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Lighten Up:
Enhancing the Visitor Experience

ABSTRACT

The Smithsonian's National Postal Museum (NPM) has over 6 million objects in its collection and the vast majority is paper based—fragile, light sensitive and small. Over the years, the biggest complaint we have received from our loyal fan base, stamp collectors, is that so much of the collection is inaccessible to them on exhibition. From the day we opened in 1993, collectors have asked for more philatelic related artifacts to be displayed and the general public regularly asks to see the famous 1918 Inverted Jenny stamp. As a conservator I want to protect the collection from light damage. As a visitor I want to be able to enjoy these rare objects in a space that enhances the museum experience.

With this in mind, beginning with the design of the new William H. Gross Stamp Gallery (which opened in September 2013), NPM focused on how to create a magical space for visitors to engage in a topic, show our most valuable artifacts and still protect them for future generations. NPM addressed some of these concerns by approaching the problem in 3 distinct areas:

- Museum envelope improvements
- Gallery specific solutions
- Object level protection

In the effort to control light damage, we developed four specific tactics based on exhibit and case furniture design and new technological developments within the lighting industry. The strategies include: limiting light exposure through historic windows by embedding images on an interior glass framework; designing and creating vertical pullout display furniture; utilizing lift-up door cases and using SmartGlass™ technology.

In conjunction with UNESCO's Year of Light, I would like to present the decision making process that created the various solutions, the conservation concerns addressed during the entire process and the visitor perspective on the results that were devised. Rather than being afraid of light, it is time to explore other options.

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Fig. 1. Smithsonian's National Postal Museum (NPM).

INTRODUCTION

The National Postal Museum is one of the Smithsonian's "off the Mall" museums, located on Capitol Hill next to Union Station. (fig. 1) The Postal Square building was designed by the architect Daniel Burnham and opened in 1914. It served as the hub of postal operations for District of Columbia for approximately 70 years when mail was transported across the country on trains.

In the late 1980's the building was renovated and repurposed as a government office building. As part of the renovation project the central lower level and atrium opened in 1993 as the Smithsonian's National Postal Museum. The building houses not only the museum and the Dorothy I. Height Post Office but also the U.S. Bureau of Labor Statistics, Architect of the Capitol and formerly a Capitol City Brewery restaurant. Visitors entered through the Historic

Fig. 2. Museum entrance in 1993.

Fig. 3. Every stamp tells a story.

Lobby to an escalator that took you to the lower level atrium where the museum was located. (fig. 2)

In 2007 the museum had the opportunity to expand the museum floor plan by 18,000 square feet in the space vacated by the restaurant on the upper level and off the Historic Lobby.

The Mission Statement for this expansion project was:

> The Gross Gallery will provide innovative and engaging access to stamps and mail. Its centerpiece will be the National Stamp Collection, featuring stamps and rarities from the NPM collection. It will tell the story of stamp design, production, and use, in ways that will engage and inspire casual and specialized philatelists as well as non-collectors. Other galleries will display permanent, rotating and educational exhibits that tell philatelic stories in the context of themes relevant to visitors.

UNESCO YEAR OF LIGHT

For the UNESCO Year of Light I would like to present the solutions to some of the conservation challenges brought to light in designing the new galleries. At first it seemed a stretch to think that the global perspective presented by UNESCO could be related to the preservation issues of light for those of us concerned with historic artifacts. However, of the 8 goals for the Year of Light—2 of them relate to those of us in the conservation profession.

- Highlight the importance of research both into the fundamental science of light and its applications, and promote careers in science in these fields.
- Highlight and explain the intimate link between light and art and culture, enhancing the role of optical technology to preserve cultural heritage. (UNESCO 2014)

With the Gross Stamp Gallery expansion, the final approach included some very basic preservation practices as well as exploring the new optical technology now available to museums. Rather than being afraid of light, the team was interested in exploring display options for light sensitive historic artifacts within a historic structure "bathed' in light on a rather permanent basis.

PHILATELY

Since I had no idea what philately was back in 1992 when I started work at the Postal Museum, and since most of the staff I have hired over the years have not either, I decided to provide you with this definition from *Stamp Collecting for Dummies*: "PHILATELY Taken from the Greek philos, loving + atelieia, exemption from (further) tax, taken as the equivalent of postage paid; the collection and study of postage stamps, postmarks, stamped envelopes, and so on."(Sine 2001)

Serious collectors are Philatelists and artifacts are Philatelic objects.

