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Inside: "Sue" Relocated at the Field Museum

Plus: The Practice of Art Conservation, Myths about Technology in Museums, The Use of Gender Neutral Language in Museums, and MORE!

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Three Myths About Technology in Museum Experiences

By Eli Kuslansky

INTRODUCTION

When you mention multimedia to most museum professionals, certain narratives immediately come to mind about what multimedia is in a museum experience. Narratives like, media is all screen based, there is no technology in children's museums, interactives break frequently, technology gets obsolete fast and it is expensive to keep content fresh, stem from a museum professional's personal experiences, from what they hear from colleagues and what they read about in industry press. While their assumptions are understandable, they are not necessarily true. Here are three myths about technology in the museums, along with ways to expand your thinking about them.

MYTH #1 - TECHNOOGY IS ALL ABOUT SCREENS!

For many, applications, such as large-scale media walls, touch tables, kiosks with collection and narrative content, screens are very effective interpretive tools. While the pictures-under-glass is one of the most common interfaces for human computer interaction, it is a pretty poor metaphor for the rich choreography of our different sensory interactions with the natural world (Victor, 2011).

Screen-based interactive media exhibits grace the floors of myriad museums throughout the world. In traditional exhibits, they display more in-depth content than what is found on exhibition panels and labels, can be flexible enough to be responsive to different learning styles and levels of interest, and offer a rich visual and dynamic dimension to a collection or a topic.

Screens are just one of a multitude of technologies that can be used for visitors' experiences onsite and online. Along with virtual and augmented reality there are haptic devices that allow visitors to tangibly feel the experience not just see it. There are directional and ambient sounds directed by motion and image sensors. Interpretive options using air, heat, scents, and vibrations, and even drawing visitor's blood using biomedical technology in a radical new approach to a science museum experience.

At Science Gallery in Dublin an exhibit titled Blood Wars was an interdisciplinary art + science experiment that was a tournament between different people's white blood cells as they vied for dominance in a Petri dish (High, 2010). At the Science Gallery, professional phlebotomists took blood samples from visitors, and using biomedical technology, created a series of battles, where the cellular 'winner' of each match would go on to fight the next participant.

Figure 1 (above): Blood Wars, Science Gallery Dublin.
Figure 2 (below): Haptic Interface from Disney Research.

Haptic interfaces are another great way to connect the physical experience to the virtual one. In a research project created by Disney Research in Pittsburgh, this haptic interface allows a person to slide their finger across a topographic map displayed on a touch screen. As they move their finger across the screen, they can feel the bumps and curves of hills and valleys, despite the screen's smooth surface. This is done with the aid of a novel algorithm created by for tactile rendering of 3D features and textures.

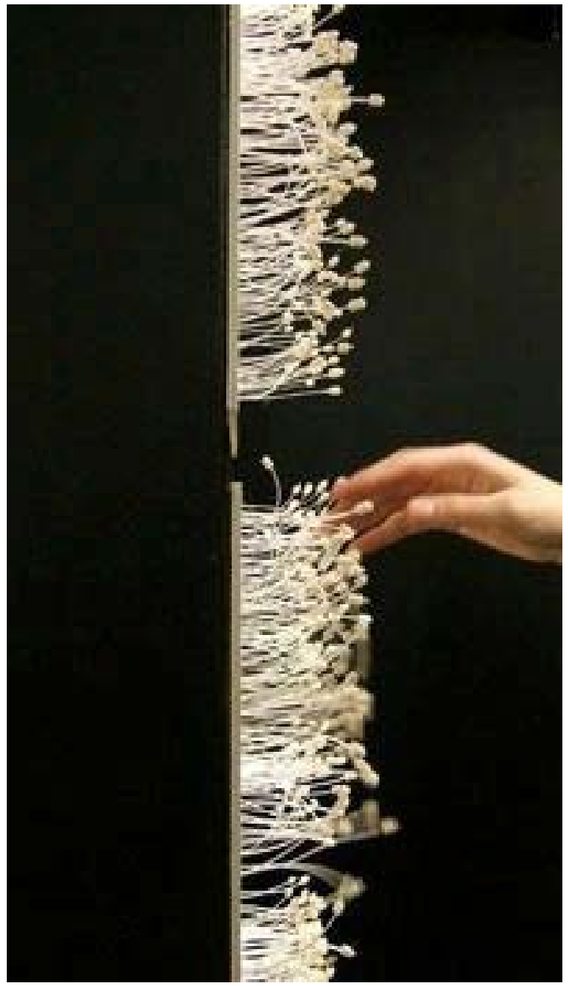
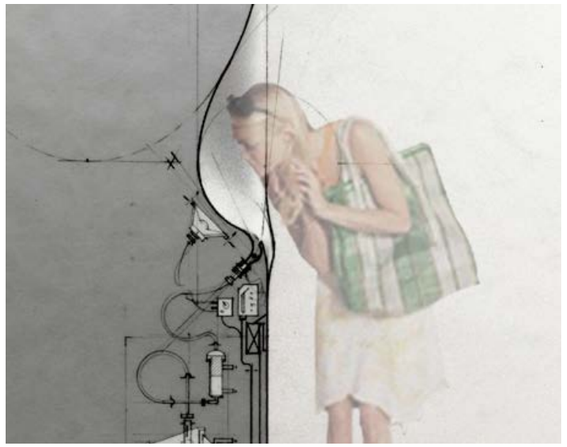


Figure 3: Haptic touch panel – The Sound of Materials, Masayo Ave, Sensory Experience Design Laboratory Haptic Interface Design Institute, SED.Lab was founded in 2017 by Masayo Ave as a cross-disciplinary design R&D platform in which interconnects design R&D projects and human senses and sensory experiences. https://www.masayoavecreation.org/sed-lab.

Of the five senses, touch, sight, hearing, taste and smell, only sight and touch are most commonly used in interactive exhibits. One exhibit, The Art of Scent on exhibit at the Museum of Art and Design in New York City from November 2011 through March 2013, broke that mold by being among the first museum exhibitions to focus on the olfactory arts. The Art of Scent looks at the design of perfume as a significant creative practice and how the advent of new technology has led to unprecedented materials and processes. In one gallery at The Art of Scent, visitors enter what seems to be an empty white gallery punctuated by a series of twelve indented sculpted wall alcoves. Visitors are invited to lean into the wall, where sensors trigger the release of a scented stream of air. Augmenting the experience, the organic wall surface pulses with sound and ghostly text projections.

Figure 4 & 5 (above and below). The Art of Scent Exhibit, Museum of Art and Design.



Another promising interpretive technique are hybrids where two or more senses are engaged to create a unique experience. Here are two examples.

Bristol University's Department of Computer Science has developed a new user interface using 3D holograms that users can touch and feel in mid-air. This system is called UltraHaptics. It has a device that can pick up ultrasound waves present in the air, condensing them to create a pressure difference that gives the illusion of a touchable 3D object.

Figure 6 (above): Ultrahaptics, Hybrid Haptic/Augmented Reality Interface.

Figure 7 (below): 7 Voice Array art installation, Rafael Lozano-Hemmer.

Voice Array is an art installation by artist Rafael Lozano-Hemmer commissioned by the Museum of Contemporary Art, Sydney, Australia and presented in multiple museums. Here is his description: "As a participant speaks into an intercom, his or her voice is automatically translated into flashes of light and then the unique blinking pattern is stored as a loop in the first light of the array. Each new recording pushes all previous recordings one position down and gradually one can hear the cumulative sound of the 288 previous recordings. The voice that was pushed out of the array can then be heard by itself" (Lozano-Hemmer 2011).

