 1 lists the result from the P.A.T. The test materials are listed in the upper part of first column (from left). The lower part lists the density reading (-1,04) for the fading control (Image Interaction Control (II), and the upper (-0,83) and lower (-1,25) limits for the density value after P.A.T.

Next is listed the density reading (0,12) for the Stain control and the limit for density value (0,20) after P.A.T.

The fading detector results:
The second column from left (upper part) list the values from the density readings for the stain detectors after P.A.T, and the third column list the final results (fail or passed) of the test materials in regard to fading the colloidal silver detector. All the test materials, except for the casein paint passed the fading test.

The stain detector results:
The fourth column from left lists the results from the test of the effect of the paints on photographic paper, or more precisely, the yellowing of the gelatin layer in the photographic paper. Casein and Acrylic pass as the only materials in this test. It is interesting to note that the results for the staining test are the opposite of the fading test, except for acrylic, which passes this test as well as the fading test.

Mottling results:
The fifth column lists the results from a visual judgment of mottling of the colloidal silver detector film as well as the stain detector paper. Asphalt, Shellac, acrylic and alkyd pass the test, while casein and oil paint fail.

Overall results:
To pass the Photographic Activity Test, the test material has to pass all three categories: the fading, the staining and the mottling test. The only paint of the six tested to pass the P.A.T is the acrylic Paraloid B-72 paint.

Paint Recipes for the Passepartout Facsimiles

Casein

Casein is a milk protein used by painters as a binder for paints with similar characteristics as egg tempera. It has also been used as glue in cabinet making, and as a sizing in paper manufacturing (Wood et alt, 1926).

Casein is made by heating and acidifying skim milk, which will make the casein to separated into a mass. The mass is then dried into a powder form.

Casein adheres well to a number of surfaces including glass, and it dries matte with velvet like finish and becomes waterproof in twenty-four hours. It is however brittle and will become more so with age. The casein should be applied as thin a layer as necessary.

Adding a little drying oil, like linseed oil will reduce potential cracking (Saitzyk, 1987).

The following recipe for Borax[1] Casein was used:

Ingredients:
2 1/2 oz. (80g) Casein Powder
9 fl. oz. (250ml) cold water
1 oz. (32g) Crystalline Borax
9 fl. oz. (250ml) hot water

Directions:
Soak Casein powder in cold water in a covered container overnight.
Dissolve Borax Powder in hot water.
Add Borax Solution to the Casein Solution and stir.
Hydrolysis will start right away and must be completed before the next step (wait approx. 2 hours until no more swelled casein particles can be seen and the yellowish mass is evenly translucent)
Heat the solution in a double boiler until it becomes liquid (140° F).
Once the solution has cooled, it will return to a syrupy consistency and is ready to be used as a pigment binder.

As with all water-based media, the chosen pigment has to be wetted first. This is achieved by adding small amounts of water to the dry pigment. Then using a palette knife or spatula, the water is worked into the pigment until it retains a paste consistency. The casein solution is then added TO the color paste sparingly. The casein to pigment ratio cannot be described in exact proportions. The amount of pigment varies according to desired opacity. The amount of binder (casein solution) varies according to pigment. Before use, apply small amounts to a piece of cardboard to make sure that there is a sufficient amount of binder. If the pigment comes off after a gentle rubbing, add more casein solution. Once pigment and binder have been combined to desired consistency, the resulting paint can be thinned with water. (www.sinopia.com)

Shellac

Shellac is a reddish-orange resin, being secretion from the insect *Laccifer lacca* Kerr, scraped from several species of trees found in India and Indochina.
The color of the resin will change from a deep brown to a milky white hue, the more refined it gets.
Shellac will hydrolyzes and cross-links rapidly at elevated temperatures and at room temperatures (Elder et alt, 1997) and grows brittle.

[1] Borax; a carbonate, Na2B4O7-10H2O (hydrated borate), found in playa lakes and other evaporate deposits.

