

Inspire: Understanding Scent Inclusion in Museum Settings

Molly Bishop

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Committee:

Wilson O'Donnell

David Gire

Dave Logan

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University of Washington

ABSTRACT

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Molly Bishop

Chair of Supervisory Committee:
Associate Director Wilson O'Donnell
UW Museology Department

The purpose of this study was to describe the phenomenon of using scented or aromatic materials to engage a visitor's sense of smell in museum exhibits. The research focused on why museum staff included scent in an exhibit, what design and implementation considerations museums made, and what impact museum staff felt scent had on visitors. Literature reviewed indicated that scent has been understudied in museums but that scent can impact human emotion, behavior, and memory. This study was significant to the museological field because it added to literature devoted to the impact of scent in museum exhibits. Data were collected via in-person and phone interviews with museum staff from three case study sites that used scent in an exhibit: The Tech Museum of Innovation, the Dixon Gallery and Gardens, and the Museum of History and Industry. Study results suggested museums chose to include scent when it enhanced the exhibit, concerns about scent were mitigated, and staff found the idea enjoyable. Additionally, the study suggested museums base design choices on how scent served the purpose of the exhibit, ease of implementation, and how surmountable challenges to using scent were. Finally, this study suggested scent contributed to positive visitor experiences, helped visitors connect with exhibit content, and did not affect visitor health. The limitations of this study were small sample size for two of the three museums participating in the study, that each museum employed different fragrance technologies, and that each site was a different type and size of museum.

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CHAPTER ONE: INTRODUCTION

The purpose of this research study was to describe the use of scented or aromatic materials to engage a visitor's sense of smell in a museum setting. The sense of smell had been labeled unimportant or deemed the forgotten sense.¹ Experimental psychologist Robert J. Stevenson titled his 2014 article in *The Multisensory Museum* about the use of smell in museums "The Forgotten Sense." In their work *The Museum Experience*, John H. Falk and Lynn D. Dierking did not mention the sense of smell when they wrote, "[e]xhibits . . . allow people to see, touch, taste, feel, and hear real things from the real world."² However, interest in multisensory experiences and in museums continued to grow and has been increasing for over two decades. German historian Robert Jütte cites the fashionable nature of the five senses and a "growth of interest in the body" in both the museum and cultural spheres of the present as justification for his 2005 *A History of the Senses*.³ Nine years later in 2014, *TrendsWatch*, the yearly forecasting report put out by the American Alliance of Museum's group Center for the Future of Museums, included multisensory experiences as one of six showcased trends. That same year, *The Multisensory Museum* was published, an edited volume of articles with the stated goals to "highlight today's best multisensory practices and reflect on how new research and technology will influence museums of the future."⁴

While smell has its own section in each publication, historian Mark S. R. Jenner wrote in the article "Follow Your Nose? Smell, Smelling, and Their Histories," in *The American Review*

¹ "Smell is probably the most undervalued sense in the modern West," Constance Classen, David Howes, and Anthony Synnott, *Aroma: The Cultural History of Smell* (London: Routledge, 1994), 2-3.

² John H. Falk and Lynn D. Dierking, *The Museum Experience*, (Washington DC: Whalesback Books, 1992), 78.

³ Robert Jütte, *A History of the Senses: From Antiquity to Cyberspace* (Cambridge: Polity Press, 2005), 1.

⁴ Nina Levent and Alvaro Pascual-Leone, "Introduction," in *The Multisensory Museum: Cross-Disciplinary Perspectives on Touch, Sound, Smell, Memory, and Space*, ed. Nina Levent and Alvaro Pascual-Leone, (Lanham, MD: Rowman & Littlefield, 2014), xiv.

that “smells, it seems, still fit uneasily into the world of serious scholarship.”⁵ Historian Mark Smith, author of *Sensing the Past* argued for “intersensoriality” and the need for studies focusing on all senses at the same time.⁶ However, Contance Classen, David Howes, and Anthony Synnott the authors of *Aroma: The Cultural History of Smell* disagreed, justifying focusing on smell to the exclusion of other senses as a means to rectify the lack of study odor has previously received. No in-depth academic research investigating specific instances of museums using scent in exhibits have been discovered to date.

To describe the use of scent in museum spaces, three research questions were examined: what was the decision-making process to include a scented component in an exhibit; what were the design and implementation considerations; and what impact museum staff felt scent had on visitors.