One interface that pushes boundaries and holds both great promise and challenges is what we call conversational interfaces. This interface combines an RFID tagging system with artificial intelligence and machine learning. The first known installation was for the Museum of Tomorrow, a science museum in the city of Rio de Janeiro, Brazil. The promise of machine learning and artificial intelligence is an unprecedented level of engagement with visitors by connecting them dynamically to the content and collections according to their learning style and type and level of interest. The challenges are how to handle privacy concerns. While most museums keep some level of personal data on patrons, members and donors, other museums track the movements of visitors using technology like apps and sensors. This visitor data is typically anonymized. By adding artificial intelligence with facial recognition brings up a new level of data privacy issues that will need to be addressed before AI in museums becomes more ubiquitous. While controversial, if done right, using AI in museum experiences holds great promise (Microsoft). For example, at the Musweb 2019 conference, Microsoft has started a Community of Practice for AI for museums. This illustrates the tech industry interest in supporting and piloting projects in the museum field, primarily as lead in to their services.

MYTH #2 — WE CAN'T DO IT BECAUSE...

All museums have a certain amount of resources, from staff, funding, learning and educational goals, to business goals, and technological capabilities. They generate projects from assumptions based on criteria like those listed above. Most exhibits are developed over a three to five-year period and are created out of what museum staff believe is possible. In an environment of rapidly changing audience needs and interests, Generation Z's ways of experiencing the world (corporeally, augmented, and virtually), and society's uses of technology and social media, to remain relevant, museums need to rethink their strategies for how they use technology in exhibits (Kuslansky, 2016). This could mean coming up with a more rapid and dynamic exhibit and educational design processes, making more dynamic connections between on floor exhibits and online experiences, and busting assumptions about what's possible. With these changing dynamics, it is no mystery museums have to change.

Many museums, especially ones that are mid-size and smaller, rightly believe that there are media and technology experiences that they cannot afford to build and maintain by themselves. Thinking outside the box, (or as we at Unified Field like calling it thinking without a box), allows mid-size and smaller museums to consider building projects in partnership not only with other museums, but with libraries, higher educational institutions and corporations and other organizations that have aligned vested interest,

and finding ways to do dynamic content and negotiating maintenance contracts for not only equipment but content too.

MYTH #3 — WE HAVE A FOCUS ON STEM EDUCATION AND WANT TO EXPAND OUR AUDIENCE

It is key to our nation's success to educate more engineers, scientists, architects, and mathematicians, through STEM (science, technology, engineering, math) education, as we are behind other nations. For many museums, in particular science centers, they're focused on STEM education. Understandable and notable, the focus on STEM education, while important, leaves out a sizable percentage of museum's potential visitor growth and inclusivity.

According to the US Bureau of Labor, there were nearly 8.6 million STEM jobs in May 2015, representing 6.2 percent of U.S. employment (Fayer, Lacey and Watson, 2017). Expected to grow to over 24 percent in the next few years, STEM careers still represent a small percentage of the US workforce. That still doesn't mean there is not a need for some level or proficiency or conversance in STEM related topics. The question remains- how does a museum or science center generate some level of STEM education into its exhibits and programs for people who are either not interested in science and math, or are actually opposed to them? From our experience, we've found that getting people engaged in activity that matches their level of interest, has emotional resonance, and relevance for the their demographic and lives, it then becomes easier to slip in the aspects of an experience that has STEM components. It's a little like the way magicians use misdirection to shift your focus while the real trick happens in the other hand.

This could take the form of interactive games for teaching data literacy, location based interactives that visitors outside the museum's walls, and creating value added content and programs that visitors can use in their daily lives.

CONCLUSION

Research has shown that middle managers and focus groups are terrible at considering original ideas. In a Stanford University study on circus performers, Justin Berg found that test audiences are no better than middle managers at predicting the success of new ideas, while focus groups are effectively set up to make the same mistakes as managers. This is true unless they are given the opportunity to develop their own original ideas first (Grant and Sandberg, 2017). Then their ability to consider original ideas goes up exponentially. Getting the full benefit of the promise of technology for the museum experience means going beyond your assumptions of what technology can and cannot do, being open to original ideas, holding ideation sessions, and looking for the right partners to develop and sustain your exhibits and programs. This can dispel the myths about technology, and open a whole new world of possibilities.

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"Sue" the Iconic Tyrannosaurus rex Relocated and More Fully Interpreted in the Field Museum, Chicago

By Robert Mac West

In 1997 the Field Museum of Natural History paid Sotheby's auction house $8.4 million for a truly remarkable skeleton specimen of the dinosaur *Tyrannosaurus rex*, the immense and truly iconic late Cretaceous (~67 million years ago) carnivore (Brown 1997). This particular remarkably complete specimen (estimated 90% by bulk and ~73% in bones) was given the name Sue in acknowledgement of its 1990 discoverer Sue Hendrickson who recognized the fossil bones in a locality on the Cheyenne River Indian Reservation in western South Dakota (fig. 1).

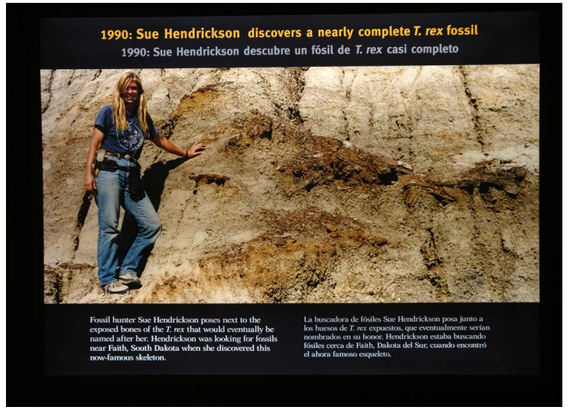

Figure 1: Sue Hendrickson at the T. rex *site, as illustrated in the FMNH exhibit.*

This discussion is based upon my observations of the initial treatment and presentation of Sue as described here, amplified by my late March visit to the new installation in the museum's second floor Evolving Planet gallery.

Despite the specimen's name its gender remains uncertain. Skeletal materials are inadequate for this. Hence, discussions of Sue have encountered numerous grammatical challenges in references to it over the past two decades.

When it arrived in Chicago it required extensive preparation, assembly, and insertion of cast bones where none had been recovered before it was mounted in immense Stanley Field Hall. There it replaced a larger *Brachiosaurus* (herbivorous dinosaur) and along with two mounted

Figure 2: Stanley Field Hall prior to the relocation of Sue.

elephants greeted visitors to the museum (fig 2). Over the course of the 18 years it stood there it became a Chicago icon and according to museum estimates was visited by about 23,000,000 people.

While Sue was entertaining people in Stanley Field Hall the museum in 2006 initiated a much more progressive second floor gallery called Evolving Planet which deals with earth history and paleontology. Space was allocated for Sue but clearly it took quite a while for the relocation to occur. Between February 2018 and late December 2019 Sue was disassembled, somewhat reconfigured, and had skeletal elements added. Recent research had clarified the role of gastralia, which expanded the front part of the rib cage, thus facilitating breathing and making for a more robust animal. It was then installed as the delayed centerpiece of Evolving Planet. It now is indeed a focal point of that gallery.

And finally, Sue's departure from Stanley Field Hall was followed by the installation of a full cast of *Pagagotitan mayorum*, an Argentinian brontosaur that is about 120 feet long and tall enough to look onto the museum's second floor balcony (Figure 3). Quite a difference!

With this history now behind us I want to carefully examine how Sue has quickly become a model for major dino

Figure 3: Stanley Field Hall today with the Pagagotitan mayorum *cast in place.*

saur exhibits, even as other museums are revising their dinosaur/paleontology galleries and new specimens of tyrannosaurids are being found and heavily publicized .