Ingredients:
1 part shellac (10g)
5 parts (50ml) denatured ethyl alcohol 95% (anhydrous if possible) (equal 47,5ml pure ethanol)

1924 recipe (Henley's 1924):
1 part shellac
4-5 parts alcohol

Directions:
Place the shellac in glass jar with plastic cap (metal will react with the shellac and darken the shellac). Add the alcohol and shake from time to time. Let it settle overnight. Decant the clear, slightly yellow liquid, which will be the stock solution. This will keep about 6 months (Gottsegen, 1987).
Add carbon black to obtain dark color.
Cracking of the layer can be slowed down by adding 10 – 11% oil of lavender (Osterman,), here used 4,8ml. Be aware of the percent alcohol when calculating the amount of lavender oil to use. The water will make a varnish bloom.

Acrylic paint

The acrylic emulsion is an acrylic resin emulsified with water, which will dry rapidly as the water evaporates and forms a relatively clear, tough, non-yellowing and water-resistant film.

The vehicle does not have to be a straight acrylic emulsion, but can be combination of different acrylic emulsion or acrylic and polyvinyl acetate (PVA) emulsion, forming so called co-polymers and ter-polymer (three polymers).

The making of acrylic emulsions requires utmost precision and the recipes might be adjusted according to the pigment used. The emulsions do all contain dispersants and surfactants (wetting agents for the pigments), de-foamers (inhibit foaming of the vehicle), preservatives, glycols (flexibility), thickeners (viscosity) and pH balancers.

Some pigments are not usable in acrylic emulsion, as they create an unstable paint. The appropriate black pigments to use in acrylic emulsions are Ivory, Mars or Iron oxide black. There is a relatively lower limit of the amount of pigment an acrylic emulsion can hold.

However, when dried the chroma of an acrylic emulsion can approach that of an oil paint.

Acrylics will adhere is many surfaces, but for plain support surfaces a acrylic emulsion "gesso" primer is most likely needed to give a better and evenly tooth.

The drying time can be prolonged with the use of water mist or a retarder-gel mixed into the emulsion. It is, however, possible to over-thin the binder. Too much retarder will also inhibit the drying of the film and produce a soft, easily damaged paint film.

Different proprietary brand names should not be mixed together, since they might be using slightly different formula (Gottsegen, 1987).

The following recipe is based on the acrylic Acryloid B-72 (25%), widely used in conservation practices.

Ingredients:
10g Acryloid B-72
40 ml acetone

Direction:
Mix in glass jar with Teflon lid in fume hood. Mix with magnetic stir and leave overnight.
This stock solution can be diluted with toluene if needed.
The pigment is added.

Oil paint

Ingredients:
80 ml linseed oil
28g carbon black
240 drops (7ml) Japan Dryer

Direction:
The linseed oil is mixed thoroughly with the pigment, followed by adding the Japan Dryer. Mixed well.

Asphalt varnish

Asphalt comes in two forms, a natural and an artificial form (known as "mineral caoutchouc"). The natural asphalt dries up much harder and is best for application on rigid materials.

The best solvent is the essential oil: oil of turpentine, which dissolves the asphalt almost completely and produces a quick-drying varnish. The dried film will increase in hardness, probably because of the effect of light (Henley's, 1924).

A recipe for black varnish recipe for backing Ambrotypes was used.

Ingredients:
150ml oil of turpentine
6g asphaltum
12g Canada balsam
(Towler, 1864)

Directions:
Mix the ingredients together and dissolve by gentle heat. Filter and preserve in a well-corked bottle.
Add more Canada balsam to get more velocity.
Add carbon black to obtain dark layer.

Alkyd paint

These paints can be looked upon as oils, since they are made by reacting a polybasic acid (Phthalic anhydride) with polyhydric alcohol (ethylene glycol or glycerin), and oil or a fatty acid (soybean, linseed, or safflower oils). Alkyds used for artist’s paints are also called “long-oil alkyds” because they have 60-17% oil content, depending on the type of oil. The solvent used for artist’s paints is mineral spirits.

Alkyd paints will dry more quickly than oil, usually overnight, where the use of different pigments determent the rates of drying. The paint is non-yellowing, if not linseed oil modified, and will resemble dried oil paint more than acrylic solution paints. The pigments appropriate for oils can also be used for alkyd paints (Gottsegen, 1987).

Ingredients:
Winton & Newton Alkyd paint, Ivory black

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