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Collections to Pests: How Insects and Humans Share Responsibility for Object Destruction in Museums

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Collections to Pests:

**How Insects and Humans Share Responsibility for Object Destruction
in Museums**

Diana Massar

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**Submitted in partial fulfillment of the requirements for the degree in
Master of Arts in Museum Professions
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Abstract

This thesis focuses on pests in museum environments. It gives a brief history of collecting insects in early museums, also known as cabinets of curiosities. It transitions from insects as part of the collection into insects as pests. The paper continues with the identification of major museum pests and the proper ways to prevent and correct infestations by insects and other vermin. Two case studies show how museums sometime need to take matters into their own hands, in dealing with infestations, when financial resources are low.

While a large portion of this thesis focuses on insects in museum environments, another section is devoted to human beings. The major discovery in this thesis is that insects and vermin are not the only creatures that cause problems for museums. Human beings can cause just as much destruction to objects, whether that destruction is intentional or accidental. Just as museums protect their objects from insects with preventative and corrective pest management technologies, museums also protect their objects from potential damages caused by visitors and staff.

At the end of this thesis are two appendixes. The first is a survey on pests in museum environments taken by sixty museum professionals on the registrar's list serve, operated by the American Association of Museums. Its findings include information such as how many museums have an integrated pest management plan in place and which insects are most prominent in their museums. The second appendix includes real life examples of destruction to art which have been provided anonymously by people on *Yahoo! Answers*, a website where people can post and answer questions on any topic of their choosing.

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I. Collecting Insects for Cabinets of Curiosities

When most museum professionals think about insects or vermin they immediately think about infestations and how they can protect their collections. They classify these insects and vermin as pests and usually think nothing more. However, there was a time when insects were gathered from all parts of the world to become part of museum collections here in the United States. Cabinets of Curiosities were known to have the strange and exotic contained within them. These cabinets offered glimpses into the natural world of insects.

Think back to a time when you were younger, a time when the flashing yellow green light from a firefly caught your attention. Maybe for you it was the rolly polliness of a pill bug or the army-like marching lines of ants. Whichever example, insects have always peeked the curiosity of humans. That is why we would put those fireflies in glass jars, poked at the pill bugs to watch them curl up, or captured ants to put in an ant farm. We had a curiosity for the things that were unknown to us and so did some of the founders of the early Cabinets of Curiosities.

For example, Charles Wilson Peale's passion for collecting and for gaining knowledge led to his creation of his very own cabinet of curiosities. In 1786, his home became, according to Marjorie Schwarzer, "the nation's first museum open to the public."¹ In Peale's time, natural history became the interest of many and would often come up in conversations. For this reason, Peale felt it was important to collect natural history specimens from the world that surrounded him. In fact, William T. Alderson, mentions that Peale's "own irrepressible spirit of adventure took him into

¹ Schwarzer, Marjorie. (2006). *Riches, Rivals & Radicals; 100 Years of Museums in America*. Washington, D. C.: American Association of Museums. pg. 8.

the field to collect insects and small game.”² He felt by putting such specimens on display one could learn from and discuss the scientific world.

Peale’s museum, filled with natural history specimens, was the inspiration for many cabinets of curiosities to come. P. T. Barnum’s American Museum, one of the most well known cabinets of curiosities, was one such museum to spring up during the mid nineteenth century in New York City. Not only known for its strange and curious collections, Barnum’s American Museum also had a reputation for its collections of natural specimens, which included “stuffed animals, seashells, insects, butterflies, minerals and a geological cabinet with thirty cases of rocks and fossils.”³ Part of Barnum’s collection was, according to Schwarzer⁴, purchased from the Peale’s family collection.

Another cabinet of curiosity, which is a combination of other former cabinets, is the Museum of Jurassic Technology in Culver City, California. Still open today, the museum can trace its origins to when many important collections, such as Peale’s and Barnum’s, began to take shape. One of the museum’s prominent collections is its Henry Dalton Collection. Dalton (1829-1911) was known for his micro-mosaics comprised entirely of butterfly wings. Being interested in microscopy, Dalton would create his mosaics on microscope slides. Using needles and boar bristles he was able to move individual scales from butterfly wings to create his designs.

² Alderson, William T. (1992). *Mermaids, Mummies, and Mastodons: The Emergence of the American Museum*. Washington, D. C.: American Association of Museums. pg. 24.

³ Semonin, Paul. *Barnum and Science in the Antebellum Era*. Retrieved November 7, 2006, from <http://chmm.gmu.edu/lostmuseum/lnv/271/>

⁴ Schwarzer, Marjorie. (2006). *Riches, Rivals & Radicals; 100 Years of Museums in America*. Washington, D. C.: American Association of Museums. pg. 8.

The Museum of Jurassic Technology's most well known curiosity is the *magaloponera foetens* or the Cameroonian stink ant. With its origin in the Cameroonian rain forests in west central Africa, this ant became a quick curiosity because of the large spike coming through its head. Lawrence Weschler⁵ mentions that, while these ants search for food on the forest floor, some may inhale the microscopic spores of the fungus, *Tomentella*. The spore then lodges itself in the ant's brain and starts to grow, slowly killing the ant while creating a protruding spike. This may be a bizarre way for an ant to die but it makes for a wonderful curiosity.

One of the largest collections of insects today is at the American Museum of Natural History in New York City. According to its website, the entomology department "houses more than 17 million examples of living and extinct arthropods,"⁶ which represents about 45 percent of the museum's entire collection. Although the museum's insect hall closed to the public in the early 1970s, the collection can still be accessed for research purposes. One exhibit of insects that is viewable by visitors is the Butterfly Conservatory, which opened nine years ago. Once in the exhibit, visitors are surrounded by live butterflies from around the world and information panels so they can learn all about the species that they are seeing.

Insects peak the curiosity of every human at some point in their lives. Cabinets of curiosities and natural history museums allowed its visitors to learn about the wonders of the insect world. Early collectors such as Peale and Barnum allowed our curiosities of the insect world to run wild. Museums such as the Museum of Jurassic

⁵ Weschler, Lawrence. (1995). *Mr. Wilson's Cabinet of Wonder*. New York: Pantheon Books. pg. 3-4.

⁶ American Museum of Natural History. *Science: Invertebrate Zoology*. Retrieved November 7, 2006, from <http://www.amnh.org/science/divisions/invertzoo/department.php>

Technology showed us a very curious-looking ant that most people, especially Americans, would never see otherwise.

Collecting and studying insects is still an important task at many museums. However, some insects have become a nuisance or pest in museum environments by making their homes or feeding grounds in museums and objects. Professionals struggle with the responsibility to preserve and safeguard collections for the future. Therefore, museum professionals should know how to identify problematic pests and how to prevent and correct infestations. The next chapter will highlight the top insects and vermin that infest museum environments. It will also provide preventative and corrective technologies that museum professionals can use to preserve their collections.

II. Insects as Pests in Museums Today

Imagine that one day the registrar of a museum walks through the museum during her weekly inspection of objects. She walks into a period room and looks down at a nineteenth-century area rug. There appears to be white spots all over the carpet. Did one of the visitors spill something yesterday, she thinks to herself? Wait, the spots are moving! On closer inspection the Registrar realizes that the white spots are moths in the process of eating away at the rug. She thinks for a moment. We have never had such a problem before. What do I do?

Every museum has pest problems at some point or another. Most museum professionals, however, do not know how to care for such problems let alone identify which pests are creating the damage to their collections. Over the years the technology of pest management has advanced in both positive and negative ways. This chapter will identify the major pests which feed on organic materials and the damage that they cause. It will also address preventative and corrective technology.

i. Identification of Insects and Vermin in Museum Environments

Organic materials exist in every museum whether they are in, for example, textiles, books, or woods. According to Insects Limited, Inc., the following twelve major pests infest organic materials in museums: webbing and case-making clothes moths, varied and black carpet beetles, warehouse/cabinet beetles, hide/larder beetles, cigarette/drugstore beetles, silverfish/firebrats, psocid/booklouse, powder post beetles, cockroaches, and mice.⁷ Mold is not considered a pest, however, it does feed on organic materials and is important to mention. If collections with these infestations are not cared for, objects could be completely destroyed.

Museum staff should not turn their heads if they see moths in their collections. Adult webbing and case-making clothes moths will lay roughly 100 to 150 eggs and when those eggs hatch the damage begins. Larvae will feed on wool, hair, feathers, furs, and upholstered furniture. They will also occasionally feed on dead insects, dry dead animals, animal and fish meals, milk powders, and almost all animal products including bristles, dried hair, and leather. Noticeable damage on objects, caused by the tiny white worm-like larvae of the webbing moth (Figure 1), which leaves webbing on the surface of textiles, and the tiny white worm-like larvae with brown heads of the case-making moth, will be small holes or loose and/or missing material. Larvae love to live in dark places and will do most of their damage there. The life of the larval period depends highly on the quality of the environment and food source, however, the life period usually only lasts around 33-48 days. Adult webbing moths

⁷ Insects Limited, Inc. Museum Identification; The Dirty Dozen of Museum Pests. In *Museum Insect Pests*. Retrieved October 7, 2005, from <http://www.insectslimited.com/museum%20pest.htm>

are champagne in color and case-making moths are golden brownish in color with small dark spots on their wings and wider set eyes (Figure 2).

