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Topics in Photographic Preservation, Volume 16.
Pages: 300-312
Compiler: Jessica Keister

Topics in Photographic Preservation is published biannually by the Photographic Materials Group (PMG) of the American Institute for Conservation (AIC). A membership benefit of the Photographic Materials Group, *Topics in Photographic Preservation* is primarily comprised of papers presented at PMG meetings and is intended to inform and educate conservation-related disciplines.

A Glimpse from the Dawn of Photography Investigation and Stabilization of an 1839 Daguerreotype at the Peabody Essex Museum

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Presented at the PMG session of the 2015 AIC Annual Meeting in Miami, Florida

Abstract

Few daguerreotypes survive from 1839, the year in which the process was officially announced by Daguerre. As such, all early daguerreotypes are important objects for historians, researchers, and conservators. Since no standard methodology for the examination and documentation of such early daguerreotypes exists, and since almost every known daguerreotype from that time has undergone restoration or conservation interventions, the analysis of the Peabody Essex Museum's 1839 daguerreotype of Pont Neuf constitutes a valuable case study.

The methodology included overall collaboration between conservation scientists, photograph historians and curators, digital imaging specialists and conservators from multiple institutions and private practices. The carefully planned stabilization project for this daguerreotype included thorough examination, documentation, analysis, and preservation.

Fig. 1 "Daguerre/Chevalier" daguerreotype from Peabody Essex Museum

The findings of this project will be shared in this article. For example, non-destructive x-ray florescence analysis showed very low levels of mercury with no gold present, consistent with a very early daguerreotype. Preliminary non-destructive Raman spectroscopy indicated that the plate was extremely sensitive to even the lowest laser power so Raman spectroscopy was not pursued further. This sensitivity is attributed to the lack of gilding and age of the plate and may indicate an increased sensitivity to light.

Introduction

In 2008, the daguerreotype, an exterior view of Paris at Pont Neuf and part of the Peabody Essex Museum (PEM) collection, came to the attention of Dr. Phillip Prodger, former Curator of Photography at PEM. An original label on the backing of the mount indicates the object was purchased from Vincent Chevalier's shop on the Quai d'Horloge in Paris, from where it appears to have been taken. Period inscriptions date the work to 1839.

Not many daguerreotypes survive from 1839, the year in which Daguerre officially announced his invention to the French Académie des Sciences. Consequently, all early daguerreotypes are important objects for historians, researchers, and conservators.

The daguerreotype was discovered in a passe-partout wooden frame with a back door pushing the plate into a cut-out window. The plate was held in place by two pieces of an adhesive material that had failed so that the plate was loose. After initial inspection, it was agreed that an improved housing would be a priority outcome for any potential treatment. Elena Bulat was retained by PEM as a contract project conservator. After preliminary examination, Bulat contacted Grant Romer, who has great experience with known daguerreotypes of this period and the results of different restoration and conservation initiatives. Grant indicated that some works have changed dramatically as a result of treatments that were once common but no longer used in our field, while others that appears are known only from written records and may not survive. Since little substantive documentation exists for those daguerreotypes that have been treated, Romer suggested the PEM daguerreotype could provide an opportunity to perform instrumental analysis in order to learn as much as possible.

Fig. 2. Grant Romer, daguerreotype by Irving Pobboravsky

According to a 1956 survey by Helmut and Alison Gernsheim, the location of only ten daguerreotypes from 1838-9 is known. Two are listed as lost; four were destroyed in the Second World War. The location of another sixteen (one of which is listed as a view of Pont-Neuf) is listed as "unknown" in the survey, raising the intriguing possibility that the PEM daguerreotype is one of the missing objects on the Gernsheim list. Such discoveries are not unprecedented; for example, three daguerreotypes from 1839 that the Gernsheims identified as made by Daguerre from the Russian Academy of Art Library have recently resurfaced.

Over the past thirty years or so, photograph conservation philosophy has shifted towards preventive actions and more thorough documentation followed by an object's condition monitoring particularly with regard to daguerreotypes. Accordingly, this project represented a unique chance to learn about early daguerreotypes and share this knowledge with others.