Welcome to the World of Stamps where every stamps tells a story. (fig. 3)

WORKING FROM THE OUTSIDE IN

The planning for the new galleries began in 2006 with input from the entire Postal Museum staff, the NPM Council of Philatelist (COP) and a feasibility study by the Smith Group. In the project plan distributed to all stakeholders and exhibit design prospects was this important line: "The gallery's layout and design will reflect the beauty of the space including the exterior exposure of the windows facing north, and architecturally, the most significant, side of the Postal Square Building" (Ganz and Piazza 2009, 9). Also, "The museum wishes to avoid creating excessively low light levels that might adversely influence the visitor experience" (Ganz and Piazza 2009, 10).

Not easy goals for a conservator who is concerned with the long-term care of the artifacts.

Figure 4 shows the general plan for the museum – the upper portion of the plan is the original footprint of the museum and the lower is the Gross Stamp Gallery and

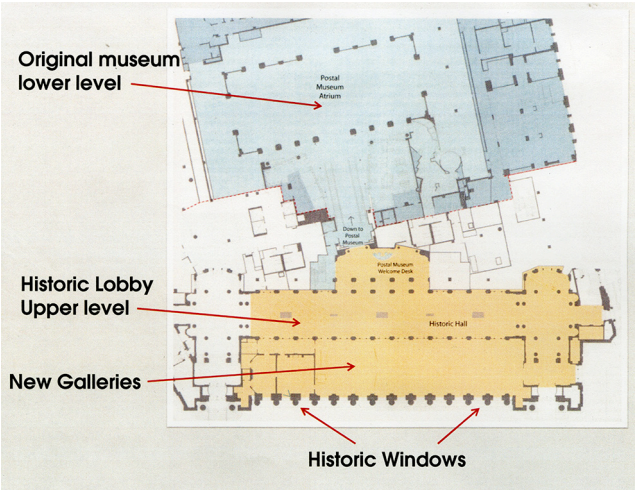


Fig. 4. Layout of the 2 levels for the NPM galleries.

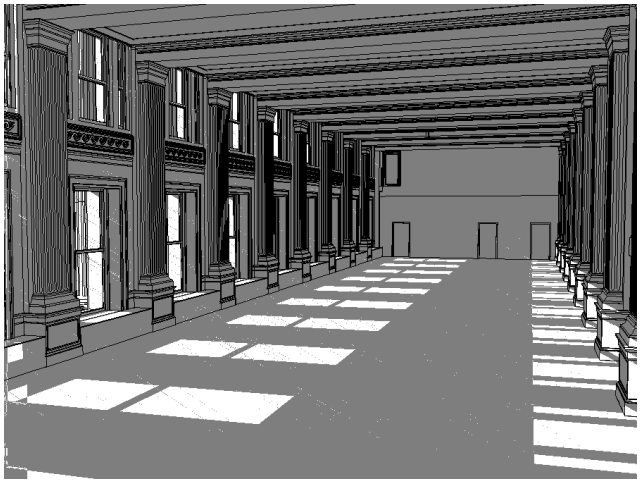


Fig. 5. Light study for new galleries, winter solstice at noon.

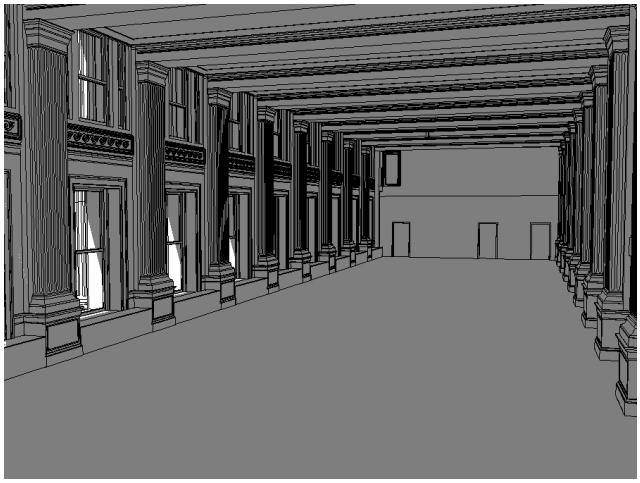


Fig. 6. Summer solstice at noon.