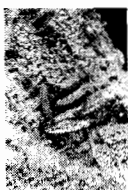


Figure 1 - Larvae, Webbing Clothes Moth Figure 2 - Adult Case-Making Moth
Source (Fig. 1-2): “The Dirty Dozen of Museum Pests”
<http://www.insectslimited.com/museum%20pest.htm>

The larvae of the varied carpet beetle will also do most of the damage to organic collections. The adult will lay her eggs near possible food sources which include carpets, wool, skins, furs, stuffed animals, leather book bindings, feathers, horns, whalebone, hair, silk, fish manure, dried silk worm pupae, and plant products such as rye meal, cacao, corn and red pepper. The adult varied carpet beetle is mostly black with white, brownish, and yellowish scales/wings and is only about 3mm in length (Figure 3). This beetle will live for about a year.



Figure 3 - Varied Carpet Beetle
Source: “The Dirty Dozen of Museum Pests”
<http://www.insectslimited.com/museum%20pest.htm>

The black beetle will also live for about a year and will lay approximately 42 to 114 eggs, again near a food source. Black beetle larvae, which are a long carrot shape with hair at their rear, will feed on the following: carpets, felt, wool, skins, furs, stuffed animals, leather book bindings, feathers, horns, hair, silk, cattle hair, insect meal, and plant products such as seeds, corn, and cayenne peppers. Adults can grow to 5mm in length and are dark brown or black in color (Figure 4).

Warehouse or Cabinet beetles can also grow to be about 5mm in length. They are black and oval in shape with white or light markings on their backs (Figure 5). The larvae, which are orange/brown in color and are covered with hairs, will feed on seeds, dead animals, cereals, corn, corn meal, nut meats, dried vegetables, plant materials, and fish meal. They desire these foods and will eat in great quantities. The warehouse beetle's life stage is 43 days however; it can hibernate for up to two years.

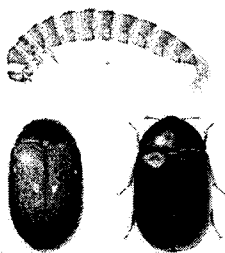


Figure 4 – Black Beetle

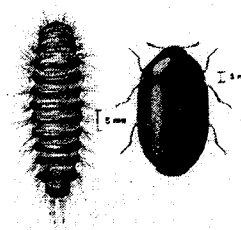


Figure 5 - Warehouse/Cabinet Beetle

Source (Fig. 4-5): “The Dirty Dozen of Museum Pests”
<http://www.insectslimited.com/museum%20pest.htm>

The larder beetle has a life cycle of 40 to 50 days and can grow to be 9mm in length. It has a dark brown or black body which has fine yellow hairs on its legs and underside. Another identifying feature is the band of pale yellow on its back usually containing six black spots (Figure 6). During its life cycle the female beetle can lay anywhere between 100 and 175 eggs. Once these eggs hatch the larvae will feed continuously until it molts. In a museum environment the larder beetle will feed on all types of dried specimens, such as animal hides and dried fish. Other food sources for the larder beetle include ham, bacon, meats, cheese, dried pet foods, and stored tobacco.

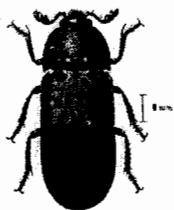


Figure 6 - Larder Beetle

Source: "The Dirty Dozen of Museum Pests"

<http://www.insectslimited.com/museum%20pest.htm>

Cigarette and drugstore beetles will feed non-stop on the same sources which include dried plants as well as books. The cigarette beetle will also feed on spices, rice, dry pet foods, seeds, and pharmaceuticals. These two beetles are sometimes hard to tell apart but can be distinguished by their wings; the cigarette beetle (Figure 7) has hairs on its wings while the drugstore beetle (Figure 8) has indented vertical lines in its wings. They both grow to be about 3mm in length. Cigarette beetles also have a shorter life cycle of about twelve weeks while the drugstore beetle's life cycle is seven months.



Figure 7 - Cigarette Beetle

Source (Fig. 7-8): "The Dirty Dozen of Museum Pests"

<http://www.insectslimited.com/museum%20pest.htm>



Figure 8 - Drugstore Beetle

Living up to three and a half years the silverfish has the longest life cycle so far. During this life cycle the female silverfish will lay one or two eggs a day. This pest prefers to live and feed in dark, warm, and damp places. Silverfish food sources include textiles, especially cotton and synthetic silk, books and other paper products, especially if they have a starch compound on it. They also like to feed on the glue that is found on wallpaper and in books. The silverfish can grow to be about three

fourths of an inch. Its long body and antennae, silver gray color, and three appendages coming from its tail are some of the silverfish's distinguishing features (Figure 9).

Booklice are extremely small in size only growing to about 2mm in length. They tend to be almost clear in color with a gray or light brown tint and have long thin antennae as well as a large bubble like feature above their mouths (Figure 10). Booklice feed on mold in damp, warm, undisturbed places. They are mostly found in book bindings, storage boxes, paper goods and herbaria collections. Their life cycle can last anywhere from 24 to 115 days during which female booklice will lay 20 to 50 eggs.

The powder-post beetle is also known as the furniture beetle because it feeds on wood and reeds. Those museums with furniture in their collections beware! This reddish brown beetle can grow to be 6mm in length and can live up to five years in its larva stage (Figure 11). Once an adult the female can lay up to sixty eggs and will usually deposit them on wood surfaces. When the eggs hatch the larvae will chew into the moisture enriched wood where it will remain and feed until it is ready to mate.

It is extremely important to control cockroaches if they are found in a museum environment because if they are not, the numbers can become considerably large. Its life cycle is a month however, in that month the cockroach will eat almost anything. The cockroach is considerably large compared to the other pests mentioned. For

example, the German cockroach can grow to be five eighths of an inch and normally is brown with two black lines on its back.⁸

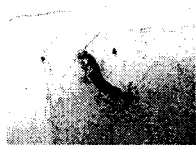


Figure 9 – Silverfish



Figure 10 – Booklouse



Figure 11 – Furniture/Powder-post Beetle
Source (Fig. 9-12): “The Dirty Dozen of Museum Pests”
<http://www.insectslimited.com/museum%20pest.htm>



Figure 12 – German Cockroach

Mice make their way into museums because of the warmth. They will make their homes usually in textiles or papers. Seeds, grains, and foods high in protein are what mice are searching for when looking for something to eat. However, if they are hungry they will nibble on anything to see if it is something that they want to eat, essentially causing damage to objects.

Even though mold is not considered a pest, because it is a microorganism, it still is extremely damaging to organic objects within museums. According to the U. S. National Archives & Records Administration, mold will “permanently damage the materials supporting them,”⁹ such as paper, wood, fabrics, and leather, by weakening, staining and foxing them. It is also impossible to completely kill mold however, one

⁸ Insects Limited, Inc. Museum Identification; The Dirty Dozen of Museum Pests. In *Museum Insect Pests*. Retrieved October 7, 2005, from <http://www.insectslimited.com/museum%20pest.htm>

⁹ National Park Service (1993). Mold and Mildew: Prevention of Microorganism Growth In Museum Collections. *The U. S. National Archives & Records Administration*. Retrieved October 7, 2005, from <http://www.archives.gov/preservation/conservation/mold-prevention.html?template=print>

can keep it from being active.¹⁰ That is why is it extremely important that museum professionals know how to prevent mold from growing in the first place. Keeping the moisture levels and temperature low will prevent mold from growing. This can be achieved by maintaining the relative humidity level at fifty percent and the temperature at seventy degrees.

After posting a survey dealing with pests in museum environments on the Registrar's list serve for the American Association of Museums, I came up with some interesting results. According to the sixty respondents, mice, silverfish, and beetles, directly followed by moths, are the top four pests infesting their museums. Some other pests, according to the survey, that are infesting the respondents' museums are cockroaches, carpenter ants and bees, centipedes, and termites. Out of the sixty museum professionals that responded to the survey, eighteen currently have pest problems at their museums and thirty-one have had problems in the past year. (Survey and survey results can be found in Appendix A)

¹⁰ Spencer, Karen (1996). Library Preservation Tips: General Information – Mold and Mildew. Retrieved October 7, 2005, from <http://www.personal.umich.edu/~kspencer/preservation/wordmold.html>

ii. Technologies to Prevent Insects and Other Vermin in Museums

Now that the different pests in museums have been distinguished, it is important for museums to come up with an integrated pest management plan to prevent future infestations. According to the sixty respondents in the survey mentioned in the last section, forty-seven museums have an integrated pest management plan in place. That leaves thirteen museums that are unsure about what they are doing when it comes to pest management. According to Tom Strang, having an integrated pest management plan “reduces pest pressure on stored objects.”¹¹ Breisch and Greene agree that an integrated pest management plan should be created and that it should include the following: prevention, least-toxic methods, and a system approach.

Prevention, according to Breisch and Greene, should use “control solutions by minimizing or eliminating the resources that pests need to enter or live in a particular area.”¹² This means, for instance, that staff should make sure that garbage is taken out on a regular basis and that cracks or holes in the foundation should be repaired and/ or monitored for pests entering the museum. Strang suggests leaving traps near these cracks and spraying baseboards with an insecticide to prevent pests from moving further into collections.

Under the integrated pest management plan, according to Breisch and Greene, toxins are rarely used. They are only used as a last resort when “exclusion, sanitation,

¹¹ Strang, Tom (2005, July/August). I’ve Got Bugs in My Pockets & I Don’t Know What to Do with Them. *Museum News*, 46-47.