Bulat began talking with other photograph conservators including Barbara Brown, Brenda Bernier, Jiuan Jiuan Chen, Paul Messier, Penley Knipe, and Ralph Wiegandt, each of whom shared their knowledge and useful thoughts on how to better plan this project. The project planning phase took several months.

The Project

This project was a truly collaborative undertaking. The following treatment plan was the result of a collaboration that encompassed the museum administration, a curator, photograph and paper conservators and technicians, conservation scientists, and professional photographers:

1. Detailed physical examination of the daguerreotype's housing and the plate

2. Building a conservation history of the daguerreotype
3. Photo-documenting the daguerreotype and its original housing with all available imaging methods: ambient light, specular light, UV and infrared radiation as well under magnification.

4. Instrumental analysis: XRF of the plate and the housing, Raman spectroscopy of the plate, FTIR of the glue used to hold the plate inside of the frame, paper fibers analysis of the window mat and other paper elements of the housing.

5. Conservation activities: surface cleaning of the daguerreotype plate with a manual air blower, rehousing of the plate and the plate package, creating preservation and storage housing for the object.

The execution of this plan required allocation of funding in the museum budget. Elena Bulat presented this ambitious treatment plan in a meeting with museum administration. It was challenging to explain how project planning, finding the right professional services, examination, documentation, imaging, analysis and rehousing are of direct benefit to the preservation of this object. The proposal received strong support from curator Phillip Prodger, and the proposal was accepted and approved.

Sufficient funding was obtained to cover most of the proposed preservation activities for this daguerreotype.

The first step was to collect all existing information about this unique daguerreotype.

There is no attribution for the object; however, there is a label from Vincent Chevalier's studio and the date 1839 written in pencil on the plate package backing. Since the daguerreotype of Pont Neuf could have been made by either Daguerre or Chevalier, in our project this daguerreotype was listed as "Chevalier/Daguerre 1839 daguerreotype". Prodger has since proposed that the object might be attributed to Chevalier's assistant Pierre-Ambroise Richebourg (1810-75). However, attribution was not the goal of this project; rather, it was to gather as much information as possible for future study without opening the plate package again.

Provenance

John Burley donated the daguerreotype "Pont Neuf" to PEM in the mid-19th century. Included in the May 12, 1858 annual meeting of the Essex Institute (which would later join the Peabody Museum to form the Peabody Essex) is the following entry: "John Burley, Daguerreotype view

of Paris taken from on top of the bridge, 1839 (one of the first pictures taken by that method after its discovery)". The donation is listed under the category of "FA" (fine art).

John Burley is listed in the Salem Directory as "Burley, John, agent, Lead Co., South Salem, 38 Harbor Street". He resided at this address until 1850, when he is listed as moving to 4 Lynde Street, Salem, MA. His listing stops in 1859.

Conservation History

A conservation record from the Northeast Document Conservation Center (NEDCC) dated May 6, 1988, notes the following:

> The photograph was surface cleaned with ammonia and water to reduce grime.
>
> The cover glass was cleaned. The window mat was cleaned, removing residual adhesives. The photograph was refitted in its frame, sealing the cover glass to the back board with Filmoplast P-90 tape.
>
> Note: The two left corners of the daguerreotype plate had plate marks. At the top left was an asterisk-type mark; at the bottom left was “40”.

PEM and NEDCC provided the reports from this conservation event. Unfortunately, we were not able to locate the accompanying photo-documentation.

Professional Ccourtesy

Since PEM does not have an analytical lab in-house, and was at that time undergoing renovations that affected the controlled environment in the conservation lab, the daguerreotype had to be moved elsewhere for analysis, imaging, and rehousing.

Penley Knipe, head of the paper conservation lab at the Straus Center for Conservation and Technical Studies, offered the use of their analytical facilities and lab for this project.