Fig. 7. Constructing barrier walls to block sunlight.

the Historic Lobby. The south facing windows face onto Massachusetts Ave—facing the north side of the Capitol. It is the historic two-story windows that create the first major challenge for the control of light in the galleries. (Fig 4)

HISTORIC EXTERIOR WINDOWS

The museum was lucky to have enough time before completion of construction plans to conduct a year-long, solar tracking and light penetration study which would provide the data required for designing the lighting control strategies. We tracked by seasons, starting with the period of greatest sunlight penetration which was late October to the end of January when afternoon sunlight is aligned to shine directly into the galleries. (fig. 5)(fig. 6) This information was used to determine where barrier walls would be constructed relative to the location of the most-light sensitive artifacts. (fig. 7)

Suzanne Keene stated in her book, *Managing Conservation in Museums*: "Conservators and museum managers still need to create the political will to take greater account of the long-term functions of museums, to balance that for the more obvious short-term benefits of display and exhibition and interaction with audiences" (Keene 2002, 248).

As a conservator, the challenge was to embrace the goals for the project yet work with the curators, exhibit designers and fabricators to create a space that would also protect the artifacts. Embracing the team approach by listening, building consensus, we found solutions that would benefit the entire project and most of all, our visitors. I was lucky that the team saw the importance of ensuring that conservation was part of these discussions from the beginning of the project.

In the initial decision making process, the team started with the museum envelope. Research on the visitor experience has shown that a view to the outside improves their experience within the galleries and this includes an allowance for a connection to some external light. Angela Matchica's article *The Fine Art of Museum Lighting*, states: "Because of the positive emotional, physical and energy impacts daylight has to offer, it has become standard to incorporate it into building designs. Museums are no exception—daylight, or any connection with outdoors, contributes to prolonged visitor stays. It also provides a time of day reference and a natural place for gathering, easing fatigue and over exposure during visits" (Matchica, 2013, P 46).

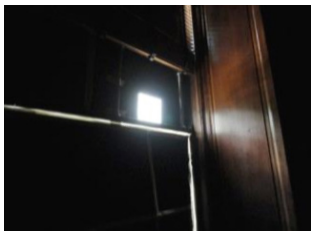
For the museum there was the need to protect objects but also a need to respect the historic structure, so what followed were numerous discussions with the designers, architects, security, curators and conservation staff as to what would be possible.

The windows are single pane old glass from 1914 and had to be maintained as is. (fig. 8) Besides the issue of light, there were the security concerns of not having adequate theft protection and the environmental concerns of maintaining the temperature and humidity levels. Changing the exterior windows was not an option. The solution was to create a new interior set of windows that would open to the inside and that would provide the required security and environmental protections.

But what about the light issue? The team played with various options from blacking them out to dark shades but it did not seem to fit into the goal of creating a unique visitor experience. Could stamp images be embedded between laminated glasses and would that block enough of the light?

A sample of the stamp image embedded in glass was created and tests were conducted to see how much light it could filter. (fig. 9) Available Light, our lighting designers, created a test using a single aperture window in one of the rooms. (fig. 10) With nothing blocking the aperture, the reading was 3.25 foot candles (FC) according to his report (Barnwell, 2010). With the translucent stamp graphic placed over the aperture the reading fell to 0.7 FC and when a MechoSystems shadecoth (EcoVeil Screen 3% open) was added the reading fell to 0.1 FC. This test was conducted in the summer months when direct light is not strong and it was conducted in a vacuum—not in the scenario of full banks of windows. However, this did give us enough information to know that a graphic image embedded in the window would not be enough filtration and additional protection, such as shades, would be required.

Fig. 8. South facing historic windows.



LEFT TO RIGHT

Fig. 9. Sample window with embedded stamp image.

Fig. 10. Light testing aperture for sample window.

Next, this presented an opportunity to enliven the windows beyond the light blocking protection they were intended to provide. A new larger sample of windows was created and an additional feature was added. At sunset the darker shades would be automatically retracted, a pause, and at the onset of night—white opaque shades would be lowered and a LED light bar would come on to illuminate the exterior windows with the stamp images at night. Bonus and a way to highlight the museum even after hours—and of course I let conservation take the credit for this brilliant solution to a light problem. (fig. 11)

Our project manager, Glen Hopkins, was tasked with getting the various historic preservation boards in DC on board

Fig. 11. NPM historic windows lite up at night.

Fig. 12. Testing a denser shade for additional light blocking.