¹² Breisch, Nancy L., Albert Greene (1998). Risk Management; Integrated Pest Management. In Rebecca A. Buck & Jean Allman Gilmore (Eds.), *The New Registration Methods* (pg. 257). Washington, DC: American Association of Museums.

and inspection”¹³ do not work. For example, when an infested object has been thoroughly cleaned, bagged, and separated from the rest of the collection but when inspected the infestation is still there, pesticides might have to be used. However, when pesticides are needed, “compounds, formulations, and application methods that present the lowest potential hazard to humans and other non-target organisms”¹⁴ should be used.

In order for the integrated pest management plan to work effectively, everyone in the museum needs to work together. That means that maintenance workers need to follow through on taking out garbage on time and cleaning away debris outside of the museum such as clogged gutters and leaf accumulations. If everyone works together, from the beginning, pest infestations could be prevented.

Once an integrated pest management plan has been put into place, it is time to work on some preventative technology. If financially possible, a museum should set up a HVAC or heating, ventilation, and air conditioning system. This will allow the museum to maintain proper temperatures and humidity levels throughout the museum preventing certain pests that prefer warmer, moist environments from surviving. Also, according to Lord, the HVAC system has a “multi-component filter bank,”¹⁵ which will catch certain pests. One way most museums keep track of the temperature

¹³ Breisch, Nancy L., Albert Greene (1998). Risk Management; Integrated Pest Management. In Rebecca A. Buck & Jean Allman Gilmore (Eds.), *The New Registration Methods* (pg. 257). Washington, DC: American Association of Museums.

¹⁴ Ibid., 13. pg. 257.

¹⁵ Lord, Barry & Lord, Gail Dexter (Eds.). (2002). *The Manual of Museum Exhibitions* (pg. 123). Walnut Creek: AltaMira Press.

and humidity levels in their museums is by the use of hygrometers which record fluctuations of both temperature and humidity.

Once the museum has a stable environment, other preventative measures can be taken for pest management. According to Breisch and Greene, “all meaningful pest control begins with inspection.”¹⁶ Therefore, it is important to have someone with a good eye looking out for damage, frass, droppings, carcasses, etc. produced by pests. According to a survey taken by sixty museum professionals, fifty-five of the respondents have someone who visually inspects the museum for pest infestations on a regular basis (see Appendix A for survey and results).

Sticky and pheromone traps are another good way to keep track of what type of pests are in the museum. These traps should be placed near where pest activity has been spotted or near potential entrance areas for pests such as cracks in the foundation. Sticky traps are one of the main preventative technologies that museums use, according to the survey mentioned in the last paragraph. The traps are extremely easy to use and are not harmful to staff, unlike some of the chemicals that were used in the past.

As early as the late 19th century, museums used chemicals to preserve their collections from the damages of pests. Lisa Goldberg writes that in the mid 1860s specimens collected on expeditions to find new objects were “rubbed, painted, immersed, or brushed with arsenical or mercuric compounds.” She goes on to say that “specimens treated with arsenic were very rarely subject to new infestation

¹⁶ Breisch, Nancy L., Albert Greene (1998). Risk Management; Integrated Pest Management. In Rebecca A. Buck & Jean Allman Gilmore (Eds.), *The New Registration Methods* (pg. 259). Washington, DC: American Association of Museums.

problems.”¹⁷ However, the use of arsenic on objects caused health problems.

According to Wikipedia, if arsenic is digested and left untreated it could lead to death.

Since arsenic poisoning effects the digestive system, symptoms include “violent stomach pains, vomiting, and delirium.”¹⁸ Studies have also shown that arsenic poisoning could lead to some cancers. It is no wonder why most museums stopped using the chemical in the early 20th century.

¹⁷ Goldberg, Lisa (1996). A History of Pest Control Measures in the Anthropology Collections, National Museum of Natural History, Smithsonian Institution. *Journal of the American Institute for Conservation*, Vol. 35, No. 1, Article 3, 23-43. Retrieved November 9, 2005, from <http://aic.stanford.edu/jaic/articles/jaic35-01-003.html>

¹⁸ Wikipedia (n.d.). *Arsenic*. Retrieved December 10, 2005, from <http://en.wikipedia.org/wiki/Arsenic>

iii. Technologies to Correct Insect and Vermin Problems

Since the harmful effects that chemicals had in the past toward the health of those around the objects, museums have taken advantage of corrective technologies for dealing with infestations, which are not a health risk. Vacuuming is one of those corrective measures. According to Breisch and Greene, using a vacuum is a great way to rapidly clean up infestations and debris left behind from pests, which tend to “serve as a food reservoir”¹⁹ for other insects. That is why fifty-one of the museums who took the survey on pests in museums (Appendix A) use vacuums to correct pest problems.

If mice are a problem in museums, regular mouse traps are still the top choice in disposing of them. The mousetrap was invented in 1897 by a man named James Henry Atkinson. His mousetrap is the one that is still used today. Other traps such as sticky traps for catching silverfish, for example, and pheromone traps for catching beetles are a safe way to capture these pests.

Vacuums and sticky traps are the simplest ways to dispose of pests. On the other hand, Breisch and Greene suggest that freezing “has become the preferred substitute for treatment of many types of infested specimens and artifacts.”²⁰ In fact, out of sixty museums, thirty-six of them use freezing techniques to correct pest problems (according to survey found in Appendix A). Freezing at -40 degrees Celsius will kill most insects. However, freezing should only be done by a

¹⁹ Ibid., 16. pg. 263.

²⁰ Breisch, Nancy L., Albert Greene (1998). Risk Management; Integrated Pest Management. In Rebecca A. Buck & Jean Allman Gilmore (Eds.), *The New Registration Methods* (pgs. 264). Washington, DC: American Association of Museums.

professional who understands the effects that it will have on different types of objects. For example, “many types of natural and artificial adhesives lose their bonding properties under extremely low temperatures.”²¹ Damage could also be caused if ice or condensation forms on the objects.

Gary McGowan, President and Principal Conservator, at Cultural Preservation & Restoration, Inc., stated in an interview that rapid freezing is one of the best ways to correct pest infestations. At CPR, McGowan wraps the infested object in polyethylene bags before putting the object in the freezing chamber. This is to prevent moisture from getting into the object as well as lessening the risk of damage. According to McGowan, freezing usually takes less time, man hours, and is more economical than some of the other treatments to correct pest problems.

Another technique that Breisch and Greene suggest is oxygen deprivation. They say that in “controlled enclosures (it) has proven to be effective in killing all stages of insects infesting objects.”²² The technology of oxygen deprivation becomes effective when the “atmosphere within the enclosed object is replaced with an inert gas, such as argon” to get rid of the oxygen. Depending on the “insect, lifecycle stage, gas used, object size and density, and temperature and humidity levels”²³ the length that an object must stay enclosed could take anywhere from four to six weeks.

Another technique to use when the freezing method can not be used because of potential harm to the object is fumigation. Toxic gases are used during the

²¹ Ibid., 20.

²² Breisch, Nancy L., Albert Greene (1998). Risk Management; Integrated Pest Management. In Rebecca A. Buck & Jean Allman Gilmore (Eds.), *The New Registration Methods* (pg. 265). Washington, DC: American Association of Museums.

²³ Ibid., 22.

fumigation process and Breisch and Greene say that fumigation is the “traditional method to treat items that actually or potentially contain pests that are highly cryptic or deeply embedded.”²⁴ However, because of serious health risks fumigation needs to be done by a professional and could be very expensive.

One toxin that is commonly found used as a fumigant is methyl bromide. Martyn J. Linnie says that methyl bromide is “restricted for use by certified applicators only” who must use “special monitoring and safety equipment” as well as “approved fumigation chambers”²⁵ when using the gas. This is because of the harmful effects that the gas can have on humans. According to Linnie, symptoms that occur if exposed to methyl bromide are “irritation of skin, eyes, and upper respiratory system.” If exposed to the gas for thirty or more minutes “malaise, visual disturbances, nausea, headaches, vomiting, vertigo, and tremors” could occur. If an individual is highly exposed to methyl bromide, that individual can fall into “epileptic-like convulsions followed by coma and death” (p.237).²⁶

Another chemical that has been used in museums for years and that is highly toxic is dichlorvos or DDVP. According to Linnie, this chemical is usually used in “resin strip form in cabinets and drawers.” DDVP can potentially damage the “neurotransmission in the human nervous system” as well as causing other health problems such as “headaches, nausea, dizziness, tremor and muscular cramp, salivation, unconsciousness and chest discomfort.” If one is overexposed to DDVP

²⁴ Ibid., 22.

²⁵ Linnie, Martyn J. (1994). Pest control in museums: the use of chemicals and associated health problems. In Simon Knell (Ed.), *Care of Collections* (pg. 237). London & New York: Routledge.

²⁶ Ibid., 25.

one can experience “fever, cyanosis, coma, heart-block, shock, respiratory failure and pulmonary oedema.”²⁷

Para-dichlorobenzene or PDB is another example of a toxic chemical used in museums to control pests. It is usually found in the form of mothballs, flakes, and crystals. Linnie states that PDB was once used as a fumigant in the early 1900s but is now used mostly as an “insect repellent in drawers and storage cabinets.” According to Linnie, the “chronic effects of long term exposure (to PDB) include liver and kidney damage, haemolytic anaemia, weight loss, profuse rhinitis and periorbital swelling.”²⁸ Not so chronic effects include headaches, sore eyes and throat, dizziness, nasal irritation, breathing problems, chest pains, vomiting, and body weakness.