Imaging

Fine Arts Express transferred the daguerreotype from PEM to the Harvard College Library Imaging Services and then to the Straus Center for Conservation and Technical Studies and back to PEM.

The first stop was at the Harvard College Library Imaging Services (IS) for photo-documentation of the bare plate and original housing. It is not easy to capture by digital camera everything seen on the daguerreotype plate with the naked eye.

Weissman Preservation Center and Harvard College Imaging Services have established protocols for photographing daguerreotypes for conservation documentation. Bob Zink, a photographer

from IS, has extensive experience with photographing daguerreotypes, and arranged to document the daguerreotype as it underwent analysis.

1. The daguerreotype was photographed with low light using a black background.

Fig. 3. Plate, recto

Fig. 4. Plate, verso

2. To avoid any abrasion of the extremely sensitive surface of the daguerreotype's front during the imaging of the back, a special frame was constructed. The frame was made of cardboard and wrapped with Teflon tape, a technique developed at George Eastman House (GEH).

3. We rotated the daguerreotype 90 degrees to the light source to capture polishing marks.

4. Imaging in specular light helped to show tarnishing and other staining on the plate that were not possible to document otherwise.

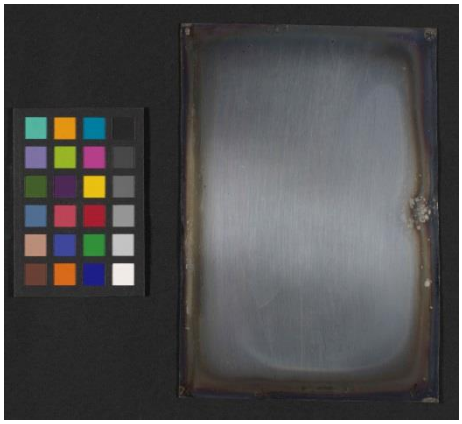

Fig. 5. Polishing marks

Fig. 6. Plate, specular light

Analysis

After imaging the daguerreotype was temporary bound and transferred to the Straus Center for Conservation and Technical Studies, Harvard Art Museums. Katherine Eremin performed XRF, RAMAN and FTIR analysis at the Straus analytical laboratory.

The daguerreotype was analyzed by non-destructive x-ray florescence (XRF) in fourteen areas using the Bruker Artax. The system at the Harvard Art Museums has a 70 micron spot size and a molybdenum tube. A thin copper filter and long count times were used to give improved

detection of low levels of gold and mercury. A camera allows the exact area analyzed to be identified and recorded if desired.

Analysis showed that the main body of the daguerreotype contained high levels of copper and silver with only very low levels of mercury. No gold was detected.

There is considerable sulfur detected in the darkened areas around the edges of the daguerreotype, particularly at the lower right corner, presumably in the form of silver sulfide. Although it was thought that chloride might be responsible for the white haze in other areas, such as the sky, no chlorine was detected with the XRF. No other halides (such as bromine or iodine) were detected, although the bromine Ka peak overlaps with the mercury Lb peak such that low levels of bromine could be hidden by low levels of mercury.

Area	Visual appearance	Elements	*Conditions*
1	Highlight	Ag, Cu, Pb; trace Hg with filter	*200s, He; 1000s, He, filter,*
2	White haze in sky	Ag, Cu, Pb	*200s, He*
3	Highlight	Ag, Cu, Pb	*200s, He*
4		Ag, Cu, Pb	*200s, He*
5		Ag, Cu, Pb; S at 500s	*200s, He; 500s, He*
6	Highlight	Ag, Cu, Pb; trace Hg with filter	*500s, He; 3000s, He, filter*
7		Ag, Cu, Pb	*500s, He*
8	Dark	Ag, Cu, Pb, S	*500s, He*
9	Dark (reddish tint)	Ag, Cu, Pb, S	*500s, He*
10	Black	Ag, Cu, Pb, S	*500s, He*
11	White haze in sky	Ag, Cu, Pb	*500s, He*
12	White haze in sky	Ag, Cu, Pb, trace Hg	*1000s, He, filter*
13	Background	Ag, Cu, Pb, trace Hg	*1000s, He, filter*
14		Ag, Cu, Pb, trace Hg	*3000s, He, filter*

XRF analysis was also undertaken on the mounting frame and window mat. The mat had high levels of calcium, iron and lead, and trace titanium. The blue mounting frame/window mat had high levels of calcium, iron, copper, and lead with possible cobalt. Trace mercury was detected in the mat using the Cu filter.