The transfer of Sue from Stanley Field Hall to the Evolving Planet was done in a very public way. And there are numerous online text and video commentaries about the move as well as about both the disassembly in Stanley Field Hall and the configuration of the new setting.

The Evolving Planet galley is organized as a "dead end" with Sue and related materials at the turnabout. Thus, as is shown in a video illustration, visitors literally walk about the dinosaur and experience it and its projected animations from all directions (Vimeo, 2018). This could be done only from a greater distance when the specimen was in Stanley Field Hall but now there is information and answers to common questions readily available and strategically located. In short, the experience with Sue and its importance in the understanding of dinosaurs is more intimate and relevant than before.

The museum calls the new 5,100 square foot location of Sue its "private suite" which, upon some reflection, conveys the message that the *T. rex* (probably the only dinosaur that has an abbreviated genus name followed by the full species name – and maybe the only dinosaur whose species name is more recognizable than the genus name) now is appropriately and solely housed. The specimen is located at the appropriate place in the geo-chronology of Evolving Planet with the Mesozoic preceding arrival there and the Cenozoic following. Thus the simple fact of the location is helpful to the visitors, as Stanley Field Hall, in the absence of geological or biological references, was not.

Two video presentations are important elements of the new exhibit. Every twenty minutes or so there is a darkening of the gallery followed by a very clear voice-over and

While we look carefully at the new treatment of Sue in Chicago, T. rex is rising elsewhere.

The American Museum of Natural History in New York on March 11 opened the new travelling exhibit "T. rex: The Ultimate Predator". The AMNH exhibit introduces the entire tyrannosaurid family and illustrates T. rex via life-sized models, claimed to be the most scientifically accurate model, as well as fossils and casts. This exhibition features feathered dinosaurs – an area of great interest for the AMNH paleontologists. It includes a VR experience in which visitors build a T. rex skeleton bone-by-bone. Upon completion it becomes a functional beast in its Montana home of 66 million years ago. The exhibition will begin traveling in fall 2020.

In late March paleontologists form the University of Alberta claim that the specimen collected from Saskatchewan is now the world's largest T. rex. The specimen was collected in southern Saskatchewan in 1990 and prepared over an extended time at the University of Alberta. Now it is claimed to be 5% heavier and slightly longer than Sue. A cast of it will go on exhibit in late May at the Royal Saskatchewan Museum in Regina; the first already is displayed at the T. rex Discovery Center in Eastend, near its discovery site.

AV with lights focused on the parts of Sue that are being discussed. Here the visitors learn about the nature of the skeleton, the functions of the various parts of the body, and aberrations in the skeleton that reflect injuries, illnesses, etc., e.g., aspects of the life that Sue led. Much of this presentation provides answers and research updates to questions that were provoked back in Stanley Field Hall but which the museum had no means to respond to.

The other presentation is an ongoing array of imagery on nine-foot tall translucent screens behind the mounted skeleton. They reflect aspects of the life of a *Tyrannosaur* in the biological environment that current researchers regard as accurate (Figure 4).

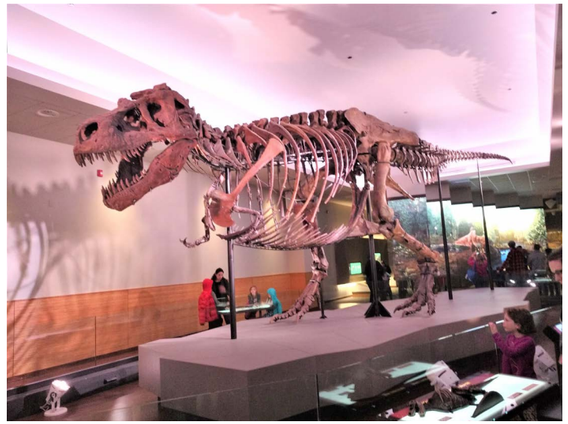

Figure 4: Newly reconstructed Sue in the Evolving Planet gallery. Note the video screens behind the specimen and the prominent gastralia at the bottom of the chest.

The skull on the mounted skeleton is a cast of the actual one which is in an eye-level case separate from the skeleton. It is kept separate (and un-mounted) as research is in process and the close-up views enable visitors to see some interesting details of bone structure, tooth shape and size, etc. (Figure 5)

A message that is implicit throughout the new presentation of Sue is that research is ongoing and, interestingly enough, things that we "knew" in the past have been altered as a result of new research tools and techniques, new comparison specimens, and new information about the geological settings of fossil specimens.

An aspect of current research and interpretations of dinosaurs that is not included here is details about their skin. It is well understood that tyrannosaurs were scaly animals. With that understood, current research is looking into skin colors and textures, with many researchers concluding

Figure 5: Sue's skull, displayed separately from the skeleton with osteological detail visible.

that they had some distinctive coloration (apparent in the animations) as well as fuzzy plumage, with the extreme of this regarding them as at least partially feathered (Brusatte, 2018). This latter interpretation is seen in the new exhibit opened in the American Museum of Natural History in New York. (Figure 6).

Figure 6: Colorful, fuzzy T. rex in the new exhibition at the American Museum of Natural History.

Right now, even with the relocation to the Evolving Planet gallery, Sue remains the most iconic specimen on display in the Field Museum and the one that is sought out by the majority of its visitors. Current calculations are that 80% of all museum visitors make their way to Evolving Planet and at least 57% of all visitors go to see Sue. And ~32,900 people follow Sue on Twitter: @SUEtheTrex.

As the most recent major gallery to open, all the graphics are bilingual. This is clearly an indication of where the Field (and realistically, the museum industry) is heading to better serve its increasingly diverse audience.

The new location and interpretation of Sue stands the Field Museum in very good stead. While it is indeed an iconic specimen, the museum is saying that it also is an important element in ongoing research into life of the past and the museum is obliged to share the results of questions of this ongoing research with its visitors. Thus, a visitor to Sue right now may very well encounter some new data and interpretations when they return in a year or two. And a real challenge to the museum's exhibits and programs staff is to be sure that they are in tune with ongoing research and have ways to ensure that museum presentations are indeed current and accurate.

Special thanks

I appreciate the assistance provided to me for my visit to the Field Museum provided by Hilary Hansen, Senior Project Manager, Exhibitions. After experiencing the exhibition I had a very pleasant and productive meeting with Hilary and Tom Cullen, Post Doctoral Research Scientist in Paleontology; Latoya Flowers, Exhibitions Media Producer; Lisa Geiger, Assistant Exhibition Registrar; Ben Miller, Exhibitions Developer; and Bill Simpson, Head of Geological Collections and Collections Manager, Fossil Vertebrates.

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The Practice of Art Conservation and Exhibition

By Wan-Yu WU and Yu-Jing WANG

CHIMEI Museum, a private museum founded by Mr. Wen-Long Shi in 1992 in Tainan, Taiwan, has been open free to the public for more than two decades. In 2015 the new museum building was built to showcase our comprehensive collections, especially centered on Western art, musical instruments, weaponry and natural history. CHIMEI Museum highly values art conservation and exhibition; therefore we established a Conservation Studio dedicated to the conservation and preservation of artworks.

In 2018, the team curated a permanent exhibition on the subject of art conservation. This exhibition elaborates the sequence of a painting treatment process in hopes to convey the importance and relevance of preserving artworks in an educational way. After an initial assessment by the team of conservators, *The Mandolin Player* was selected as the subject for this case study because of its deteriorating conditions that required extensive treatment. The before and after contrast of the restored painting was then presented to help the visitors better understand art conservation.

This piece of artwork, 46 x 36 in (119 x 93 cm) in size, was painted on canvas by Francesco Oliva, an Italian painter in the 19th century. Since only a few works have been credited to him, there is relatively little known of him other than that he was a teacher at the royal college in Naples, Italy. In his artworks, Oliva preferred to depict life in the countryside, such as musicians or children at play. *The Mandolin Player* is characteristic of his usual subjects.