In conclusion, it is important for all museums to have someone on staff who understands how to properly handle pest infestations. Being able to identify which pests are causing what damage is essential for correcting problems. It is also important to know how to prevent pest problems. If the proper museum staff is educated in the most advanced pest management technologies, museums will be able to take preventative and corrective measures in dealing with pests, which will ensure the preservation of collections for the future.

²⁷ Ibid., 25. pg. 236.

²⁸ Ibid., 25. pg. 235.

iv. Case Studies

The information presented in the previous pages has provided an overview of the variety of pests that make their home in museums, preventative technology with regard to infestation, and corrective technology used when infestation has been discovered. It is imperative that museum professionals not only acquire a knowledge base such as the one provided, but also continually review research and case studies to keep abreast of new developments in the field of object care. Case studies can be an excellent resource to learn more about how others have used their knowledge to tackle unique problems. However, museum professionals can also benefit from reviewing case studies that do not show successful outcomes or that show what can happen when unique problems are attempted to be resolved with good intentions but limited funding resources. The following two case studies are real cases that show how limited monetary resources can lead to unresolved pest management outcomes and/or improper pest management techniques.

The first case study involves a serious moth infestation. Museum X has in part of its permanent collection an old wooden traveling salesman case that contains real candy. The Museum has decided to keep the candy for the purpose of future research. When the case was initially donated to the Museum it was inspected. Upon inspection moth larvae were found within the case. The Museum decided to vacuum out the case and separate any candy that also seemed to be infested. It then decided to wrap the case in two layers of clear plastic bags and then seal the case into a plastic box. This was done to prevent the infestation from spreading to the rest of the

collection in the case that there were still larvae or eggs present that could not be seen.

After a few months the salesman's case was checked for any activity.

Unfortunately, there was still a problem and so one of the staff members cleaned the case again. She then sealed the case back up in new plastic bags and put it back into the plastic box in hopes that this was the last time that she would see the larvae.

Recently, the salesman's case was checked again by a staff member and me. The lid of the plastic box was removed. The smell that came out of the box was unbelievable. It smelled like moldy death. We removed the salesman case from the plastic box and immediately saw the larvae. They were in-between the two plastic bags. Somehow the larvae made their way through the first. The plastic bags were removed carefully, collecting the larvae, and then disposed of. We then proceeded to kill any of the larvae that were on the outside of the case as well as in the inside. Each candy piece inside was inspected for any activity. None was found. However, signs of activity were visible such as chewed paper and frass. Everything was documented and then the case was sealed up again as mentioned previously. (Figures 13-16)

This process of inspection and cleaning continued to go on for months because the Museum did not have the funds to send the salesman's case to be professionally conserved. If Museum X had the funds they could choose to take advantage of a number of corrective pest management technologies. These technologies include freezing, fumigation, or oxygen deprivation. There are concerns with freezing and fumigation. Condensation or ice, which can occur with the technology of freezing,

can cause damage to the wood case and to the fragile candy wrappers on the candy inside. If the candy is left inside the case, the chemicals used during the fumigation process could change the compounds that make up the candy, altering future research for those interested in finding out how that candy was made. The most logical option is oxygen deprivation which would basically suffocate any living organisms in the object. Again, the gas used to deplete the oxygen might effect the chemical composition of the candy but still seems safer than freezing and toxic fumigation.

The next time the museum checked the case the larvae were still there so the museum took matters into its own hands. The larvae were once again cleaned out. A food saver, owned by someone on the museum staff, was then used to create individual storage bags for the objects within the salesman's case. The food saver is a machine that is used to preserve food by depleting the air and vacuum sealing the bag. The bags were then housed in a plastic bin and checked a couple of months later. There were no signs of an infestation. The food saver turned out to be an innovative and inexpensive method in dealing with Museum X's insect problem.

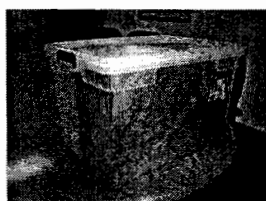


Figure 13 – Plastic Box housing moth traveling Salesman Candy Case.



Figure 14 – Moth infested traveling infested Salesman Candy Case wrapped in two plastic bags.



Figure 15 – Moth infested traveling Salesman Candy Case, closed



Figure 16 – Moth infested traveling Salesman Candy Case, opened

The second case study involves a quick spreading mold problem. In the summer of 2005, Museum Y's air conditioning system broke for two days. During that time the temperature and humidity levels in the Museum's library and archives skyrocketed. A few months later a member of the Museum's staff was putting a few books away and noticed a mold problem. She inspected the rest of the book collection and realized that it was a huge mold problem. The mold had spread through the entire library living on most of the books in the collection as well as on a few of the books in the archives.

When an object infested with mold is detected, it should be separated from the rest of the collection to keep the mold from spreading. The object should be sealed in a polyethylene bag to prevent spores from infecting other objects or it could be placed in a freezer to stop the mold growth.²⁹ However, when the mold is infesting the whole collection and the Museum does not have the funds to properly care for hundreds of mold infested books, what should they do?

Museum Y decided to vacuum each and every book that was infested with mold. They used their conservator's vacuum, with a HEPA filter, which prevents the spores from entering back into the air. After each book was vacuumed a staff member used Lysol wipes to clean the outside of the books. However, they only used the wipes on recently bounded books and not on valuable leather bounded books. This was done in hopes to prevent the mold from returning. The whole process of vacuuming and cleaning took Museum Y about three months to complete.

²⁹ National Park Service (1993). *Mold and Mildew: Prevention of Microorganism Growth In Museum Collections. The U. S. National Archives & Records Administration*. Retrieved October 7, 2005, from <http://www.archives.gov/preservation/conservation/mold-prevention.html?template=print>

If Museum Y had the financial resources the entire library would have closed due to the potential health risks that mold can cause. The Museum would have hired a professional book conservator, who uses the proper safety gear, to appropriately handle the mold problem. The conservator would have used isopropyl alcohol instead of Lysol wipes to further clean the mold from the books. The chemicals in the Lysol wipes could potentially discolor or deteriorate the books in the future.

So, what did museum professionals learn from reviewing case studies such as these? They learned that completing their research on pest management's preventative and corrective technologies is extremely important for caring for their collections. They also learned that museums with low financial resources sometimes do what they have to do to correct pest infestations. When museums do this they are potentially putting their collections at risk. A good thing, going back to the survey taken on pests in museums (Appendix A), is that out of the sixty museums that answered only eleven have used improper pest management techniques due to low financial resources.

III. Humans as Pests

Insects have been known to cause serious damage to museum collections. Many museums however, forget that there is another type of pest which can cause damage to their collections. As defined by the *American Heritage Dictionary of English Language*, a pest is “an annoying person or thing; a nuisance.” Motivated or accidental destruction of art by visitors and/or museum staff is a rising occurrence which many museums are starting to take into account. With the proper precautionary measures, museums can prevent accidents and vandalism caused by this forgotten museum pest, the human being.

i. Motivated Destruction of Art

Vandalism is one way that humans can be pests in museum environments. The greatest act of vandalism, which occurs in museums, tends to be the act of graffiti. Many people, especially teenagers, tend to have a desire to mark their names on things. For example, how many times have you seen “Mike was here” or “Sally loves Jimmy” written on bathroom stalls or on outdoor fences and monuments. Most museums have an unwritten rule excluding pens and markers inside their galleries to prevent accidental or self motivated ink stains on objects. However, how is the average museum visitor supposed to know that pens are not allowed inside?

I am aware of this rule because I was an art student who was given many assignments inside museum galleries. Before my visit the teacher reminded the class to use pencils when taking notes because on those rare occasions pens could leak or explode, which could cause damage to the nearest object. If I did not go on all those museum assignments, I am sure that I would not think twice about pulling out a pen to jot down some notes. So what is the best way to inform visitors about this unwritten rule against pen usage?

Many museums post signs at the entrance of the museum indicating the “rules” of the museum. Two of the rules seen most often are “No Flash Photography” and “No Touching.” However, I rarely see written “No Pens.” Maybe, a few times, I noticed something written in a museum’s brochure persuading visitors not to use pens or markers when in the galleries. However, it was always at the very end of the brochure. By the time I get to the end of the brochure, I have usually been through a number of the galleries and have already taken some notes.

Note taking with pens is not usually a big problem; however, spray paint is a growing concern. Brian Nearing³⁰, a writer for the *Times Union*, mentioned that two antique fire trucks as well as some walls and display cases at the State Museum in Albany were vandalized with spray paint. He mentions that velvet ropes are the only things that separated the visitors from the fire trucks. The four young graffiti artists were caught in the act on the museum's video surveillance system. The four youths, according to Nearing, were captured by the police a few blocks away from the museum.

Even though the graffiti artists were caught, why did it take so long? And better yet, how did they even get away with spray painting the objects and walls in the museum to begin with? Having video surveillance in a museum is very effective to an extent. It will capture an act of vandalism while it is happening, however, it can not prevent it. If the State Museum had security guards throughout the museum, the graffiti in question could have most likely been deterred altogether.

Another example of destruction of art through vandalism is the one that happened at the Palm Beach International Sculpture Biennale in September 2006. Three of Susan P. Cochran's giant sculptures, entitled *Ants*, were vandalized with carvings of racial nicknames, declarations of love, and profanity according to writer, Kelly Wolfe, of the Palm Beach Post. Wolfe quotes Cochran saying, "I built my pieces for people to enjoy, and 99 percent of people respect them. Then you have that 1 percent."³¹ It is very

³⁰ Nearing, Brian. (2005, November 15). Antique Firetrucks Defaced. *The Times Union*. Retrieved March 16, 2006, from LexisNexis Academic database.