XRF analysis of the glass indicated high levels of silicon, calcium, and arsenic with trace potassium, titanium, iron, rubidium, strontium and zirconium. This is a typical soda lime glass and could date to the 19th or 20th century. XRF spectra from the two sides were identical.

Analytical Conclusion

XRF indicated that the object was a non-gilded daguerreotype with extremely low levels of mercury.

FTIR analysis of the material found on the plate's corners and inside of the fame identified beeswax.

Preliminary non-destructive Raman spectroscopy (Bruker Senterra system was used) showed that the plate was extremely sensitive to even the lowest laser power and Raman spectroscopy was not pursued further. The sensitivity is attributed to the lack of gilding and age of the plate and may indicate an increased sensitivity to light.

The reason for high sensitivity of the daguerreotype image to laser light is unknown and needs to be researched, but this is important information to keep in mind about ungilded early daguerreotypes generally.

Examination and Documentation with Longwave and Shortwave Ultraviolet Radiation

The daguerreotype's housing was examined and photographed with longwave ultraviolet radiation (UVA). The housing components exhibit typical fluorescence of aged organic materials. There is no distinctive fluorescence neither flagging condition concern nor helping with identification.

Fig. 7. Original window mat in UVA

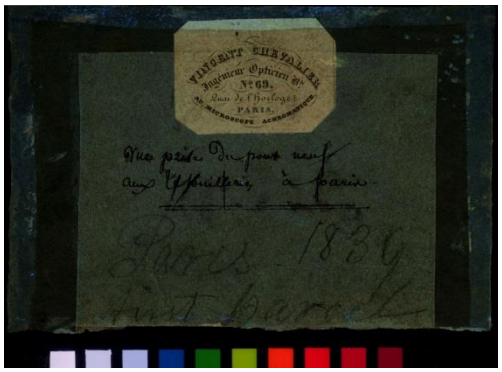

Fig. 8. Original backing in UVA

The bare plate was examined and photographed with longwave and shortwave ultraviolet radiation (UVC). UVA reveals only a few speckles of dust or debris on the image side and a few small spots of adhesive residues on the verso. Under UVC, the image side did not have the typical green-yellow fluorescence of copper cyanide compound. The verso did not fluoresce overall except for small areas around the margin with dull yellow fluorescent color. It is still unclear what these fluorescent materials are.

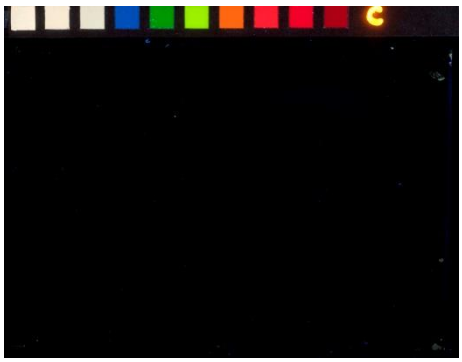

Fig. 9. Plate, recto in UVC

Fig. 10. Plate, verso in UVC

Overall, the lack of florescence is consistent with a cleaned 19th century daguerreotype. Based on a lack of copper corrosion on the image side, there is no immediate concern about corrosion / stability of the silver surface

Micro Imaging

Photomicrographs were taken by Elena Bulat at the Straus Center. Different magnifications were used to provide close-up images of the hallmarks and different physical and chemical deterioration visible on the surface of the daguerreotype.