Fig. 13. Entrance to the William H. Gross Stamp Galleries.

with this idea and he did manage to secure approval in less than 6 months (it may be a DC record for historic preservation board's approval).

Challenge to the Window Solution

I would like to say that this resolved the window light challenge but I will not. Though this resolved some of the problem additional precautions were necessary in the layout of the galleries and casework to reach the levels that were within acceptable perimeters. In the Postmaster Suite Gallery where exhibit wall barriers were not possible, the density of the shades needed to be increased in order to block the direct sun light during the winter solstice. The shade cloth needed to be changed from the 3% open to the 1% open in order to protect the artifacts in the cases (0950 series). The unfortunate outcome is that these rooms are less inviting to the visitor and especially our director who still complains about the low light levels in these rooms. (fig. 12)

GALLERY SPECIFIC

With the larger envelope solutions determined, the time came for gallery-level initiatives to be explored. There were seven new galleries included in the Gross Stamp Galleries and each offered a different challenge for the exhibition team. (fig. 13) The galleries are, in order: World of Stamps, Gems, Mail Marks History, Connect With Stamps, National Stamp Salon, Stamps Around the Globe, and the Postmaster Suite Rotating Gallery.

GEMS GALLERY

The official entrance to the galleries is off of the interior Historic Lobby, entering into the World of Stamps. This gallery is an introduction and meant to give a sense of intrigue and curiosity into exactly what a stamp can represent in life. Since the location is in the interior section of the galleries, the exterior windows are not yet visible which means that the visitor's eyes are adjusted to a lower light level. The World of Stamps gallery flows directly into the Gems Gallery, which is at the far-east end of the building and tucked away behind the historic windows.

For the Gems Gallery, the curators selected what they felt were philatelic icons of the American Experience and wanted these gems exhibited for long-term display. The selected stamps include a cover sent to John Hancock on July 4 1776, an iconic block of four of the Inverted Jenny Stamp from 1918, a cover carried by the Pony Express and a cover cancelled on the Moon in 1971. (fig. 14)

The gallery was designed to limit light levels but also to give a sense of reverence for what the visitors would be experiencing in the gallery. (fig. 15) The wall is curved to give a sense of direction and flow. The small cases are highlighted on the exterior with floor to ceiling graphic panels that glow. As the

Fig. 14. Display of the Pony Express mail in the Gems Gallery.

visitor approaches, the cases interior lights glow on the objects that are mounted on a frosted Plexi panel to add a soft light around the artifacts. Light levels when the visitor is viewing the artifact were originally set for 30 lux, the thinking being that that would be as low as possible for viewing the artifact. The sensors are set in a tight semi-circle and the light remains on for 30 seconds before starting to dim. The amazing thing is that because of the low ambient light levels as the visitor enters the gallery, the glowing manner in which the cases are illuminated, and the use of a frosted Plexi mount for the artifacts, the visitor is able to view them quite easily without any additional light.

Fig. 15. Curved and illuminated panels in Gems Gallery.

The gallery's successes are that it gives a sense that you are in a special, quiet, space with artifacts that are iconic to history. As a conservator, I can feel secure in the fact that ambient light levels are not going to add an additional risk to the artifacts and I appreciate the fact that the curators added a panel at the beginning of the gallery explaining the low light levels.

The challenge in this gallery is that it is difficult to get an accurate cumulative lux reading without interfering with the visitor experience. However, when one of the artifacts was removed for a short term loan, a light meter that read the light levels every second was installed so that a more accurate reading could be obtained. A graphic was installed in the empty case which described the testing that was underway with the additional hope of engaging the visitor in the testing experience as well. The monitoring results were surprising and gave added assurance that the levels the artifacts were being exposed to were minimal and yet were sufficient for viewing by visitors. The levels during the day were 2 lux in their dark state to 16 lux during viewing (viewing time was less than a minute). The fact that the cases need daily cleaning to get the

nose and finger prints off of the glass demonstrates that there is an engagement by the visitor with the artifacts on display.

MAIL MARKS HISTORY GALLERY

Once the visitor leaves the Gems Gallery they enter Mail Marks History and the first view of the historic windows. This is the gallery where the light levels are the biggest challenge so the artifacts used to highlight the curators' text are mainly 3-D artifacts that do not pose the same rigorous standards that paper does. However, there were some 2-D pieces that are included in the section and in the later Stamps Around the Globe (the international gallery) section that required a case design to limit their exposure to light.