³¹ Wolfe, Kelly. (2006, September 19). 'Ants' Draw Pests; Sculptures Defaced. *Palm Beach Post*. Retrieved September 22, 2006, from LexisNexis Academic database.

common to walk through a sculpture park and notice the graffiti on the pieces. However, why some pieces are left alone and others are covered by graffiti is a mystery.

Graffiti is not the only act of vandalism that occurs in museum environments. In 2001, six hundred seven books pertaining to gay, lesbian, bisexual, transgender, women's issues, and HIV/AIDS topics were destroyed at the San Francisco Public Library. Out of hatred the vandals slashed and tore these books. According to the library website, most of the books in question, valued at about \$24,000, were damaged beyond repair. Richard Meyer stated that:

“the work of artists and authors who address sexuality will continue to be attacked, whether materially or symbolically, by those who are convinced that such images and ideas have no place in the public sphere. Rather than wish these attacks away or imagine that we can fully escape from them, we might work instead to make the threads of our response visible. Our small repairs cannot undo vandalism or the damage it has wrought. Yet precisely because they fail to heal us, these imperfect sutures will not fall or fade away.”³²

Instead of completely disposing of the books, the library decided to allow employees, artists, and anyone who was interested to turn these destroyed books into works of art. The exhibition titled, *Reversing Vandalism*, opened in 2004 in three galleries in the library allowing the vandalized books to be seen once again by the public, basically creating the opposite of what the vandals were attempting to do.

Istvan Kantor, a controversial performance artist, is another example of a human being a pest in museums. Kantor is most known for his blood campaigns, in which he splatters his own blood in the form of an “X” between famous works of art. According to Clifford Kraus, Kantor splattered his own blood on a wall in the Museum of Modern Art in New York between two Picassos in 1988. He had no authority to perform in the

³² Meyer, Richard. (2005). *Slasher Story*. *Art Journal*, 64, no.1, 32-41. Retrieved March 16, 2006, from Wilson Web database.

museum and had accidentally got some blood on the nearby Picasso. Kantor had this to say about his preparation for his blood campaigns in an interview with Daniel Baird:

“I do my splash usually in between two works of art on the empty white museum wall. Inevitably some blood will always go on the works. My intervention creates an instant crisis. The Blood X marks the nerve center of this crisis around which circulates the reaction of the museum officials and the media, people’s opinion, the reality of laws, politics, spirituality, sexuality; and they interact with each other in a kinetic pattern. My X is always site specific and designed as an in-situ piece produced between two selected works. The execution is the crucial part of it. Consider the fact that you don’t want to get arrested too early before you can complete the piece. You have to do it in a way that they don’t see it immediately or don’t discover it too fast; you have to really choose the right place in the museum where you can do it without the disturbance of the museum guards.”³³

He then continued to talk about how he went about getting away with his blood campaign in the Museum of Modern Art. Kantor’s exact words were:

“I chose that Picasso room because I knew that it was far from the security offices, so I knew that it would take a long time for them to get there. I calculated how much time I really needed to make my Blood X and to read my manifesto as well; I knew that it could take at least three to five minutes to do the whole thing.”³⁴

Even though Kantor was able to vandalize the Museum of Modern Art he was still punished for it. According to Krauss he was fined \$1,000 for the damages caused and spent the night in jail. He was also banned from the museum. Over the years Kantor has been banned from many other famous museums for similar actions.

(For more examples of real life situations of destruction of objects in museums, presented by real people, see Appendix).

³³ Baird, Daniel. (2004, June). In conversation: Istvan Kantor with Daniel Baird. *The Brooklyn Rail*. Retrieved September 27, 2006, from http://www.ccca.ca/performance_artists/k/kantor/kantor_perf18/brooklyn/

³⁴ Ibid., 33.

ii. **Reasons Behind Motivated Destruction of Art**

We have seen that motivated destruction of art is a rising problem throughout many museums. However, what are the reasons behind this destruction? Some acts of vandalism are simply done without thinking, whereas others are thought out before the act is committed. So what possibly could be on these vandals' minds?

Some people have reasons behind their acts of violence towards art while others do not. For instance, the subject matter of some works of art may cause controversy, which may lead to vandalism. A nude sculpture or painting may offend someone who believes that the human body is sacred and should not be displayed in such a matter. That person may believe that she needs to cover up or take down the offending work in any matter possible. This could lead to cutting the painting or using some type of marking tool to cover up the offending areas.

Going back to the example of vandalism at the San Francisco Public Library, in the previous section, we can see that the vandal was extremely offended by the controversial books pertaining to gay, lesbian, bisexual, transgender, women's issues, and HIV/AIDS topics, which the library housed. The vandal either had hatred toward people who had different beliefs than him or was very religious and believed that the topics of these books were simply a sin. Either way the vandal decided to take matters into his own hands and destroy, by cutting and/or tearing, the books that offended him.

Works of art that may be perceived as offensive to some are not the only reason why people cause destruction to art. Dario Gamboni mentions some other motivational factors for destroying works of art when talking about the vandalism that occurred at the Swiss Sculpture Exhibition in 1980. In brief, forty four sculptures out of one hundred

seventy seven were vandalized and in some instances destroyed. Most of the organizers of the exhibition felt that the vandals attacked the “most convenient objects” and the “least risky circumstances in which to vent their instinctive violence.”³⁵

Although convenience and least risky places might be part of a vandal’s train of thought when attacking works of art, we still do not know why these attacks happened at the Swiss Sculpture Exhibition. Gamboni fills us in when he states that many of the people of Bienne, where the exhibition took place, did not have respect for the artists due to the type of materials they used. He said that “works made of materials traditionally associated with fine arts, such as marble and bronze, or with handicraft, such as wood, had generally been spared, whereas attacks had concentrated on works made of concrete, plastics, aluminum, steel, unusual combinations and ready made elements.”³⁶ The people of Bienne were just not ready for works of art made from such materials.

Many had lost respect for the artists due to the fact that the sculptures were not created in the traditional fine art manner. Instead they felt that anyone could create such simple sculptures and why should they care about something that could be so common. Many could not understand the concept of the sculptures or completely misunderstood them, which in many cases led to their destruction.

Gamboni mentions two things, which I felt were important to mention in the matter of why people destroy works of art. The first is that some people feel that certain works of art destroy the landscape in which they are placed. Gamboni says that a family in Scotland received abusive letters about sculptures, created by Moore, Epstein, and

³⁵ Gamboni, Dario. (1997). *The Destruction of Art; Iconoclasm and Vandalism since the French Revolution*. New Haven and London: Yale University Press. pg. 172.

³⁶ *Ibid.*, 35. pg. 173.

Rodin. The author of these letters wrote that the sculptures were “hideous bits of metal and the like” and how dare they “desecrate the countryside”³⁷ with them. Obviously this family’s neighbors did not approve of such works of art. In 1995 the heads of one of the Moore sculptures were sawn off.

³⁷ Ibid., 35. Pg. 184.

iii. Accidental Destruction of Art

Vandalism is not the only cause of the destruction of art. Accidents happen and they can just as easily happen inside a museum environment. Visitors could trip, fall, bump into something, or even spill something. Staff could drop or break something if not handled properly. These things can be a nuisance and the museum can not possibly think of everything to prevent such accidents.

For instance, in January of 2006, a man tripped on his shoe lace and fell down a flight of stairs at the Fitzwilliam Museum in Cambridge. He accidentally fell into a set of three Qing Dynasty vases. According to Laura Barton, the three hundred year old vases “sat happily undisturbed on a windowsill at the bottom of the staircase for a good 40 years.”³⁸ She also stated that the vases were priceless. Seven months later an article appearing in another London paper mentions that the largest vase “decorated with peonies, pheasants, butterflies, and insects”³⁹ was glued back together. It took many months to separate all the pieces and clean them before attempting to glue them back together. Although the Fitzwilliam Museum is doing everything it can to repair these vases they never again will be perfect the way they were before this shoe lace incident.

Another example of accidental destruction to art, this time due to miscommunication between staff members, was just recently in the news in August 2006. According to Alan Riding⁴⁰, two works of art fell off the walls of the Georges Pompidou

³⁸ Barton, Laura. (2006, January 31). Oops! *The Guardian (London)*. Retrieved March 16, 2006, from LexisNexis Academic database.

³⁹ Camber, Rebecca. (2006, August 8). Smashing! They called it Mission Impossible, but museum vase broken by Mr. Clumsy is superbly restored. *Daily Mail (London)*. Retrieved September 22, 2006, from LexisNexis Academic database.

⁴⁰ Riding, Alan. (2006, September 8). Museum Apologizes for the Destruction of Two Artworks. *The York Times*. Retrieved September 9, 2006, from LexisNexis Academic database.

Center in Paris. The first sculpture by Peter Alexander fell right before the exhibition opened. The second, by Craig Kauffman, fell four months later during the exhibition. Both sculptures were completely destroyed. The owner of Alexander's piece, the Franklin Parrasch Gallery in New York, was paid \$28,000 for its loss. Kauffman's piece was insured at \$60,000, which will be paid to the museum that owned it in the near future.