Fig. 11. Hallmark-1

Fig. 12. Hallmark-2

Paper Fiber Analysis

Debora Mayer performed paper fibers analysis of original housing paper elements. To aid in dating the materials used to assemble the frame package, samples from the window mat and blue backing material were collected for analysis. The samples were prepared with indicator stains and examined with polarizing light microscopy. The sample from the window mat contained bast fibers (probably flax) with a possible trace amount of cotton fibers. The fibers were extremely short and broken, a result of manufacture and/or subsequent deterioration. The condition of the fibers made identification of some fragments difficult and also explained the brittleness of the mat. The sample from the backing paper included a mixture of cotton fibers (blue, red and undyed fibers) with a trace amount of bast fibers. There were no wood fibers detected in either

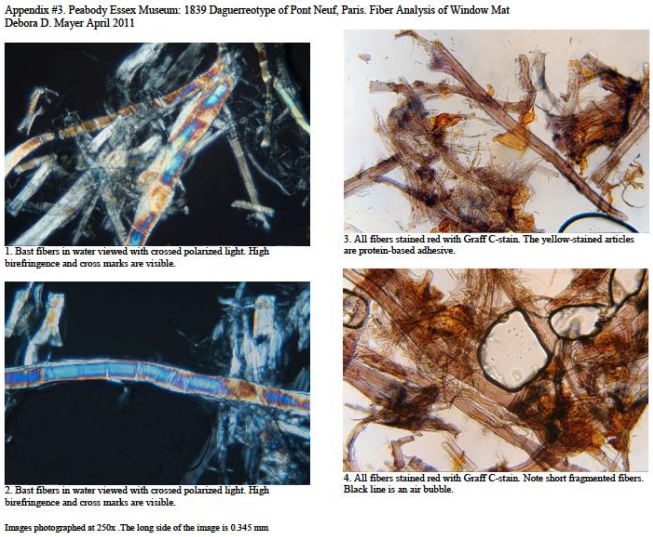

Fig. 13.

sample. The presence of bast and cotton fibers in the papers and the absence of any wood fibers (in use post mid nineteenth century) support the premise that the housing is original to the period of the daguerreotype.

Physical Examination of the Plate:

Format: L-11.2cm, T-16.4cm, R-11.3cm, B-16.3cm
Plate profile: flat
Thickness of the plate: 0.73mm
Weight: 97.83g
Polishing marks: horizontal
Hallmarks: there are two hallmarks on the plate: asterisk flower type mark (TL) and #40 (BL)
Copper back has two vertical lines (probably process related).

Condition of the Daguerreotype Plate

There are scratches on the edges of the plate, abrasions, accretions, etching, and pieces of wax on the right edge. The interference color tarnish follows the shape of the window opening due to the exposure to air pollutants, humidity and wood acidity. There is a milky haze residue on the surface of the plate. Another white deposit located on the plate's perimeter (more on the right side) looks slightly different, with thicker coverage and more consistency. Different corrosion stains were found on the daguerreotype - many have a white halo around them and some are a dark brown color. There are also residual stains from solvents. The top edge of the plate is covered with blue tarnish and has a large area of etched surface with silver exfoliation. The copper back of the plate does not have noticeable signs of active corrosion accept in small areas.