Since the gallery has a large bank of windows, the design of the space had to enhance and yet block the lower level windows. The decision early on was to place casework off to the side and facing away from the windows as much as possible. Large graphic panels were placed directly in front of the windows, panels that could also be moved so there would be access to the windows for cleaning and security checks. These walls added some light blocking but still allowed the visitor to see the windows. (fig. 16)

Fig. 16. Mail Marks History Gallery with panels blocking portions of the historic windows.

Fig. 17. Winter solstice light on case in Mail Marks History.

Though the larger wall and window panels help eliminate some of the direct exposure of the south facing windows, there are still challenges during the winter months when light comes into the gallery in a more sideways direction. The design of the exhibition casework that follows will address some of the concerns; there are still some light exposure issues that should be addressed on several cases. These individual issues still need to be remedied. (fig. 17)

EXHIBIT CASEWORK

Though attempts were made to mitigate the lighting issues of the historic windows through the museum envelope and gallery design, there were still areas where additional case-level solutions were necessary. As it turned out, no one solution would work for all of the artifacts and galleries but rather, four different techniques were chosen to provide adequate protection.

LIFT UP AND PULLOUT CASES

In the Mail Marks History and Stamps Around the Globe Galleries, there were individual paper artifacts which the curators wanted to have on long term display. These included items such as a letter written aboard the Titanic, a 1923 cover from the DeAutremont train robbery disaster, and a cover from an Italian soldier in Napoleon's army mailed from Prussia in 1812. These and other items were too fragile to put into any casework that required mechanical action for viewing access as well as requiring limited light exposure. The solution for these items was to place them each in a small individual case that was covered by graphic text on the exterior and for viewing, the visitor must use a handle to lift a door to see the object. Once the door is lifted the light in the case comes and then goes off when closed. There are only five of these cases in the Mail Marks History gallery but there are 16 in Stamps Around the Globe. (fig. 18)

These lift-up cases, much to my surprise, have proved to be very popular with the visitor. They feel a sense of engagement because it requires action on their part to see the artifact—the simple lifting of the door connects the visitor to the piece in a way that just looking within a case does not. However, as the conservator, I know that the true benefit is that the artifact is only lit when it is being viewed and it is protected from ambient light at all other times.

The challenge with these cases has to do with the mechanics—they are only as good as the fabrication. The museum has had some problems with the pulley mechanisms on some of the cases and with the magnetic light sensors. I originally wanted the lights in these cases to be on a 20–30 second timer like the Gems cases to ensure that if there was a problem with the primary mechanism there would be a backup plan for the lights to go off. This did not get into the final design and there have been problems with some of the case lights remaining

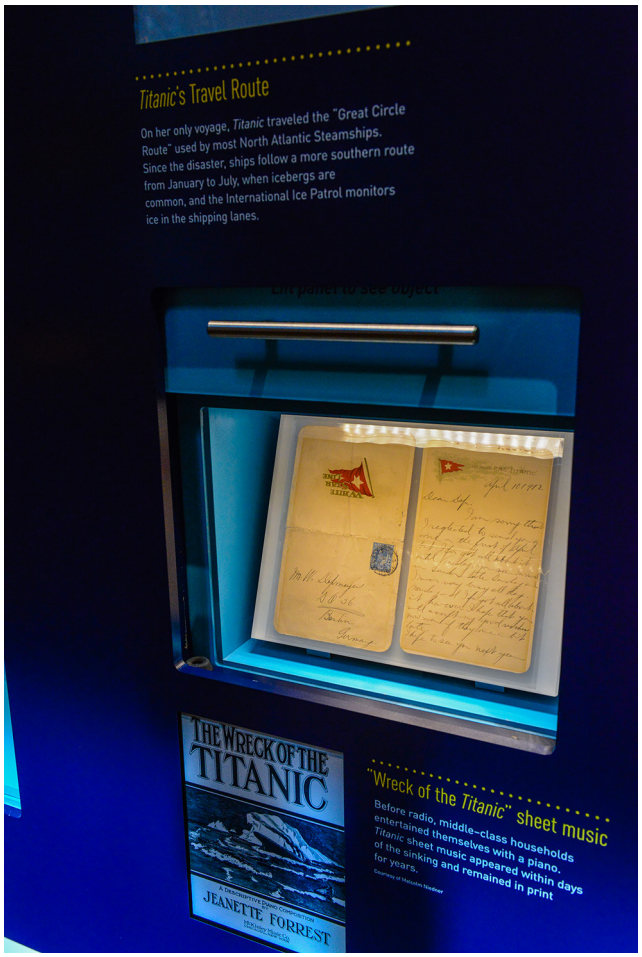


Fig. 18. Lift-up case for a letter written aboard the RMS Titanic.