No one at the Pompidou knows why Alexander's and Kauffman's pieces fell from the walls. The president of the Pompidou, Bruno Racine, said that Alexander's work fell because of a "misunderstanding between a restorer and an installer." He went on to say that Kauffman's piece was "hung according to the Los Angeles County Museum of Art's (the lending museum) specifications in the presence of a museum representative" and that the reason for the fall must have been because of "an error in installation or a disturbance caused by a visitor."⁴¹ If museums took the time to check and then double check their installations, an accident such as this might have been prevented.

⁴¹ Riding, Alan. (2006, September 8). Museum Apologizes for the Destruction of Two Artworks. *The York Times*. Retrieved September 9, 2006, from LexisNexis Academic database.

iv. **Protecting Works of Art from Humans**

Destruction of works of art through vandalism and by accident happens increasingly in museums. It is a growing concern and many museum professionals are doing everything they can to prevent such acts and to protect their collections from these potential problems. It had been mentioned in previous sections how to prevent insects and mice from infesting museum environments but what are the ways in which museums can prevent this new museum pest, the human, from motivated and accidental destruction of art? The best way to do these things is to really think about the ways objects should be displayed and what security methods will be taken.

According to Keck, one of the first things that all museums should do if they have not done so already is to train any employee that might potentially need to “move, hold, or lift”⁴² objects in how to properly handle the objects in its museum. Many accidental breaks are caused because the person handling the object did not know how to handle it in the first place. Luckily with the proper training these types of accidents can mostly be avoided.

The next step a museum can take to prevent accidents and vandalism by pest like people is to think hard about how they are going to display certain objects. They should take into account an object’s value and fragility. Is it something that can be replaced or fixed if an accident or an act of vandalism occurs? Or is it something that is one of a kind, extremely valuable, and would cost the museum a lot of money if damaged? Just by asking these simple questions a museum can figure out which objects need to be placed in secure cases or need added security.

⁴² Keck, Caroline, Block, H., Chapman, J., Lawton, J., and Stolow, N. (1966). *A Primer on Museum Security*. New York: New York Historical Association. pg. 70.

Assessing the fragility and the value of an object will also help museum staff decide where an object should be placed in a museum. If an object is extremely rare and fragile you certainly do not want to place it in the middle of the room on a pedestal without any case or ropes to prevent people from bumping into it. Take for instance the example of the Qing Dynasty vases at the Fitzwilliam Museum. Although the vases sat on the window sill at the bottom of the stairs for almost forty years, their breakage could have been prevented if the museum thought about the display of the vases. I am sure that the Fitzwilliam Museum, as well as most other museums, will start thinking about what other objects in its holdings might be vulnerable to accidental damage or vandalism.

After the museum understands the proper places and ways to display each of its objects, it can decide what security measures to take to protect them. The best thing that the museum can do is to keep a watchful eye on all of its visitors. Whether this is through roaming security guards or through video surveillance, the museum should monitor its visitors. Security guards in the exhibition spaces are probably the best way to prevent people from touching or defacing works of art due to the fact that their presence may stop people in the act before or while it is happening.

When sixty museum professionals were asked whether or not their museums used security guards to prevent damage caused by visitors, only thirty nine of the museums said that they did have them on staff. If a museum can not afford to hire security guards, it could train its volunteers and other staff to keep a watchful eye on those visitors who tend to get a little too close to the objects.

Proper training for security guards is very important. They should be trained on the effects that a person's touch could have on the objects in the museum and the

importance of preserving the objects. Security guards who are not trained in this way may not have the proper respect for the objects and therefore might not care if a person touches something or not. For instance, I was walking through a Duane Hanson exhibition, not too long ago, and saw a woman move a magazine on the table of his *Self Portrait with Model* (the one with Duane and a woman seated at a table eating ice cream). I was in complete shock that a woman her age did not know better. I immediately walked up to the security guard and told him what I saw and suggested that he keep an eye on her. He responded by saying that people do that all the time because they want to get a glimpse of the headlines on the newspaper. I couldn't believe that he said this to me. It was almost as if he was saying go ahead touch everything, I do not care.

There are many other ways to secure areas of the museum and to attempt to prevent visitors from damaging objects. Most museums use some type of device to separate the visitors from the works of art. Some examples are rails, ropes, motion detectors with alarms, and display cases. The museum might also put up signs asking visitors not to touch the objects.

The examples throughout this chapter have demonstrated that humans can cause a tremendous amount of damage to objects in museum environments. Whether the damage is motivated or accidental, it is safe to say that it happens quite often in museums. Most museums are becoming aware that insect and mice infestations are not the only problem when it comes to pests. They are starting to see that accidents such as a man tripping on his shoelaces and destroying a set of priceless vases or a couple of teenagers walking into the museum with spray paint and tagging up the objects can be just as bad, if not worse, than the damage an insect can cause to an object. Museum professionals also realize that,

if they do not take the proper security measures, things like this will continue to happen and might happen more often.

IV. Conclusion

Insects started out as part of the collection in the early museums, known as cabinets of curiosities. Charles Wilson Peale and P. T. Barnum are two men who had a desire for gaining knowledge and collecting the strange and exotic. That is why it is no coincidence that both of their museums contained insects from local and distant locations.

The tradition of collecting insects continued with the Museum of Jurassic Technology. Within its collection are micro-mosaics constructed entirely out of butterfly wings and its famous Cameroonian stink ant. One of the most famous insect collections, containing over 17 million specimens within the entomology department, can be found at the American Museum of Natural History in New York City.

Today, collecting is not the only concern when it comes to insects. Museum professionals are also starting to realize the importance of having an integrated pest management plan (IPM) at their museums. By implementing an IPM plan, they are forcing themselves to take better care of the objects in their collections. Taking the time to learn the different “calling cards” of certain insects will allow museum professionals to identify problems and prevent certain damage. From there, professionals will then know what corrective steps to take if an infestation occurs.

Museum professionals can continue to learn about insect infestations by taking a look at case studies from other museums. From these studies, professionals can learn mistakes other museums made or better ways to handle infestations, especially on a low budget. For instance, the case of Museum X and the moth infestation, shows museums professionals an innovative way to correct an insect problem on a low budget.

Damage to collections is not only caused by insects but is also caused by visitors and museum staff. The damage caused by insects is created for the purpose of their survival. Museum objects become homes or meals for insects. Unlike the damage created by insects, the damage caused by humans is either motivated or accidental, not for survival. In my mind this makes humans the worse pests in museums.

Just as with insects, museum professionals can take precautionary measures to prevent motivated and accidental destruction within their museums. Surveillance cameras, security guards, protective cases, ropes, and other barriers can prevent destruction by graffiti or someone falling into an object. However, it is up to the museum to understand its collection, predict what potentially could happen, and take the steps to make sure that destruction does not occur.

It is almost impossible to decide whether insects or humans cause more damage to museum collections. We tend to hear more about insect damage because it seems that at some point every museum has a problem with insects, whether it is in its own collection or brought in with a loaned object. Damage caused by visitors sometimes goes unnoticed or is unworthy of mention to the general public. Staff damage is usually kept a secret from the public as to not jeopardize the museum's ability to care for the collection.

When it comes down to it, museums deal with pests everyday. It may be in the traditional way of thinking of pests, as destructive insects, or it may be potential destruction caused by visitors or staff that museums deal with on a day to day basis. Whichever pest museums have, museum professionals need to be equally concerned about both.

Appendix A

The following survey was posted on the list-serve of the American Association of Museums Registrars. I received sixty responses. The original survey is in bold. The responses are in normal type.

Pests in Museum Environments Survey

To find out how many museums have an Integrated Pest Management plan in place, what type of pests they have had and the steps taken to prevent and correct pest problems.

1. **What state is your museum, historical society, gallery, etc. located in?**

2. **Does your institution currently have an Integrated Pest Management plan in place?**

<input type="checkbox"/> Yes	47 answered
<input type="checkbox"/> No	13 answered

3. **Have you had pest problems in the past:**

<input type="checkbox"/> Year	20 answered
<input type="checkbox"/> Six Months	7 answered
<input type="checkbox"/> Month	4 answered
<input type="checkbox"/> Presently have problems	18 answered
<input type="checkbox"/> No Problem	6 answered

4. **What types of pests have you had in the past or currently have? (Check all that apply. If checking other, please type your pest in the blank field)**

<input type="checkbox"/> Moths	22 answered
<input type="checkbox"/> Beetles	27 answered
<input type="checkbox"/> Silverfish	26 answered
<input type="checkbox"/> Booklouse	3 answered
<input type="checkbox"/> Cockroaches	21 answered
<input type="checkbox"/> Mice	31 answered
<input type="checkbox"/> Humans	17 answered
<input type="checkbox"/> Other	20 answered: carpenter ants, carpenter bees, mites, ants, flies, spiders, crickets, rats, centipedes, scorpions, mold, fleas, bats, raccoons, palmetto bugs, pigeons, termites.

5. What measures does your institution take to prevent pests? (Check all that apply)

- | | |
|---|--------------|
| <input type="checkbox"/> HVAC System | 42 answered |
| <input type="checkbox"/> Visual Inspection of Environment | 55 answered |
| <input type="checkbox"/> Sticky Traps | 49 answered |
| <input type="checkbox"/> Pheromone Traps | 15 answered |
| <input type="checkbox"/> Exterior Chemical Repellents | 26 answered |
| <input type="checkbox"/> Interior Chemical Repellents | 17 answered |
| <input type="checkbox"/> Mouse Traps | 29 answered |
| <input type="checkbox"/> Regular Garbage Removal | 56 answered |
| <input type="checkbox"/> Regular Housekeeping (cleaning of environment) | 56 answered |
| <input type="checkbox"/> Other | 12 answered: |
- vacuuming, physical examination, freezing, sealing openings, isolation of specimens, staff training, physical barriers, and restrictions on food locations.