A preliminary examination of the work found the painting loose and partially deformed (Figure 1). The cracked condition of the painting surface was seen clearly under raking light (Figure 2). Almost the entire paint layer was cracked and warped (Figure 3). The canvas was also affected by pest infestation, so parts of the oil painting separated from the base material canvas. The team also observed the

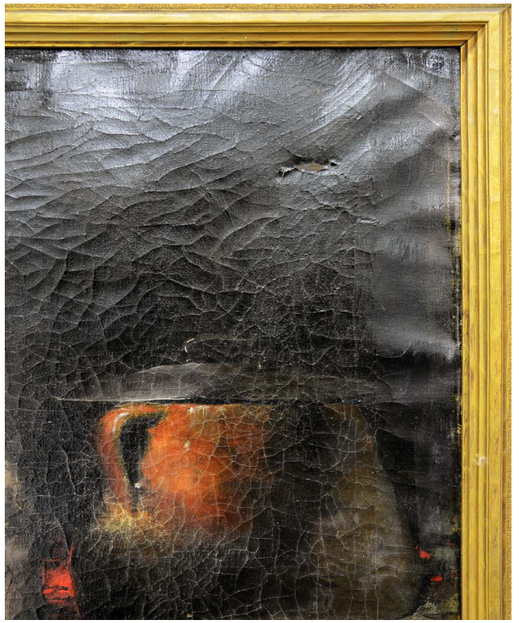
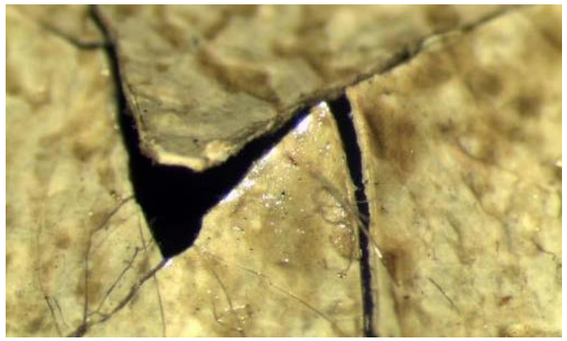


Figure 1 (above): Painting was loose and partially deformed.
Figure 2 (top right): Using raking light, we see the cleavage condition of the painting.
Figure 3 (bottom right): Through scientific examination, we see that the paint layer was cracked and warped.

absence of some paints and the presence of many holes (Figure 4).

When we turn to the back of the work, we see many white blotches on the canvas (Figure 5), which are the results of insect damage, thus exposing the preparatory layer. The paint layer is unstable, not only because of the cracks but also the loss of the underneath canvas. Because of the absence of the paint layer, holes appeared on the painting. From the front, the holes seem small, but they are actually bigger than appeared. We mark the extent of the damage of the canvas to compare the front and back conditions (Figure 6).

In addition, by observing the breakages of the painting through a microscope, we found some very tiny, scattered black dots, with some spread sequentially. This is a very important finding, as the conservators identified them as biological excrement (Figure 7). Unfortunately, the conservators did not find any insect corpses or wrecks. Although the biological excrement is very small, the conservators had to remove it and make sure its acidic nature would not endanger the painting. Furthermore, through ultraviolet light detection, we see traces of restoration done by

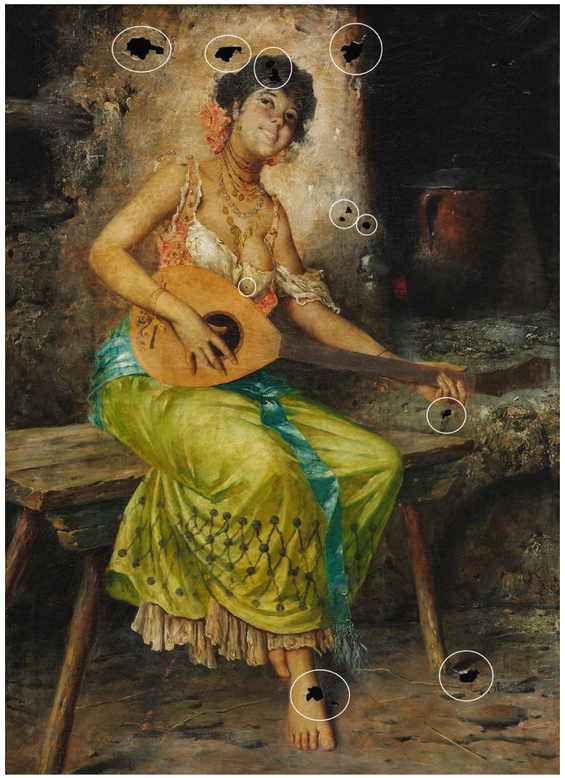


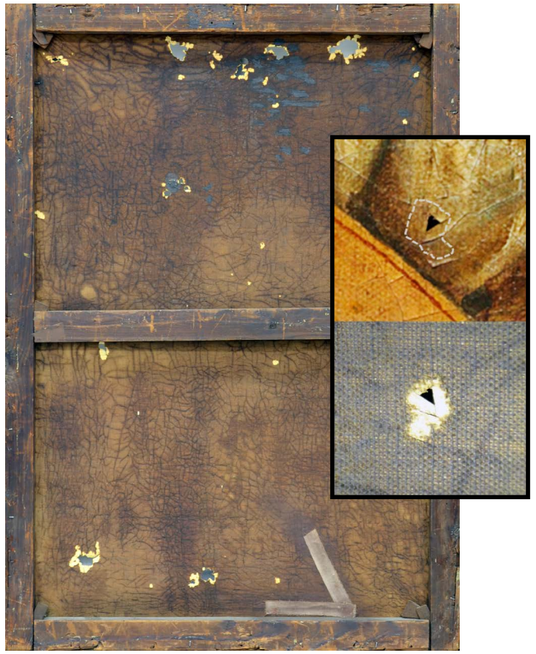
previous conservators, as well as the L-shaped holes at the bottom left of the painting (Figure 8).

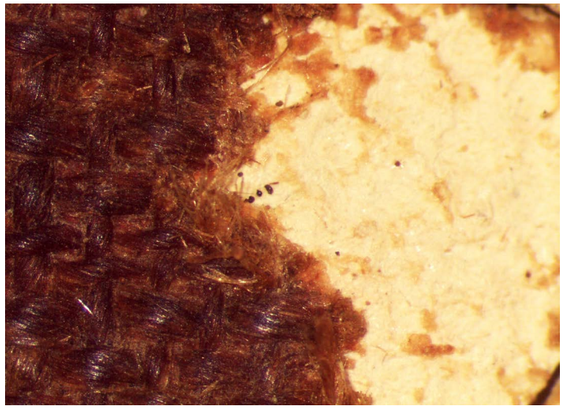
Through initial observation and scientific examination, the conservators undertook a rigorous analytical process to assess and determine an appropriate treatment approach, while also factoring in different canvas materials and the degrees of damage. In the following, we detail the sequence of restoring *The Mandolin Player* to illustrate the caring process for artworks.