Fig. 19. International Treasures with lower row of pullout drawers cases.

Fig. 20. Smithsonian Postal Collection from the late 1800's.

on. Luckily security staff keep an eye out for problems with the cases and contacts us as soon as they notice a problem.

There are eight pullout drawers in the Stamps Around the Globe section where a lift-up door would have been too low. Using a drawer had the added benefit of giving the curators an opportunity to include oversized pieces that would not fit in the smaller lift-up cases. (fig. 19)

For the drawers in the Stamps Around the Globe, there was a larger problem with the design and mechanisms on the cases. They have required numerous repairs by the fabricators and the exhibits department which also requires de-installation and reinstallation of the artifacts each time. The fabricators went back to the drawing board to find a better solution. A new weighted pulley system using bike cabling has been installed and the drawers are now experiencing few problems.

VERTICAL PULLOUT FRAMES

The classic method for display of philatelic artifacts around the world has been using vertical pullout frames. The Smithsonian has incorporated the use of pullouts since the late 1800's when the collection was displayed in the Arts and Industry building. (fig. 20) When the museum first opened in 1993 there was a gallery with frames that were purchased used from Canada and were used until the new galleries opened. These re-used cases were problematic in many respects: they lacked the security for high value artifacts to be displayed; the glass affected the color of the material displayed; they were not environmentally stable; they were difficult for visitors to manipulate and a safety concern for those of us who had to work with them.

Over the years I have received numerous calls from archives and museums asking me about purchasing pullouts, but there were no longer any manufacturers that specialized in that type of casework to refer them to or for NPM to purchase from.

The good news was that the NPM staff knew what an ideal pullout frame should be and the team set out to create the perfect casework. The design team (curators, collections and conservation staff) created a very specific document

Fig. 21. Working on prototype with Goppion staff in Milan Italy.

Fig. 22. National Stamp Collection in banks of pullout frames.

outlining our goals and our engineering and conservation requirements. We sent out a bid document to engineers and fabricators looking for 786 pullout frames, in two sizes for over 10,000 objects ranging from stamps, covers, album pages, large plate proofs, artwork and more.

In the end, the museum hired Goppion from Milan, Italy to engineer and construct the pullouts. There were three week-long meetings in Milan working through prototype after prototype until the desired outcome was achieved. (fig. 21)

The museum philatelic council and the philatelic curators worked for over five years selecting the artifacts that they felt would represent the National Stamp Collection. They wanted to make available those objects to the public and world at large (all of the artifacts are also available online) in a manner that a collector and non-collector could appreciate. There is much talk about the democratization of museum collections, making more of the hidden visible by creating visible-storage galleries. This is great for many artifacts that are not light sensitive like ceramics, metal or glass but there has been little done to make light sensitive 2-D collections available in the same manner. The museum achieved their goal for visible storage for a large part of our collection with these pullout frames.

The successes have been numerous for our stakeholders, visitors, researchers, and the museum staff. A member of our philatelic council who helped the museum with the creation of the new galleries but was not really a fan of the idea for the pullouts came up to me at the opening. He told me he could not have been more wrong about the outcome—he loved the gallery, the display and the access the public now has to the National Stamp Collection. Hopefully this is an indication that after 20 years of philatelists complaining about the museum's lack of exhibiting rare artifacts they can finally stop. (fig. 22) The New York Times reporter Edward Rothstein started his review with this line: 'It could easily be a glorious Pharaonic tomb, stocked with all the sustenance a philatelist might require for the afterlife.' (Rothstein 2013)

The artifacts are exposed to light only when they are viewed, they are stable within the display mounts on materials that were tested for long term stability. One of my concerns was how the visitors would treat the frames since we had had problems with the previous frames and young children abusing them. These cases have enough weight to them that they are not easily toyed with and once the visitor sees how they operate, they do feel comfortable using them. I also think that the room where most of the banks of frames are displayed creates an environment that is not conducive to abusing them.

