

Using scents to connect to intangible heritage

Engaging the visitor olfactory dimension: three museum exhibition case studies

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Abstract—Olfactory experiences are powerful triggers of personal memories and can play an important role in connecting audiences to intangible heritage. This is recognized by museums seeking to move beyond the dominant visuocentric exhibition paradigm, broadening the spectrum of sensorial stimuli on offer. However, the delivery of olfactory experiences in a museum presents important and unique challenges, largely related to the odorant’s physical nature, which impose constraints to the design of experiences that can reach the visitor with impact and efficacy.

Here, we present an olfactory delivery device designed to address these issues, which was prototyped and implemented over a 10-year period as an integral element of a display dedicated to the culinary heritage of Singapore. The device was also utilized in two other exhibitions, with radically different purposes: in one case as an element of the indigenous natural and cultural heritage, and in the other as a comparison tool to provide an intuitive illustration of progress. The diverse subject matters covered, and the different approaches to the delivery of olfactory stimuli demonstrate the versatility of the olfactory device in a range of exhibit settings. The case studies presented indicate that olfactory experiences can be effectively integrated in local museums, but their inclusion demands additional processes and specific consideration. Growing interest in this area of exhibition design, consistent with a global trend to transform museums into multisensory environments, makes this an important field for further research.

Keywords—*olfaction; museum; exhibition design; intangible heritage; memory*

I. INTRODUCTION

Anybody smelling a familiar aroma, such as that of a dish cooked by their grandmother, may have experienced the sensation of being thrown back to their childhood, revisiting in vivid details a particular place and time. Olfactory signals, while being invisible and transient, are inalienable from our memory and our emotional personal baggage. Of all senses, olfaction has the most marked ability to retrieve long-forgotten memories and cause people to relive them: “A particular smell makes us unknowingly re-enter a space that has been completely erased from the retinal memory; the nostrils awaken a forgotten image, and we are enticed to enter a vivid daydream. The nose makes the eyes remember” (Pallasmaa, 1996). One important reason for the intensity with which events and places from our past are conjured by smell is that odor-cued memories are entangled with emotions (Herz,

Eliassen, Beland and Souza, 2004). In addition, olfactory signals can be enormously nuanced. In contrast to the narrow repertoire of five flavor attributes detected by our taste buds (sweet, salty, bitter, sour and umami), retronasal olfaction- the process by which volatile chemicals from food and drinks stimulate the nose- can activate over 300 olfactory receptors to render gustation (Rozin, 1982, Stevenson 2014).

Sensorial stimulation of memory is a particularly valuable device for referencing what we broadly define as intangible heritage: multifaceted characteristics of traditions, social practices and customs that are part of our culture, but are difficult to capture, preserve and present to an audience (Smith and Akagawa, 2009). As a result of our life experiences, a substantial part of intangible heritage becomes embedded in our sensory perceptions, especially those generated from contact senses such as smell, touch and taste. Yet, museum exhibitions tackling the fundamental issue of bringing cultural heritage to life often rely on physical artifacts, visual documentation and recordings (oral history) as primary sources of their narratives. This has resulted in a dominance of visuocentric exhibition design practices; other than engaging with the aural dimension through audio-visuals, sound and multimedia, the stimulation of non-visual senses is seldom taken into consideration. Activating the olfactory sensorium in a museum offers the twofold advantage of expanding the range of learning experiences by which visitors are engaged, and awakening layers of reminiscences embedded in their sensations.

II. CHALLENGES OF INTEGRATING OLFACTORY EXPERIENCES IN MUSEUMS

In the past few decades museums have experimented with appealing to all senses, and current theories underpinning exhibition design practices recognize the importance of multisensory approaches in constructing meaningful experiences and reaching a broader public (Levent and Pascual-Leone, 2014). However, the introduction of olfactory experiences in museum environments present substantial challenges.

The first challenge is related to the physical nature of odorants. Olfaction is activated by the interaction of small volatile molecules with specialized receptors in human sensor cells, and therefore the delivery of a scent requires the production of a cloud of molecules which is difficult to contain

in space and in time. Hence, odor is an ephemeral medium which can either vanish with the air flow or build-up in space, with consequences on the visitor's experience (Keller, 2014). If the odor concentration is too high, visitors may find it uncomfortable; if it is too low, the scent may not produce the desired impact. Positioning different scents within the same space is even more problematic, since a mix of multiple heterogeneous scents can produce the so-called "garbage effect", resulting in a repulsive and malodorous sensation. Visitors may also experience olfactory fatigue when sniffing various odorant in a short period of time, as happens when visiting the perfume sales area of a department store.