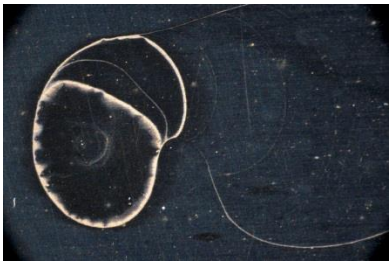

Fig. 14. Tarnish, micrograph, 30x objective

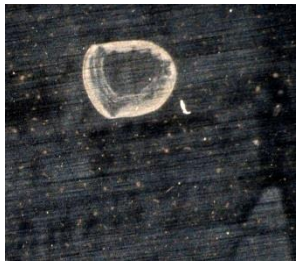

Fig. 15. Tarnish, micrograph, 20x objective

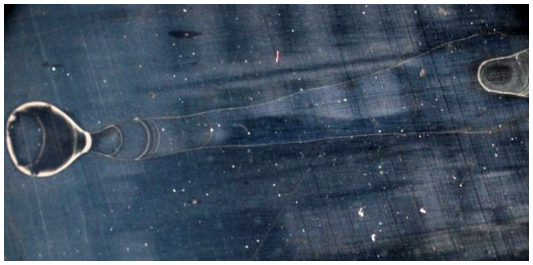

Fig. 16. Tarnish, micrograph, 30x objective

Original Housing

Originally, the daguerreotype's package consisted of a wooden block (6 mm thick) with cutout in the middle opening (slightly larger than the daguerreotype size and deeper than the daguerreotype's thickness). The daguerreotype plate was inside the cutout and pushed to the edges with a backing door of the wooden structure. Initially, pieces of beeswax and pressure from the backing were holding the plate in place. The wax adhesion failed over time and the plate was loose and moving inside of the wood cutout. The verso of the frame was conditioned and photographed. The original backing paper is a bright blue Fabriano wove paper. It is on this backing paper that the Vincent Chevalier label, the iron gall notation "Vue du pont neuf aux

Expuilleries a paris", the graphite notation "Paris 1839, first parcel" and John Burley gift to PEM are located. This wooden backing board was designed to hold the daguerreotype in place within the frame. It measures 7 x 9 inches, with a 4 1/2 x 6 3/4 cut out (including a front facing 1/4 inch rabbit.

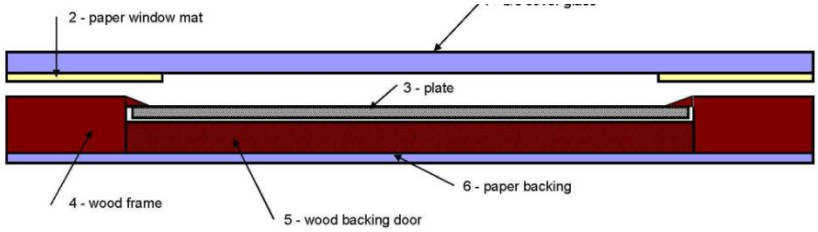

Fig. 17. Original housing schematic

Conservation treatment of paper elements of the original housing performed by Kathryn Carey included mechanically removing five layers of paper and self-adhesive tape that covered the blue backing paper and the edges of the wooden backing board. These layers extended two inches along the margins of the backing board and held the daguerreotype plate in place. After tape and paper were removed the blue Fabriano (note the original bright blue paper is visible where it was protected by the paper tape) was consolidated with Japanese wheat starch paste. All the paper layers and self-adhesive tape were retained.

Due to poor condition of the original paper window mat, a new paper window mat (a facsimile) was made for the daguerreotype. “Griffen Mill”, an archival handmade western paper (120g), was used for the facsimile. A French style ink outline was beautifully recreated by Barbara Owens at the Straus Conservation Center.

The original paper window mat and wooden structure were rehoused and stored next to the daguerreotype.

Surface cleaning and rehousing of the plate package

After imaging and analysis, the plate was surface cleaned with a manual air- blower. The historic cover glass (not original) was replaced by the same thickness (2mm) borosilicate glass (i.e., Pyrex glass). Borosilicate glass is optically clear and believed to be the most chemically stable glass currently available.

Howard Glass Company cut a perfectly measured sink mat made of 2 mm thick borosilicate glass cutout. A one piece Mylar Z tray was used to secure the plate inside the glass sink mat. The glass cutout is the same thickness as the Mylar Z package with the plate inside, so the daguerreotype plate is nested securely without moving inside and having any direct contact to the cover glass. (The borosilicate structure with cutout window was developed by Bulat, and proved to be a rigid and stable support for daguerreotype plates).

An additional piece of 2mm borosilicate glass was used as backing, so the copper back is visible.