Since the artifacts are hidden from our view most of the time and to ensure that the artifacts are in fact safe for the long term, there is a monthly gathering of the Collections Management and Preservation staff to clean the frames and check to see that all of the artifacts are still secure on their panels. It takes one hour and it serves as a good time to catch up with each other; it may also be why none of us want to clean the windows in our homes.

The challenge for this type of display, for many, may be the initial cost, though if compared with the cost of rotations the return on investment could be realized over a few years. There have been a few mechanical problems though the warranty and service agreement with Goppion means these have not been a major challenge.

SMARTGLASS TECHNOLOGY

It may seem that there are enough solutions to controlling light already covered, however there is one more technology that recently became available to museums. SmartGlass is a film of microscopic particles that can be laminated between any two clear supports (glass or Plexiglas). "When no standard AC voltage is applied, the particles are randomly positioned and block visible light. When voltage is present, the particles align and allow light to pass, thus making the VariGuard transparent" (VariGuard 2015). In a case using this

Fig. 23. Anthrax Letter case, on left, in the off state and on right, where push button activates SmartGlass.

technology over 95% of the ambient light from the room is blocked. The artifact in the case is only exposed to light when it is actually being viewed. This is not new technology, it has been used in aircraft, buildings and vehicles for years but because of the small production size that museums require it has been difficult to obtain. There were discussions during the Historic Windows exhibit as to whether it would be an option but it was nixed due to the cost at that time.

In 2014 the museum first used SmartGlass in a new exhibit, Behind the Badge: The U.S. Postal Inspection Service, for the display of one of the 2001 Anthrax letters that were sent to the Senate. This is the letter and cover sent to Senator Daschle. Because of the decontamination process and the investigative testing that these artifacts went through during the investigation, the letter and cover are extremely fragile. There was no conservation treatment that would improve the condition of the material, so the only display choice we had was to lay the items flat in a case without any mounting supports and with extremely limited light exposure. I saw SmartGlass at an AAM meeting and realized that this could be the light-protection answer for these two artifacts. (fig. 23)

The exhibit case is protected on three sides to prevent any bumping into the case that could cause the object to shift since it is not mounted to the sink mat it rests upon. The visitor approaches the case and sees the text explaining that the anthrax letter and cover are within this dark case. The visitor then pushes the button and the glass clears with the LED light illuminating the artifact. Once the visitor removes the pressure from the button, the lights lower and the glass slowly goes opaque again. There is light on the artifact only when it is being viewed.

The NPM Preservation Office worked with Seth Van Voorhees from VariGuard after the exhibit opened to test and determine exactly how much light blocking there was achieved with the Smart Glass. A recording light meter was temporarily installed inside the case with the artifacts and another was installed on the exterior of the case. Light level readings were taken every second from both meters and the data was compared. The interior readings showed that the artifacts in the case were receiving over 90% less light than the exterior of the case. I wish there was a non-obtrusive recording light meter where we could continue with a longer study but at this point I do not know of one and keeping the current one in the case was too visually distracting to continue the study.

The curators are thrilled that these artifacts can remain on exhibit for longer periods of time. I am thrilled that the ambient gallery lighting is not affecting the artifact. The film will not wear out over time so it can easily be used for years, mitigating the cost of replacement. The challenge for implementing this technology in the exhibit context is more about how it is used in the exhibit and designing supporting graphics that let the visitor know there is actually something to see inside that dark case.

CONCLUSION

There are light-control options available that can enhance the design of an exhibit and the visitor experience while protecting the objects at the same time. I believe there is still more that can be done for the Gross Stamp Gallery to reach those three goals and I am always on the lookout for those opportunities. (fig. 24)

The teamwork from the start of this project made for more inclusive and better decisions. Over the years, conservation has been known as the naysayer because too often we are brought in after a design is complete and changes were difficult and expensive. If conservation is allowed to come to the table at the beginning of an exhibition project—we can come with a positive attitude, new ideas and work with the other stakeholders to find solutions when problems arise. It can be challenging to assert design elements that will add to the cost of the project, so be willing to justify where there maybe flexibility and cost savings in the future.

Fig. 24. Exterior of NPM at night.

I would like to thank the great team that worked together to create the William H. Gross Stamp Gallery:

- Project Manager: Glen Hopkins
- Architects: Cho Benn Holback & Associates
- Exhibit Designers: Gallagher and Associates
- Lighting Designers: Available Light
- Fabrication: Design and Production
- And of course the ENTIRE NPM Staff

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