RESTORATION STEPS

The first stage for restoration involves protecting the surface and cleaning the canvas, as outlined in the following steps:







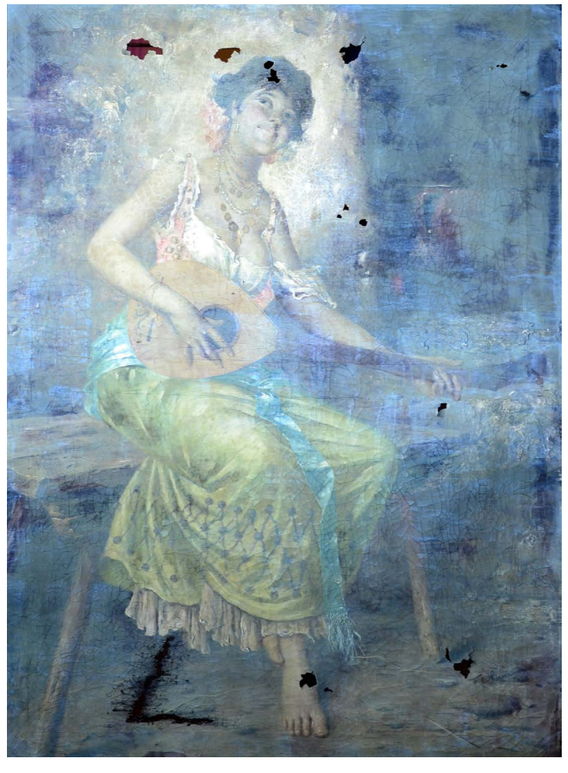


Figure 4 (top left): We see many holes in the painting.
Figure 5 (top right): The white blotches are on the preparatory.
Figure 6 (top right insert): The same hole appears in the front (upper) and back (lower).
Figure 7 (bottom left): Canvas grazed and left the biological excrement.
Figure 8 (bottom right): The oil painting under UV detection.

1. Temporary Facing

We put a piece of Japanese Paper on top of the painting, and then applied animal glue on top of the paper to temporarily stabilize the paint layers.

2. Inner Frame Removal

After protecting the painting surface, the next step was to remove the nails from the canvas and take off the inner frame. Then, we used a speed-controlled vacuum cleaner to clean the accumulated dust off the back of the painting.

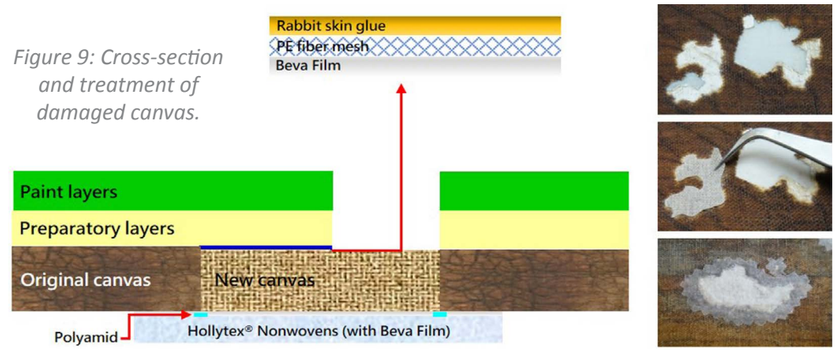


Figure 9: Cross-section and treatment of damaged canvas.

3. Reinforcement of the paint layers

We ironed the painting with a heated spatula to soften the cracked areas of the paint.

4. Rear of Canvas Cleaning and Remained Fiber Removal

We used an AKA pad to clean the gaps between the fibers on the rear of the canvas. After removing the old patches, we used a scalpel to remove the remaining and blackened adhesive in order to ensure a better adhesion between the new and the old canvas.

5. Inserting Linen onto Canvas and Patching

After cleaning the canvas, we restored the damaged section. First of all, we had to protect the underlying and paint layers that lost support. Considering future reversibility, we attached the PE fiber mesh as a buffer material for protection, with one side in contact with the preparatory layer with the rabbit skin glue and the other side in contact with the new linen, which is adhered with Beva Film. Then, we inserted a piece of new linen, and used the thermoplastic adhesive - polyamide powder to create a new piece of canvas to cover where insects had eaten through the old canvas. Finally, we used acid-free nonwoven fabric as a patch to strengthen the tightness of the junction between the old and the new linen (Figure 9).

The use of a PE fiber mesh as a protective cushioning material is often considered with future restoration in mind. If this new linen is removed, it can be cushioned during the removal process. Since the part above the inserted linen is usually filled and retouched by conservators, in the future when restoration is needed again, the process of removing the old inserted linen is equivalent to removing previous conservators' works. However, this case is different, because there is an original paint layer on the inserted linen, it is necessary to add a fiber mesh as a buffer. Once the inserted linen is dismantled, the original paint layer will not be removed and will serve as a protective layer.

6. Removal of Temporary Facing

We wetted a cotton swab with warm water to remove the Japanese Paper used for the surface protection of the first step.

7. Making New Impermeable Canvas and Lining the Painting

The new canvas must be washed to get rid of sizing, and ironed flat to be stretched. We used special restoration glue to make the fiber resistant to water, and we applied glue (thermoplastic substance) in advance onto the new impermeable canvas. Then we used a professional restoration iron to heat and line the painting onto it.

8. Cleaning the Surface of Painting

We cleaned the dirty surface of the canvas, such as yellowing varnish, and removed the previous retouching of the painting from the canvas.

9. Varnish as Isolation

We then applied a layer of protective coat of varnish made from natural resin.

10. Filling the Ground

A white filling is applied to replace the lost parts and to imitate the texture of the original canvas.

11. Retouching

We then used professional paint materials to restore the loss of the paint layers, and reconstructed visual integrity of the painting.

12. Spray Top Varnish

Finally we sprayed a protective paint made from synthetic resin as the final protective layer of the painting.

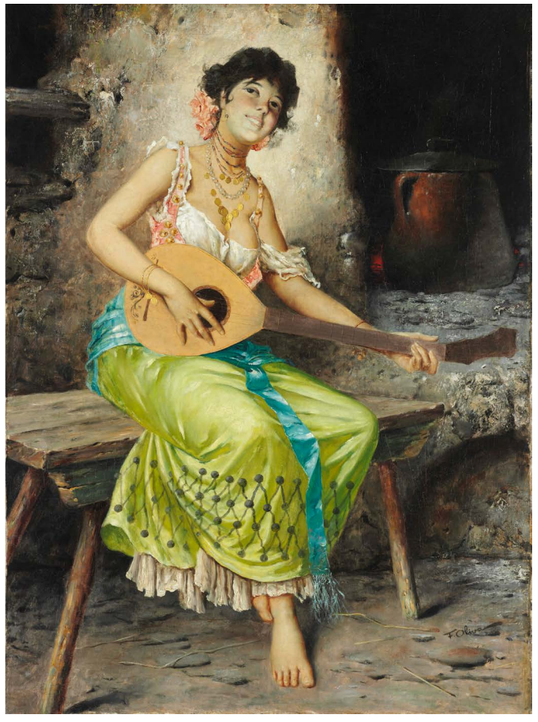


Figure 10. The Mandolin Player after restoration.

13. Completion

The paining was finally restored after completing these steps (Figure 10).

THE PRACTICE OF ART CONSERVATION EXHIBITION

As we restored this artwork, we also started to plan for an exhibition centered on the theme of art conservation. Most people are not familiar with this restoration process, so right from the beginning, we were fully aware that we had to translate technical terms and professional conservation knowledge into an easy-to-understand explanation for museum visitors. We simplified the tedious research and analysis of the restoration process, reworded the technical terms along each step, and also divided the steps into four topics, instead of using a time-line style presentation (Figure 11). The four topics are "What happened to the painting?", "Paint flaking", "Damaged canvas" and "Graphic lost" (Table 1). Tools and pigments used in the treatment process were also introduced as part of the Conservation Studio of CHIMEI Museum.