6. What does your institution do to correct pest problems once they have occurred? (check all that apply)

- | | |
|---|--|
| <input type="checkbox"/> Chemical Treatments | 26 answered |
| <input type="checkbox"/> Vacuuming | 51 answered |
| <input type="checkbox"/> Mouse Traps | 27 answered |
| <input type="checkbox"/> Sticky/Pheromone Traps | 32 answered |
| <input type="checkbox"/> Freezing | 36 answered |
| <input type="checkbox"/> Oxygen Deprivation | 16 answered |
| <input type="checkbox"/> Fumigation (toxic gases) | 11 answered |
| <input type="checkbox"/> Other | 5 answered: professional service, exterior sprays, stomping, caulking, whining about door seals, |

7. Does your institution have unresolved pest problems due to limited funding?

- | | |
|------------------------------|-------------|
| <input type="checkbox"/> Yes | 15 answered |
| <input type="checkbox"/> No | 45 answered |

8. Has your institution used improper pest management techniques due to limited funding? In other words, taken matters into your own hands instead of hiring a professional.

- | | |
|------------------------------|-------------|
| <input type="checkbox"/> Yes | 11 answered |
| <input type="checkbox"/> No | 48 answered |

9. If you would like to give an example of how your institution has taken pest problems into their own hands due to limited funding please do so below.

Freezing items ourselves in a -20F freezer rather than going to a professional.

I think that limited funding, resulting in limited staff has impacted what we can do ourselves. We would like to be able to do more frequent vacuuming and inspect our sticky traps more frequently. I am not sure what you mean by a professional. In most cases, taking the problems into our own hands is better for the collections and staff than hiring an exterminator. We consult with conservators and entomologists when needed.

Re:8 The choice seems to be between professional treatment and staff treatment, with the implication that all staff treatment is bad. I prefer staff treatment to your standard pest control professional, who usually lacks experience in museum settings. We lack time to do the basics of pest management- cleaning and sealing, but would certainly prefer to do it ourselves rather than hire a professional.

Examples listed above, certified staff member for applying chemicals when needed.

A while ago we used OLD pest strips; instead of low-oxygen treatment. Our conservator has been using these toxic things for decades and they came in handy. Our problem was with a Tule boat bound with grape vine. The bugs LOVE the grape vine!

Regular inspection of the premises and sprays

Museum building has windows next to the collections but limited funding prevents us to cover them up.

During a beetle infestation we had over 35 large mounts infested with carpet beetles. WE contacted a local bait company and after bagging all of the mounts, moved them into their deep freezers. Unfortunately, due to the distance they had to travel (the freezer was in an old ammunitions bunker and our area was at the back of the fourth bay), and the difficulty in getting through some tight places, two of the mounts were damaged in the move in and out of the area. We also had no control over security, but that did not turn out to be a problem. Previously, we have used PDB since our freezers are not large enough to hold birds of prey.

The University now has an IPM specialist for the entire campus (dorms, kitchens, labs, etc.) Prior to the IPM specialist & our IPM plan, museum staff used naphthalene and PDB on individual objects because it was available through the entomology section of the museum.

We just don't have staff enough to do the visual checks and change sticky traps like we used to.

10. Has there been damage caused to the collection by visitors or staff? (Check all that apply)

- | | |
|---|-------------|
| <input type="checkbox"/> Visitor | 27 answered |
| <input type="checkbox"/> Staff | 31 answered |
| <input type="checkbox"/> No damage caused | 18 answered |

11. If there was damage caused by visitors or by staff did your institution need to spend money to repair the object?

- | | |
|------------------------------|-------------|
| <input type="checkbox"/> Yes | 32 answered |
| <input type="checkbox"/> No | 19 answered |

12. If you would like to give an example of damage caused by visitors or staff please do so below.

Visitor: visitor bumped into a pedestal that a wooden sculpture was resting on; the sculpture fell to the ground and sustained minor damage. Staff has caused damage to works on several occasions when moving, packing and installing them.

The director wanted to use a piece that was on exhibit in a photograph and when the object was moved it was damaged. It had to be removed from the exhibit and taken in for conservation, then returned to exhibit.

These have been minor accidents caused in storage, due basically to staff negligence.

A visitor stuck gum on a painting. A visitor tried to move a part on a sculpture that wasn't a movable part, thus broke the part off.

Visitor related damage has been confined to people climbing on outdoor sculpture.

Occasionally, something gets broken during exhibit installation (within the last 6-8 years, a ceramic plate and a contemporary kachina).

A few objects were damaged when our entire collection was moved offsite for a renovation.

A visitor made a mark on a painting with a ballpoint pen while it was on display.

An old woman with a cane knocked a glass sculpture once and cracked it. A girl punched a painting in the nose once (a nose was the center of the painting)

Most of the damage by visitors and non-museum staff is cumulative wear/mishandling which has not been singled out, or required repair.

People sitting on splint seat chair.

Young volunteer picked up heavy metal object wrong way, didn't realize it, dropped it, broke some of the levers; we had repaired. Table broken and mended poorly - no way to know when!

Poor handling resulted in breakage.

Fingerprints on intentionally unglazed work (visitors); unglazed piece dropped (temporary staff)

Ladder damaged a painting

Wear and tear of objects that are used for teaching/education for university classes

Visitors - theft of parts, damage caused by touching and skin oils, putting children on top of sculptures and other exhibit items for that great photo; Staff - breakage from moving and handling objects, damage when accessioned objects are mistaken for hands-on education materials.

Sculpture touched and small piece was broken

Usually breakage from housekeeping, or visitor carelessness

We have a staff member who is simply careless around artifacts. She has crashed a cart into the side of a trunk, scratching it. She has stepped on things and broken them. She has knocked furniture over into the side of a cabinet. We haven't had several incidents with her. I am trying to fix this somehow, but carelessness by another staff member is difficult to fix if they don't recognize it as a problem.

Handle broken off 1929 Olds model six - due to negligence while moving.

A visitor sat in a roped off historic chair (sat through the seat!) Children scratched historic bronze and iron cannon tubes as they climbed on them Visitors have soiled plaster busts by touching noses (anything that protrudes); visitors have promoted corrosion of bronze busts in the same way Researchers have damaged archival materials and rare books through improper use (soiled and/or torn pages; broken bindings; scratched leather cover boards).

Many years ago we had a visitor scratch initials into a bronze sculpture. We had a young visitor hit a painting (hard) with his hand. A staff member knocked a small carving off a shelf onto the floor, breaking the carving. A staff member used the wrong cleaning agent on a piece and caused irreversible damage.

Maintenance men decided to bring boards up stairwell (as it was icy outside) and knocked a painting off the wall. Painting was conserved. Collections staff dropped a glass Christmas ornament while inventorying it. Ornament was de-accessioned and discarded.

Our staff is part-time and temporary (i.e., students). We provide training but very occasionally a student breaks an object usually by clumsy handling.

Vandalism by visitors to exterior sculpture. Accidents with artwork have rarely happened with staff members.

Claws ripped off taxidermy bear mount

13. Does your institution use any of the following to prevent damage caused by visitors? (Please check all that apply)

- | | |
|---|--|
| <input type="checkbox"/> Security Guards | 39 answered |
| <input type="checkbox"/> Security Cameras | 40 answered |
| <input type="checkbox"/> Barrier Rails or Ropes | 50 answered |
| <input type="checkbox"/> Plexi or Glass Display Cases | 56 answered |
| <input type="checkbox"/> Other | 13 answered: motion detectors, don't touch signs, alarms, guides with groups, glazed paintings, locks, volunteers. |

14. Do you feel that more damage to objects in your institution is caused by humans rather than by insects or mice?

- | | |
|------------------------------|-------------|
| <input type="checkbox"/> Yes | 35 answered |
| <input type="checkbox"/> No | 23 answered |

15. After answering the previous four questions would you consider humans to be pests?

- | | |
|------------------------------|-------------|
| <input type="checkbox"/> Yes | 33 answered |
| <input type="checkbox"/> No | 27 answered |

Appendix B

Yahoo! Answers is a website that was introduced in 2006. The site provides a forum in which anyone from around the world can post and answer each others' questions anonymously. In hopes to receive some real life examples of the destruction of art in museum environments, I posted the following question:

Destruction of objects in museum environments?

Part of my thesis for graduate school is on the destruction of objects in museum environments caused by visitors or staff. I am looking for real life examples of people destroying works of art. Have you ever witnessed anyone touching, writing on, climbing on, etc. a work of art in a museum or museum like setting? Have you ever seen someone disregard ropes or other barriers to get a closer look at a work of art? Have you ever seen anyone leave garbage behind? Take flash photography? Have you ever witnessed a security guard reprimanding someone for any of these things? If you have seen someone do something along these lines or if you have done any of those things could you give me an example? I would really appreciate it. (If you have done any of these things I will not think less of you and will not include any names or screen names in my paper) Thank you in advance.

Below are the responses I received, exactly how I received them.