A second crucial consideration is that chemical pollution of the gallery environment must be avoided in view of the collections' conservation requirements (Maximea, 2014). In the same way that light must be designed and dimmed to avoid harming the preservation of artefacts, odors must be controlled to keep those artefacts from unwanted contaminations.

Finally, odorants are inherently consumable, and often degradable. The odor diffusion method must therefore take into account the need for odorant replenishment and maintenance operations, especially in the context of permanent exhibitions that are designed to last for several years.

To address these challenges, the integration of olfactory stimuli as ephemeral elements of an exhibition demands different exhibition design considerations from those pertaining showcasing an artefact, such as a document, an artwork or a natural specimen. Table 1 summarizes a number of these considerations.

TABLE I. DIFFERENT CONSIDERATIONS INVOLVED IN DISPLAYING OBJECTS AS COMPARED TO SCENTS

<i>DISPLAY ASPECT</i>	<i>artefact</i>	<i>scent</i>
Physical nature	Visible, Two-dimensional or three-dimensional.	Invisible, chemical.
Display method	Object can be showcased or exposed.	Scents can be a localized, diffused or triggered on demand.
Display impact	Dependent on lighting. Maximum visibility is preferred.	Scents are powerful even if not consciously perceived.
Multiple placement	Simultaneous presentation, grouping and comparison is as common as isolation.	Isolation is preferred. Multiple scents can create "garbage effect" or olfactory fatigue.
Other visual elements	Neutral treatments are preferred.	Visual stimuli can help identifying odors.
Identification	Visitors can immediately identify objects' visual characteristics.	Visitors may not be able to identify a smell. Olfactory sensations is individual.
Conservation requirements	Objects can be cased, lighting can dimmed to required lux levels.	Odorants should not contaminate the gallery environment.
Textual description or label	Artefacts are generally labelled.	Scents may be labelled or left as subliminal elements.
Visitor dwell time	Depends on visitors' interest.	Depends on type of smell. A repulsive smell can cause visitors to leave.

A. The olfactory experience of the Food Gallery, NMS

We present an olfactory delivery device that was researched and developed to address the issues of odor diffusion and containment, ergonomic comfort and maintenance. The device was designed for the *Food Gallery* at the National Museum of Singapore (NMS), an exhibition that used gastronomy as a thematic lens to portray the social history of post-war Singapore (Wong, 2009), and specifically examine how the street food sold by hawkers reflected ethnic diversity, cultural heritage and culinary innovation. The development of the exhibition took two years and was the result of collaborations between teams of curators, exhibition designers and domain experts which looked at museological solutions to show food as a marker of culture and social identity. The design process identified as a primary focus the sensual and social qualities of the eating experience, and opted for a multimodal exhibition approach, involving the use of touch, sound, moving images and aromas. The acknowledgment that flavors depend on a combination of taste and smell, and that olfaction is a fundamental component of the gustatory experience, became a pivotal driver of the exhibition's design.

The olfactory experience was conceived as a component of a display dubbed "Wall of Jars", consisting of 330 backlit glass containers organized as a gigantic chromatic palette, merging color, visual elements and fragrances (Figure 1). The idea was to invite visitors to browse a large gustatory abacus, flanking three of the gallery walls, offering an extensive variety of indigenous and imported ingredients used in the local cuisine. Iconic flavors like pepper, wolfberry, star aniseed, cardamom, kaffir lime leaf and coconut would engage the visitors' noses, while others would be featured using color, form, botanical or zoological representations and textual descriptions in relation to their provenance, gastronomic use, and sometimes healing properties.



Fig. 1. Perspective drawing of "Wall of Jars", *Food Gallery* (NMS).

The selection and preparation of fragrances was a challenging collaborative exercise, since the perception of the same odorant may differ from one person to another (Hudson and Distel 2002). During collaborative sessions, curators, designers and a chef worked with the flavorists to assess and fine-tune the scents for realism, on the basis of shared perceptions.

B. The design of the Olfactory Delivery Device

The olfactory delivery device was designed as an individual interactive unit (Figure 2). A key principle was to limit odor dispersal and release the scent only when users would choose to smell. The latter was a preferred method to drive visitors' attention to consciously smell (Keller, 2011), since active sniffing is necessary to perceive odors (Mainland and Sobel, 2006).