This treatment process of the oil painting The Mandolin Player highlights the importance of informal learning in museum exhibitions. This exhibition not only introduces art conservation, but also analyzes the restoration process in sequence, and incorporates an interactive display design to engage the general public. Although the exhibition is

Topic I	What happened to the painting?	Status Analysis	Raking Light
			Ultraviolet Florescent、Infrared Reflectography
			Micro Lens
			Optical Microscope
Topic II	Paint flaking	Protecting the Surface	Temporary Facing
		Consolidating the Paint	Painted Layer Reinforcement
Topic III	Damaged canvas	Fixing the Back	Removal of the Old Patch and the Remaining Adhesive
			Cleaning Rear of Canvas
			Removal of the Fiber Remains
		Patching	Inserting Linen onto Canvas
			Patch
		Removing Protective Layer	Removal of Temporary Facing
		Treating the Canvas	Making New Impermeable Canvas
		Lining the Painting	Lining the Painting
Topic IV	Graphic lost	Cleaning the Surface	Cleaning the Surface of Painting
		Varnishing	Varnish as Isolation
		Filling	Filling the Ground
		Retouching	Retouching
		Final Varnishing	Spray Top Varnish

Table 1: Restoration steps into four topics.

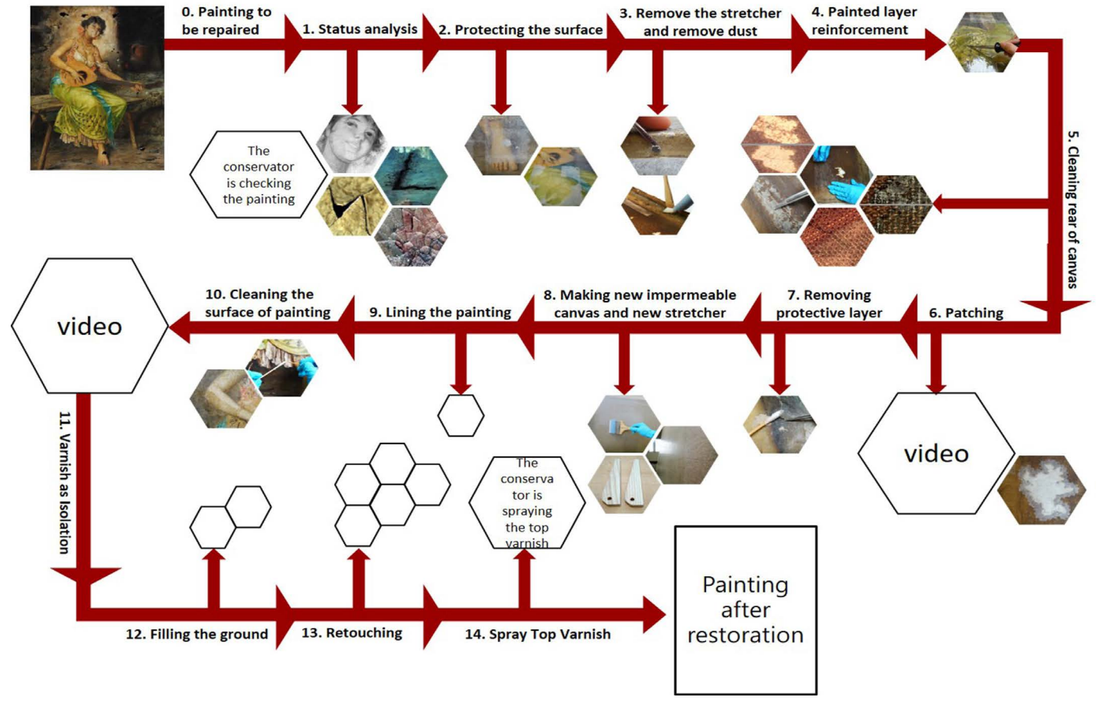


Figure 11 (top): The time-line style of restoration steps.
Figure 12 (bottom): The exhibition on "Art Conservation."

restrained to a very limited space between two fine arts galleries, the display incorporates a narrative figure as a curious little girl to take the audience through the conservation process in a coherent flow. This little girl raises different questions to highlight the four main topics, and her persona also echoes the lively image of the girl in The Mandolin Player. Through this simple and approachable display, we hoped visitors could enter into the world of art conservation, and become interested in art. We were very fortunate to receive great feedback from visitors. This exhibition not only inspired adults to learn more about art conservation, but also encouraged children to interact with the exhibition. As a result, we achieved our strategic implementation of combining education and entertainment (Figure 12).

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Other Words, Other Worlds: An Exploratory Case Study into the Use of Gender-Neutral Language in Museums

By Joanna Munholland

Based on an article first published in Social History in Museums volume 41 (2017), the journal of the Social History Curators Group.

INTRODUCTION

The use of language in museums is inescapable. Studies have shown the text read in museums has an impact on visitors (Sandell, 2006). With this in mind, attention should be given not only to the objects displayed but also the language used to interpret the objects. Feminists have critiqued and examined language since the 1960s (Cameron, 1992), and through this work gender-neutral language (GNL) has emerged to combat linguistic sexism (Pauwels, 1998). Though some disagree with the necessity of GNL (Pauwels, 2005), and others disagree on the effectiveness of GNL to combat sexism (Cameron, 1992), GNL can impact those exposed to it (Pauwels, 1998). After examining the power of GNL and museums to shape perspectives, this article explores whether museums are using GNL in their exhibitions, and if so, why.

It is important to consider the power of language as it is a main method of communication and influences the information shared. David Birch (1989) explains, "[t]he view of language as determining, not simply reflecting, reality, is an important one… Language is not a neutral instrument: it is biased in a thousand different ways." Serious consideration must be given to the construction of text, as words are not free from history and politics and may offer biased world-views unintentional to the museum. Schulz (2000) posits, "[t]here is no doubt… a language reflects the thoughts, attitudes, and culture of the people who make it and use it." Thus, the words a museum uses mirrors its world-view to its visitors.

Museums are hugely trusted institutions (Museums Association, 2013) and the stories presented and how they are constructed is incredibly influential (Sandell, 2006). Combined with specific GNL choices, museums can impact gender equality (Prewitt-Freilino, Caswell and Laakso, 2011; Sandell, 2006; McManus, 1991).

TERMINOLOGY

In this article, *gender-neutral language* is "a form of language which tries to not make unnecessary reference to gender" (Mills, 1995). *Codified* is "[t]he technical term for [the] engraving of linguistic norms", while the rules and practices that are unwritten regarding spelling and usage are *uncodified* (Cameron, 1992). A *gatekeeper* is "a person… that controls access to something, or that monitors and selects information." While Sara Mills defines gatekeepers as "those institutions which often prevent change from occurring," this author suggests they select which changes occur, acknowledging they may be biased (1995).

IMPORTANCE OF GENDER-NEUTRAL LANGUAGE

Anne Pauwels (1998) wrote the aim of GNL "is to obtain linguistic equality of the sexes by minimising or discarding gender-specific expressions and constructions." Research shows gendered language and gender-neutral language have the potential to affect users' world perspectives; for example one study "investigated the use of masculine generic Man in chapter titles in educational text-books. They found… if the masculine generic Man titles were replaced with more gender-neutral titles, students were less likely to associate male-only mental imagery with the title" (Schneider and Hacker, cited by Puawels, 1998). Studies like this begin to demonstrate the impact of gendered and gender-neutral language.

IMPORTANCE OF MUSEUM TEXT

Museums must think carefully about the text used within their exhibitions because "communication… is largely about making meanings – constructing, sharing and interpreting a range of content, *attitudes and values*" (emphasis added, Ravelli, 2006). Thus, exhibition text explains narratives and discloses the museum's worldview to their audience. How information is presented will influence the public's understanding of an object, an exhibition and their world. Ravelli (2006) further writes, "[strong] reactions point to the significance of communication in general, and language in particular: meaning is a valuable commodity… there are strongly vested interests in controlling the meanings which are made…" This statement reiterates the importance of gatekeepers in museums. It is imperative those creating text are aware of the power they hold and the various meanings possible when producing exhibition text.