I have been to several museums of various kinds and three art galleries in the last year. At one art gallery there was a sculpture so enchanting to me I could not help but touch it.. It was a bronze statue of "The Balinese Princess" by Norman Lindsay in the Lindsay Gallery that was his former home in NSW, Australia. In another gallery I stepped around the guard rail to have a closer view of a section of a painting. INear Gosford NSW there is an art gallery that has many sculptures outdoors and some of these I touched. I do try to remind myself that these works of art can be affected by the oils on my hands and by too much physical attention, but every now and then I am drawn to be more at one with a work of art. As for museums I do not touch items on display unless it is an item that is displayed for the purpose of touching it. I don't eat or drink in galleries or museums so don't spill anything. I generally use the bins available or take my rubbish with me if there are no bins, sometimes around outdoor displays there are no butt bins for my cigarette butts so I place the butts back in my packet when I'm finished to dispose of elsewhere.

No, I have never touched a work of art, defaced it or anything like that. I have gone past the ropes to get a closer look, however. There are always security guards around. If I find someone taking pictures, I report it to the guard. The flash from photos can damage the finish of the artwork. Cell phones are the biggest interlopers nowadays.

I usually visit museums with my husband and children and we are very careful to obey any and all posted rules. We do not cross ropes or handle and touch the items and displays. Although, one time we were at a large outdoor sculpture park, and I took a photo of my kids all standing around a bronze dragon, before we noticed the "do not touch" sign. Oops.

Hi I love Museums of all types from the Bazaar like Ripley's to the classical art museums like the Louvre (been there) to answer your questions I like the hands on exhibits the best and sculpture more than paintings I have ignored the ropes and was never bothered or asked to step back . You do see guards but mostly for show or to keep the kids with ice cream at bay. I would never eat at a museum unless it was a kid type and would never leave trash (I don't even do that at McDonald's . It saddens me to see that much disrespect for the museum.

I usually visit the museum together with my children and through visiting I used to teach them every thing about it such as how read the notes about it and how obey the rules. To me the museums, historical societies , etc are holly places.

I straightened a picture in the National Modern Art Museum of Brazil in Niteroi. A security guard saw me but was indifferent. You've seen the building, it's in the American Express ads on TV. It looks like a UFO.

Never climbed/touched/wrote on a work of art.

Never left behind garbage or spilled anything.

Never ignored guardrails etc.

Yeah, there were security guards, but they were friendly. When asked about something, the responses showed that they knew more about the artifact than the tour guides.

amused

Not only have I never done anything like that, I've never seen any evidence of vandalism/disrespect in a museum. I've been to museums in New York City, Washington DC, New Orleans, Mobile (Alabama), Gulfport (Mississippi), Memphis, and Okinawa (Japan). They were all great, and there were always guards around who didn't seem to have much to do besides answer questions.

I have done all the stuff ,but why should I tell U.

The thing that I frequently see when visiting museums is how close some people try to get to some objects to have their picture taken, particularly statues and large paintings. In some cases, I've even seen people look around first to see if there is a security guard observing them. They'll drape their arm over the object, or sit on it, or otherwise try to pose with it in a manner that puts them into physical contact with it. And yes, I've seen guards come hurrying to stop them. Quite often, even when there are signs posted everywhere telling them not to do so, I see people using their flash to take pictures of fragile objects, then hiding the camera or moving away when a guard comes to investigate the flash.

Interesting topic for a paper. I was in Athens' Archeological Museum last month and I did touch a couple of statues. On one occasion the security guard saw me but she just nodded as if saying "just don't let the other guards see you". It could be because we were both Greek, I don't know how she would have acted if I was a tourist. Now, I know it's not what you're looking for, but here's some food for thought: Did you know there are museums for the blind? In there you are welcome to touch everything. I wonder how it is. Also, how about the bad things that happen to artifacts due to museum personnel? I know that some Greek statues and ancient works of art in foreign museums were irreparably discolored after being scrubbed with chlorine and steel brushes (!) for cleaning.

I admit...I am guilty. On a trip to Europe during my senior year in college, we of course hit a lot of museums. By and large we were all very good, but... We stopped at a museum of musical instruments in Vienna, and being a bunch of music students, had a hard time keeping our fingers off of them. I remember running my hand over the case of a clavichord and being asked by the docent not to touch. And then we hit the Louvre. I took a flash photo of the Venus de Milo, which I don't think was a big deal because there's no paint on her, but I also took a flash photo of The Coronation of Napoleon, which in retrospect was stupid, because the painting is simply huge, and there was no way I was able to get it all into frame (this is before the days of digital cameras, so I thought I might get lucky).

My little brother-in-law once touched Seurat's Sunday in the Park... He was only 5 though and it was his first time in a museum and he didn't know you couldn't touch them! This past spring in NYC the flash on my camera kept going off accidentally whenever I'd try to take a photo at the Met.... I eventually just stopped trying because I knew it was bad for the pieces on display... that and every time it happened (twice) the guards yelled bloody murder at me!

I once smacked my sticky seven-year old hand on a 3000 year old Egyptian sarcophagus at the Boston MFA, and an ancient security guard once told my friend to not point so close at a Rest on The Flight To Egypt at the MFA (don't remember artist) I always see people standing WAY too close to the paintings- what I think is really funny is that a lot of the time the paintings are impressionist and are better viewed from a distance.

Oh my yes! People climbing over ropes to go sit on the horse in armor at Warwick Castle, for one. Parents letting their kids run loose and nearly knocking another person into one of those big dinosaur exhibits. And some dumb idiot TOUCHING pieces of the Egyptian Exhibit at the First Center in Nashville right now. Lord, thought the guards were going to have an entire litter of kittens claws first!

Yes I have gone past those barriers to get a closer look. Because my glasses do not correct my vision to 20/20 or even 20/60. I do enjoy art and sometimes being able to see the brush strokes preserved on the canvas is a way of connecting with that master as they worked. I also enjoy the sculpture display for the blind that was replicated through computer and laser cutting to make almost perfect duplicates that allowed the blind to touch the scepters all they wanted. Art is not only a visual medium.

There was that famous case in England a year or two ago, where the man coming down the stairs knocked over a vase. I am a professional in my 40s. I have traveled some and have spent a great deal of time in the museums of Paris, New York and Washington D.C. Generally people have behaved well. I suppose if someone wanted to be destructive they could be, if they didn't care if they were caught. Unfortunately, just about the only thing that prevents bad acts in general is the fear of punishment, or harm to one's self.

I don't know why, but whenever I visit Italy and go to a museum, it never fails that someone is being reprimanded for going through the ropes or touching art...usually Americans! I'm an American and it's just rude and obnoxious!

I've done all those things and more.....

I have not, nor would I ever do that, but there was a recent story (probably in the last month or so) of a kid who was on a field trip who put his piece of chewed gum on a painting. I have also seen security guards reprimanding people for standing beyond the ropes or taking flash pictures. Visit the Louvre sometime, or the Sistine Chapel; there are signs EVERYWHERE in six languages asking you to stay behind the ropes and not to take flash photography because the light of the flash will gradually fade the paint, and there are a zillion tourists with flash bulbs going off and maybe two security guards yelling at each and every one of them. This is why the Mona Lisa is displayed behind this clear acrylic shield; if you try to take a flash photo of her, all you get is a reflection of the flash. I've also seen (in Florence) somebody just stand there and watch their kid try to climb onto the replica of the statue of David; granted, it's a replica and not the real thing, but it's still a museum piece, and if they really wanted you to stand next to it, they'd probably charge a price to get your picture with David rather than roping it off.

I have a friend who works in an art museum. One really egregious incident, aside from flash-photography was an elderly couple who would be presumed old enough to know not to touch the work, especially with the "Please do not touch" signs. Anyway, the couple, a man and woman, were looking at some art done on an evidently intriguing medium, not canvas. The man quickly extended his hand and thumped the piece with his finger, audibly. "Yep, its wood!", he pronounced his verdict. My friend fumed, but didn't say much to the people because of their age. He has assured me he will not be so tolerant in the future. Touring a museum in D.C. (I can't remember which one) with this same friend and others, we were darkly amused at how the dark-green patina had disappeared from the now shiny bronze penis of the statue within reach.

When at The Louvre in Paris in 1984, I was astonished at the number of people taking flash photos in and around the more famous works, especially the Mona Lisa. I understand that the museum has now constructed a special housing that protects that specific work from light, including camera flashes. In my experience there, the guards made a concerted effort to prevent flash photography, but they failed due to the sheer number of people making the attempt. As a local museum (VA Museum of Fine Art in Richmond), we had a showing of French impressionist art (~2002), and many patrons ignored the ropes and "leaned over" to get a better view. Inevitably, several people lost balance and touched the painting, either with their heads or hands (trying to catch themselves), and to my relief and amazement, there was no visible damage. However, there was also effort by the museum staff to prevent this behavior, and despite my complaints, I did not see anyone removed from the museum. Amazingly, there were many rooms in which there wasn't even a guard present.

I had a friend (no longer is) who reached across a rope to touch a Picasso at the Cleveland Museum of Art. Luckily, an alarm sounded and he was removed before he could touch it. Also, read about a kid on a field trip in Detroit who put gum on a work. It's going to cost quite a bit to fix.

A couple of years ago, I was taking an Australian friend around Hampton Court Palace. She lifted her camera to take a photograph in the Great Hall, but was immediately pounced on by a security guard who quietly told her photography was not allowed.

In 2000 my daughter and I were in Paris and went to the Louvre (as one does in Paris) before we went in I told her that she would not be allowed to take flash photos. But I was mistaken because once in I was amazed to see people taking flash photos all over the place of every thing from the Mona Lisa down.

I was at the National Holocaust Museum and the guy there said that some kids were horse playing one time and damaged a door that was used in a concentration camp. The school was asked to never return.

I see people taking flash pictures at museums all the time.

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