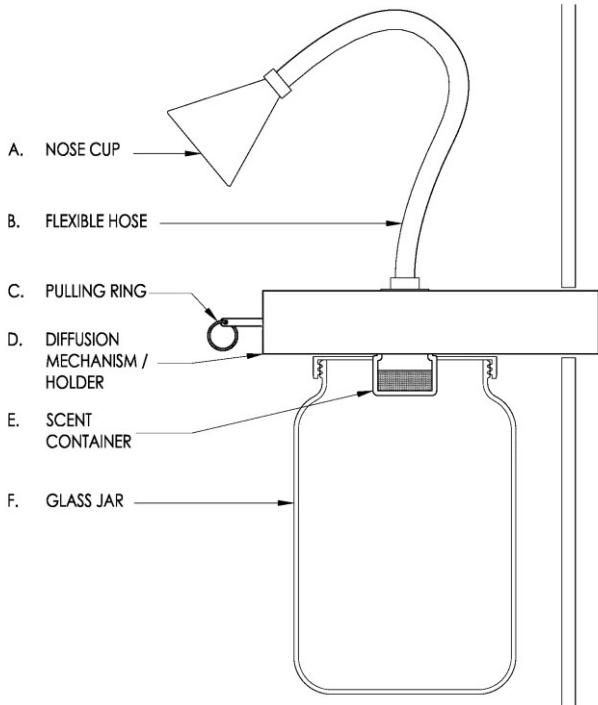


Fig. 2. Schematic drawing of olfactory interactive device.

A prototyping process was used for calibrating the amount of odorant that would allow users to distinctively perceive the scent upon activation. The design provided odor control within the gallery and avoided chemical contamination. To aesthetically integrate the device into the display, the entire delivery mechanism was engineered for encapsulation within one of the jars. Ergonomic factors guided the placement of the device holder (Figure 2, D) at a height that facilitated the reach of children, adults and visitors on wheelchairs. The introduction of a movable hose (Figure 2, B) allowed users to adjust the sniffing cup (Figure 2, A) to the required position and inhale the scent by pulling a ring (Figure 2, C) located at the jar top. This interactive system was labelled with the simple message “pull the ring to smell” and released the scent (Figure 2, E) only on demand. The device was manufactured with materials that would not alter the chemical components of the scent over time, and would resist wear and tear due to visitors' interaction. Scent replenishment (Figure 2, E) took place in the lower part of the apparatus (Figure 2, F), requiring a basic two-step operation to prevent chemicals spills in the gallery.

The device was in operation from 2006 to 2014, a period in which NMS registered a flow of 800,000-900,000 visitors per year. Although the museum never formally collected feedback specifically for assessing these olfactory experiences, the curator indicated that “they were very well received, especially for their novelty. It was often a feature highlighted when people talked about the Gallery. Students were generally enthusiastic about trying out all the scents, going from one to the next.” (Wong Hong Suen, personal communication)



Fig. 3. A visitor using the olfactory device in the *Food Gallery* (NMS) while reading the name of the scent in braille.

The *Food Gallery*'s multisensory approach inspired a further pioneering exhibition project, commissioned in 2008 by the Singapore Ministry of Information, Communication and the Arts (MICA), aimed at making museums more inclusive of visitors with visual impairments. The project, designed by the same exhibition team in collaboration with the Singapore Association of the Visually Handicapped (SAVH), integrated braille and tactile maps, enabling public with visual impairment to interact with the exhibition environment independently (Figure 3).

III. OTHER APPLICATIONS

A. The exhibition *Desire and Danger* at the Goh Seng Choo Gallery, NMS

In 2015, four of the scent delivery devices from the *Food Gallery* were refurbished for *Desire and Danger*, a new exhibition featuring a selection of early nineteenth-century natural history drawings from the William Farquhar Collection, looking at the complex relationship between man and nature. The species of flora and fauna illustrated in the drawings were selected “to understand the ways local people interacted with nature using a myriad of lenses and senses, not just visually, but very much through the body especially smell, taste, touch and hearing.” (Marcus Ng, curator; personal communication)



Fig. 4. Visitors exploring scents in the exhibition *Desire and Danger* (NMS).

Scents were presented not only as precious products from the forest but as a vital component of the indigenous culture. The ephemeral scent of *Gaharu* (Agarwood) and *Kemenyan* (Gum Benjamin), highly prized since ancient times in the Middle East and still exported today, were locally used for their magic “aura” and medicinal power. The elusive fragrance of *Bunga Kesidan* (Breadflower) was a favorite in the potpourris of traditional wedding celebrations, while *Lengkawas* (Great Galangal), a spice used in Malay cuisine, was known for its healing and aphrodisiac properties. Presenting these important natural elements of the heritage to today’s city-dwellers of Singapore was a considerable challenge for the curators: “Although these scents are quite embedded in the regional culture, for visitors grown up in recent time they may not be familiar. Some may recall memories, especially those who visited the house of a traditional Malay doctor or that grew up in a *kampung* (local village). It is a hope that some visitors will find some kind of connection through their personal experiences or else it will offer a gateway to establish a new one. For instance, the Breadflower scent is something that one will not easily forget”. (Marcus Ng, personal communication). In summary, a smell’s ability to recall deep-rooted memories acts as an effective mean to keep collective memory alive. Memories of shared practices, traditional rituals and cultural events that have been passed down for generations can be evoked by activities that engage the nose, and this may promote intergenerational exchange of personal stories among museum visitors. Thus, olfaction offers unusual potential to provide innovative ways of preserving our fragile intangible heritage.