Research has shown the chance to see oneself represented positively in a museum can be extremely meaningful (Sandell, 2006), and positive self-identification in text should also be considered. Inclusive text consistently uses language that encompasses all visitors, regardless of gender identification, here specifically done through utilising GNL. No one should question whether they are truly embraced in museums' narratives because of word choice; inclusive text allows everyone a place within museums' stories. *How* exhibitions are presented and discussed is important – language frames the exhibition. A case study at the British Museum, described below, offers one examination of how GNL is being incorporated into museum exhibitions.

THE CASE STUDY

This case study was comprised of an examination of different policies and guidelines under which the British Museum operates and three staff interviews, including Stuart Frost, who since 2009 has been Head of Interpretation at the British Museum. A 2009 job posting for Head of Interpretation's overarching description reads, "[t]he key responsibility will be to help **develop, define and implement** the Museum's interpretation strategy across the public spaces and exhibitions" (Museum Insider). This means the Interpretation Team is the main gatekeeper at the British Museum. They are guided in their work by a booklet entitled, "Practical Guidelines: Writing for galleries and exhibitions at the British Museum." This is the document followed by the Interpretation Team when editing exhibition text and is an example of codified power. The guide (Learning, Volunteers and Audiences, 2014) clearly states for the curators and others what the Interpretation Team is responsible for:

"[They]… act as the visitor advocate when developing gallery and exhibition narratives. They also have editorial responsibility for ensuring text is accessible, [and] appropriate for the audience… and will suggest alternative text where necessary."

GNL is mentioned as number seven on a list of ten basic rules and reads, "Avoid cultural and gender bias" (Learning, Volunteers and Audiences, 2014). This is an example of gender-neutral language being codified and making it "past" the gatekeepers, here at the British Museum. If an interpretation officer was challenged about wanting to exchange gendered language for GNL they would be able to point to the guidelines encoded by the Museum for authority. This reinforces the importance of GNL being codified by institutions.

PERMANENT VERSES TEMPORARY GALLERIES

One issue with ensuring the use of GNL in museums is out-dated exhibition panels. Frost made a point of saying the temporary galleries were in particular where the British Museum's most up-to-date views on language could be observed. However, there is another distinction to be made between permanent and temporary exhibitions. During his interview, Frost (2015) remarked,

"you can sort of look at the permanent galleries as… being a big dictionary and… people come and they dip in to particular parts and then the [temporary] exhibitions are the stories…so you've got the text for the permanent galleries which is maybe more conservative, more object focused, less story based, and then the [temporary] exhibitions' texts are much more about narrative and taking people on an emotional, intellectual journey."

This is an interesting comparison to make; dictionaries are conservative, selective of the definitions chosen and often lag behind word change (Oxford English Dictionary, 2014). If permanent galleries are dictionaries, a helpful comparison might be that special exhibitions are like periodicals. While dictionaries take time to make changes and are exceptionally formulaic, periodicals are much more flexible, able to play with their format and use new words to keep up with and help shape public opinion. The gatekeepers of both are important – dictionaries make a definition indisputable, but periodicals help make new definitions more common and new uses gain a permanent place in dictionaries. Like the dictionary gives definitions power by encoding them, the permanent gallery encodes exhibition practices within a museum. Temporary galleries also have incredible power: they are a reflection of what tomorrow's permanent galleries may look like. It is important to make sure today's special exhibitions are not repeating out-dated messages as these temporary exhibitions are an area where new best practice ideas will evolve from.

CONCLUDING CASE STUDY ANALYSIS

GNL is being used consistently at the British Museum because the gatekeepers, the Interpretation Team, identify gendered language as an issue and are watching out for its use guided by text guidelines. While temporary galleries are by nature more progressive than the permanent galleries it is important to bear in mind today's temporary exhibitions are a place for updated best practice, which will in turn feed into tomorrow's permanent galleries – gender-neutral language included.

FINAL PROBLEMS

Language reveals world-view. Users of language can choose any number of words to communicate - using gender-neutral language demonstrates a desire for an equal society while working within the constraints of language. Museums have a responsibility for shaping the world they exist in and one way this is done is through their word choices, especially in creating inclusive text.

To ensure language is consistently given consideration within museums, people must be alert, monitoring and editing language. Of course there is a possibility gender-neutral language is already being used in museums that do not have any of these safeguards in place. But having text creation guidelines and, if possible, a designated text editor in place means the use of gender-neutral language, among other language choices, is not left up to chance. This research cannot give final answers as to how to get gender-neutral language into museums, but it has presented initial research and begun to build a framework others might build upon in the future.

PRACTICAL STEPS : WHAT CAN YOU DO?

- Inform text writers about language issues and opportunities, including GNL.
- Create in-house text creation guidelines to be followed by all text writers.
- Consider text in brochures, pamphlets, education material, etc.
- Discuss GNL with those working in close contact with the public.
- Identify speakers when using gendered quotes, for example in exhibition text, and clarify whether only men or all people are meant.

FINAL THOUGHTS

The use of gender-neutral language in museums cannot change the world alone. But it can contribute to positive self-image amongst its visitors through use of inclusive text. It is a way for a museum to demonstrate its worldview. To get gender-neutral language into museums, those standing between text creation and production (the gatekeepers of language within museums) must be thinking about and vigilant towards the use of gender-neutral language. Language is an authority and museums are too – combined they may have an impact on gender equality.

Finally, gender-neutral language is a relatively easy modification for museums to implement; it does not ask people to rewrite history. Using gender-neutral language is about vigilant word choice. It is easier to make language changes than to change narratives – but *language choices shape the narratives told.*

As Helen Coxall (1995) surmised, "[t]he claim that language choice can cause a writer to creates [sic] her/his own version of history has disturbing implication [sic] for museum text writers;" not only is history not fixed, but something as simple as word choice may change it. This is a huge responsibility, and the gatekeepers of language must be aware of this reality. The use of gender-neutral language in museums shapes the past, present and future narratives the museum endorses and shares with its visitors – other words, other worlds.

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Inclusiveness: A Science Museum's Approach to Science Stakeholders and the Public

By Mamoru Mohri and Gary Vierheller

INTRODUCTION

Japan's National Museum of Emerging Science and Innovation (Miraikan), located in Tokyo, is unique in its dedication to featuring cutting edge science and technology that applies strategies to attract and engage the public. To understand Miraikan, one must understand what motivates and inspires all those involved, through Miraikan's Vision, summarized here :"Miraikan is dedicated to discovering global solutions to global challenges" (https://www.miraikan.jst.go.jp/en/aboutus/vision.html).

We understand that those global challenges cannot be solved by science and technology alone. Rather, to find global answers we must involve all aspects of human endeavor, across the globe, and that grand ambition begins at home.

Miraikan is committed to providing opportunities to discuss those challenges to foster understanding, and create solutions through eight stakeholders to contribute towards a sustainable society as shown in Figure 1.

For this article, we will focus mainly on two stakeholders - researchers/engineers and industries - and their related activities currently ongoing at Miraikan.

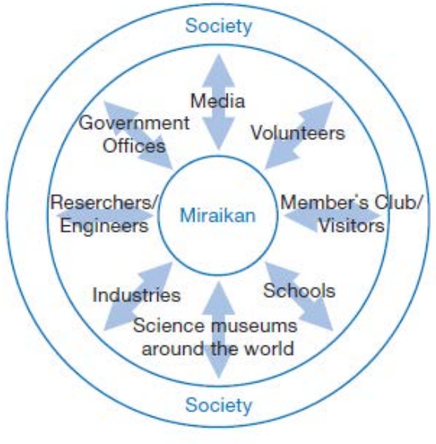

Figure 1: Network with 8 stakeholders.