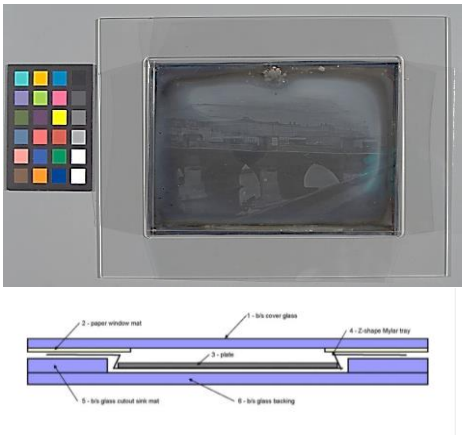
Fig. 18-19. Borosilicate glass housing

Plate Package

For the new plate package Filmoplast P-90 (two layers) was used to bind all elements together. To provide a more airtight environment and to avoid tape contact with edges of glass structure and paper mat, a Teflon tape was applied between the edge of the plate package and the binding tape. The top layer of the Filmoplast binding was toned with gold Mica powder mixed with acrylic base.

Fig. 20. New housing

Preservation housing

For the bound daguerreotype plate package, a secondary housing was designed by Jiuan Jiuan Chen and constructed by Mark Beeman. This design incorporated a strip of Corrosion Intercept® fitted snugly between bound plate package and the secondary housing to act as a sacrificial material to prevent corrosive gas from entering the plate package.
http://paulmessier.com/pm/pdf/papers/housing_bare_plate_dags_jj_chen_oct_2011.pdf

Storage housing

Additional storage housing was made by Zach Long of archival materials to provide an extra layer of protection and to accommodate the original and historic elements next to the daguerreotype.

Project evaluation

The materials chosen for rehousing are archival, approved by ISO standards and most of them passed PAT. It is clear that paper enclosures are not ideal for daguerreotypes, but the current housing offers the most appropriate solution at this time.

All conservation procedures were undertaken at Straus Center for Conservation with environmental conditions as follows: lab - 49% RH and 69F. Detailed report on the project including images, results and interpretation of the analysis provided to PEM.

Fig. 21. The daguerreotype in the preservation housing

Recommendations

The object should continue to be regularly monitored, as the plate package was opened (possibly introducing uncontrolled elements into the package). It will be necessary to check its condition twice a year. With the first signs of visual change in condition, a photograph conservator should

be called. Caution should be used when handling the object. It is advised that this daguerreotype should not be exhibited. If exhibition is proposed, the plans for exhibiting and transporting the daguerreotype should be closely monitored. The exhibition length should be a maximum of three months. Since some daguerreotypes are extremely light-sensitive, the light level during exhibition is very important. It should be no more than 5- 7 foot candles. It is essential that the object be kept in a controlled environment (RH 30-40%, T-68 F and under).

When more funding becomes available, anoxic housing should be considered for the daguerreotype.

Conclusion

Since the knowledge about daguerreotypes created prior to 1840 is limited, it is difficult to predict how this particular daguerreotype will behave in the future. According to recent research, close examination of daguerreotype surfaces shows a constantly changing dynamic of the micro-climate inside a sealed package. As a result, visible changes may be unavoidable. During the preservation project in 2011, the object was thoroughly examined, documented, and analyzed with the standard examination, imaging, and analytic techniques for daguerreotypes. A monitoring baseline was set in 2011 for this daguerreotype's condition monitoring.

Acknowledgements

These authors acknowledge with gratitude Lynda Hartigan, The James B. and Mary Lou Hawkes Chief Curator, (PEM) and William Phippen, Director of Museum Collection Services, (PEM) for their assistance with this project. We also would like to thank Penley Knipe, and Henry Lie from the Straus Center for Conservation and Technical Studies for hosting this project in the Straus Center lab. This project would not have been possible without professional support of our colleagues: Barbara Brown, Brenda Bernier, Gary Albright, Grant Romer, Monique Fisher, Paul Messier and Ralph Wiegandt.

Special thanks to Bob Zink and David Remington for creating very high quality digital images of the daguerreotype plate and all elements of its original housing, Barbara Owens for making a paper window mat facsimile, Mark Beeman, and Zack Long for work on the new preservation and storage housings for this unique daguerreotype.

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