B. *The Transforming the Landscape zone of the Singapore History Gallery, NMS*

Transforming the Landscape is the closing section of the Singapore History Gallery, a comprehensive exhibition featuring the city-state’s history, which opened at the National Museum of Singapore in 2015. One of the novelties of the current approach is the use of odors in relation to Singapore’s environmental journey towards becoming a “garden city”. As explained by the section curator: “during the exhibition

planning process, it was clear that there are not many artefacts that could well represent this aspect of Singapore’s history as the legacy of the Garden City is not in objects, but in the quality of the urban environment that we live in.” (Sarong Lim, personal communication). Visitors approaching this section encounter a large platform covered with artificial grass, a tactile element inviting visitors to relax at the end of a long gallery visit (Figure 5). While seating, visitors are made to feel the vivid atmosphere of a park after the rain. This is achieved by diffusing an ambient-wide fragrance, specially created for the exhibition, which combines scents of rain, moist soil and greenery in response to the curator’s request to represent tree planting events held during the start of the rainy monsoon season in November. This olfactory experience is immersive, but the scent is diffused intermittently and kept as a soft sensation, a subliminal element of the exhibition atmosphere.



Fig. 5. Visitors relaxing in the *Transforming the Landscape* zone of the Singapore History Gallery (NMS).

In this garden-like space, the scent delivery devices designed for the *Food Gallery* are integrated into a large graphic element, and used to sample two more contrasting odors. One is the putrid smell of the Singapore River before been cleaned up in 1977, and the other is the pleasant fragrance of the flower of *Tembusu* (*Fagraea fragrans*), a native tree depicted on Singapore’s currency notes. The curator’s choice was inspired by a story narrated by Lee Kuan Yew, about a blind clerk who knew his bus was approaching the Singapore River from the smell of sulfur dioxide: “a very strong anecdote which allowed me to imagine how bad the river’s pollution was.” (Sarong Lim, personal communication) In this case, the scent are deliberately selected to instigate emotional reactions toward “good” and “bad” smells of the city: “while we may not be able to fully recreate a smell, these experiences are intended to evoke memories and spark conversations among visitors”. (Sarong Lim, personal communication)

It is interesting to observe that stimuli below our sensory threshold, such as the after-rain scent of this gallery, can still induce an emotional response. This effect leverages on the knowledge that diffuse low-concentration scents, that are not consciously perceived, can elicit very strong responses (Keller,

2014), and clearly exemplifies how designing exhibitions with olfactory elements is very different from working with visual elements alone. An artefact or a graphic panel has to be clearly viewed to not go unnoticed, while limiting the presence of an ambient odor- and therefore reducing its conscious perception- can be a powerful way to make a certain space experience memorable.

Other examples of scents designed in association to Singapore's history like the launch of *Scent of the Nation* in 2015 and the creation of *City*, a limited edition fragrance to celebrate Singapore's 50th anniversary, also attest a new direction in local institutions, which experiments with olfactory innovative means to link together tangible and intangible heritage.

IV. CONCLUSIONS

Olfactory experiences are potent means to involve visitors in museum exhibitions and connect tangible and intangible heritage. The engagement of smell has a central role in recollecting personal memories and can be instrumental to touch a visitor's emotional dimension.

The scent delivery device described here presents an effective way to use olfaction in the context of permanent exhibitions. Its design and implementation in the three exhibitions presented here attests to its versatility and success. However, the scent delivery only represents the technical aspect of the integration; olfactory experiences also demand a design process that is very different from the one used in visual displays and requires specific considerations.

The three exhibitions described show that the use of olfaction can support very different curatorial frameworks, and that odor can be employed as an inherent component of the subject matter of the exhibition, as in the *Food Gallery*; as an intangible heritage to be preserved, as in *Desire and Danger*; and to provoke emotional reactions, as the immersive experience of the *Singapore History Gallery* advocates. Furthermore, the recognition of odors as an integral part of the intangible heritage poses the question of whether museums should not only exhibit but also preserve scents as a form of heritage. The challenges of such a preservation effort are beyond the scope of our work.

The case studies described here are tangible signs that the use of olfaction is an aspect of exhibition design that has expanded in the last decade in local museums, and is a relevant area of research. The experimental design and curatorial methods described herein align with a global trend that is transforming museums into multisensory environments. Further investigation will be required in order to measure quantitative and qualitative aspects of visitors' response and unpack cultural specificities.

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