SCIENCE COMMUNICATORS

We employ around 50 Science Communicators (SCs) who possess research experience and at least a Masters or Ph.D. degree. Miraikan fosters young scientists as science communicators with a five-year program in which they experience diversified fields of science and their relation to society that supports their future contribution to the public.

Their assignments in Miraikan are based upon the creation and execution of Miraikan activities in collaborating with the eight stakeholders (see Figure 1). They conduct research, and survey active scientists for the latest information to collaborate in creating permanent exhibitions. On the exhibition floor, they are challenged to bring the newest science and technology to the public in an understandable way (Figure 2).

Figure 2: Science Communicator interacting with visitors.

They also invite researchers to an interactive venue, the "Co-Studio," that enhances the visitor's science experience and enriches their appreciation for science. Figure 3 shows a science communicator conducting a workshop event as a facilitator with research scientists. They also organize and operate various workshops with active scientists.

Science communicators also write articles and report on cutting edge science and technology, and appear on TV, radio, and in newspapers (mass media) and social networks. Thus, they provide the latest, up-to-date information to society.

Figure 3: Science Communicator facilitate workshops.

We will now describe more detailed activities conducted by Science Communicators with the two stakeholders of researchers/engineers, and industries.

IN HOUSE RESEARCH LABORATORIES

Miraikan has twelve research laboratories in diversified fields from nano- and bio-technology, robotics, and information technology, to the life sciences to name a few. These in-house labs are operated through research projects with specific research funds from Japanese universities and institutes. Miraikan provides research facilities and collaborates on their promotion of the research as a partner through science communication with the public.

1. Basic researches

A Science Communicator is assigned to each reseach lab and plans a lab tour guided by Miraikan volunteers. Science commincators collaborate by having special activity days introducing reseach scientists to the public, and provide interactive events on the exhibition floor introducing the specific research activity.

Figure 4: Basic research laboratory.

Figure 5: Visitor tour of research laboratory by volunteers.

2. Applied researches

Some in-house researchers need human research subjects for collecting data in order to conduct and improve their experiments. It is difficult to acquire such subjects for those researchers who work in universities and institutes. However, Miraikan has many visitors who willingly collaborate as subjects for such experiments.

Moreover, the scientists can then directly collect data with the public, in accordance with each visitor's approval. This allows the scientists access to a broad range and greater number of subjects than normally accessible, and also allows visitors to be active participants in a scientific

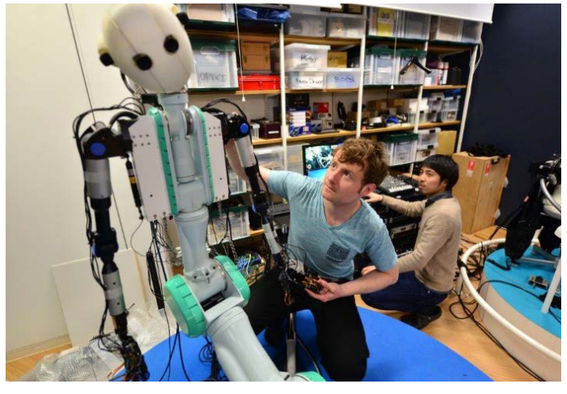

Figure 6: Applied Reseach Laboratory.

endeavor. Science communicators work together with researchers to create this opportunity, allowing visitors to better understand science and boost interest.

COLLABORATION WITH OUTSIDE RESEARCHERS AND ENGINEERS

1.Permanent Exhibition

All of Miraikan's permanent exhibits are created, edit

ed, and overseen in collaboration with active scientists. Miraikan science communicators survey scientists in diversified fields for involvement in projects of development of specifically themed permanent exhibitions. We usually invite dozens of scientists in the process of developing and building one permanent exhibition and nominate one scientist as a Principal Investigator who serves as the leader to coordinate all research results and content.

One example of scientists involvement currently underway in Miraikan, is researchers from Osaka and Tokyo University providing science communicators the newest android information. Through this interactive exhibition reseachers have been scientifically revealling the current relationship between robots and humans, as well as what and how humanity/androids will interact in the future.

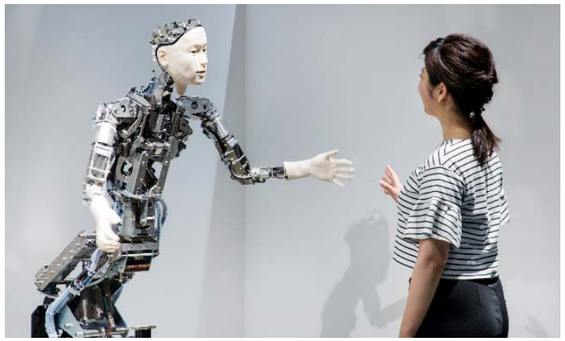

Figure 7 (above): Interaction with Android robot.
Figure 8 (below): Communication with Android robot.

2. Opinion Bank, Co-Studio, and workshops

An important method to access the public's concerns and interests is through the Opinion Bank (Figure 9). Here visitors share their ideas on issues they believe society should be discussing, including the future that science and technology should create. Visitors can enter their questions or thoughts and the science communicators then transmit those to active scientists in the field. We also ask visitors to think about how research becomes part of their everyday life, and their expectations in living with science and technology.

Many times, scientists then create an interactive presentation addressing those concerns/interests. Miraikan's Co-Studio activity, (Figure 10) brings scientists to the public in an interactive venue that enhances the visitor's science experience and enriches their appreciation for science. Here you can see a Science Communicator conducting a Co-Studio event. Both activities are direct collaborations

Figure 9 (above): Opinion Bank.
Figure 10 (below): Co-Studio.

with outside researchers and engineers. In addition, Miraikan hosts many workshops inviting scientists and the general public to discuss issues selected in the above activities facilitated by science communicators.

COLLABORATION WITH INDUSTRIES

Miraikan opened in 2001, and was the first to "employ" a robot. Honda's first generation, bi-ped robot, ASIMO, (Figure 11) was assigned a science communicator employee number, and is provided payment through unlimited power charging. Figure 8 shows the third generation of ASIMO. ASIMO has continued to evolve and now we employ the fourth generation. Science communicators note

Figure 11: Science communicator robot ASIMO.

the level of interaction between ASIMO and the public, particularly children, thereby making Miraikan a venue for research of human – robot interaction.

A direct offshoot of ASIMO has been the personal mobility device, UNI-CUB (Figure 12) that incorporates the technology of ASIMO. UNI-CUB is both a vehicle and a robot, and when introduced, was a collaboration between Honda and Miraikan and its visitors. Honda wanted to investigate its safety when being used in the public. In particular, Honda was interested in design appeal and comfort. Honda and Miraikan staff issued questionaires and conducted research to understand the public's reactions. That reseach, emphasizing safety in society, was conducted over five years, and now the UNI-CUB is a slight revenue generating exhibit, offering an unique experience with cutting edge technology, and is very useful for group tours.

CONCLUSION

This is just a snapshot of activities Miraikan conducts that incorporates the wisdom from researchers /engineers, industries, and the public in order to help people better understand and become more involved in science and technology. Miraikan also involves as many stakeholders as possible, complete with their wisdoms (Figure 1), and this inclusive approach helps each visitor discover how science and technology affects their lives, and all life on this planet. Miraikan continues to explore new partnerships with every aspect of human endeavor and we hope when the readers of this article visit Tokyo, you will also visit us and participate in finding sustainable, global solutions for us all.

Figure 12: Personal Mobility Robot UNI-CUB.

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On the cover:

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Full story on page 7.