For the purpose of this research, words referring to the olfaction or the sense of smell (e.g. scent, odor, aroma, fragrance, etc.) were used interchangeably. “Perfume,” referred to an “a substance, extract, or preparation for diffusing or imparting an agreeable or attractive smell, especially a fluid containing fragrant natural oils extracted from flowers, woods, etc., or similar synthetic oils.”⁷ “Scent inclusion” was a shorthand to refer to the use or incorporation of fragrant or aromatic materials in a museum exhibit. In this study “fragrance medium,” “fragrance medium technology,” or “scent technology” referred to a method by which a scent was released or put into the air, such as an electronic dispenser, scratch and sniff stickers, scent pellets, or botanic specimens. While flavor and taste – or retronasal olfaction – relate to the sense of smell,

⁵ Mark S. R. Jenner, “Follow Your Nose? Smell, Smelling, and Their Histories,” *The American Review* 116, no. 2 (2011): 336.

⁶ Mark Smith, “Conclusion: Futures of Senses Past,” in *Sensing the Past: Seeing, Hearing, Smelling, Tasting, and Touching History* (Berkeley, CA: University of California Press, 2007), 118.

⁷ “perfume,” Dictionary.com Unabridged. Random House, Inc., accessed August 2, 2017, <http://www.dictionary.com/browse/perfume> .

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neither were the target of this paper. There were many museums that have had a culinary focus and did in some way include smell in their exhibits, but this study chose to focus solely on smell removed from taste to maintain clarity.

CHAPTER TWO: LITERATURE REVIEW

The purpose of this study was to describe the use of scented or aromatic materials to engage a visitor's sense of smell in a museum setting. This literature review sought to explore the existing research that was available about how scent has been incorporated into museum settings. The first section of this literature review put the sense of smell in a cultural context. The second section reviewed human olfactory ability. The third section described the human olfactory system and its connection to the brain. The fourth section explored the psychology of the sense of smell and how it influenced human behavior, memory, and emotion. The fifth section synthesized how the psychology of scent has been employed in the consumer world and how it spurred the creation of scent technologies. The sixth section discussed scent in museums and how scent was included in Jorvik Viking Centre. The section continued by considering the place of scent in museum experiences and examining theories of best practice introduced in *The Multisensory Museum*.

Scent + Culture

In their book *Aroma: The Cultural History of Smell*, Constance Classen, David Howes, and Anthony Synnott (a cultural historian, anthropologist, and sociologist respectively) wrote that “[s]mell is *cultural*, hence a social and historical phenomenon.”⁸ Scent had always been a part of human existence, society, and culture and as such had been employed and thought about in many different ways. In *A History of the Senses*, historian Robert Jütte described how different cultures had organized the senses into a hierarchy with scent most commonly being placed in the center: “[t]he intermediate position of the sense of smell has ... hardly been questioned since

⁸ Constance Classen, David Howes, and Anthony Synnott, *Aroma: The Cultural History of Smell* (London: Routledge, 1994), 3.

antiquity.”⁹ A key moment in the history of smell was a deodorization process that began in the eighteenth century and continued into the twentieth which was brought about by evolving standards of cleanliness and hygiene as well as advancing technology.¹⁰ A research study titled “Roses, Coffee and Lovers: The Meanings of Smell” in *Compendium of Olfactory Research* conducted by Anthony Synnott at Concordia University in Montreal in 1995 seemed to show the overall devaluation of smell. He asked 270 students and faculty to place the senses in a hierarchy. He found that smell was rated the least precious with only 1% of respondents rating it in first place.¹¹ Additionally, respondents rated smell as the sense they would be most willing to lose. He concluded that scent was seen as the least useful sense and that most people were accustomed – through colds, allergies, or illness – to temporarily losing their sense of smell and thus found it less essential.¹² In his work with Howes and Classen, he wrote that among scholars, it was commonly suggested that the human sense of smell had atrophied.¹³ Jütte was one scholar who argued such, writing that “[smell and touch] are supposedly underdeveloped, although they have in fact simply atrophied in post-industrial society.”¹⁴ Neuroscientist Charles A. Greer disagreed with that supposition in his article “Anatomical Organization of the Human Olfactory System,” in *Compendium of Olfactory Research* claiming that while it was often suggested that the human sense of smell was less complex, sensitive, and efficient than other animals, this was not supported by research.¹⁵

⁹ Jütte, 67.

¹⁰ Classen, Howes, and Synnott, 3. See also Jenner, 343.

¹¹ Anthony Synnott, “Anatomical Roses, Coffee and Lovers: The Meanings of Smell,” in *Compendium of Olfactory Research: Explorations in Aroma-Chology: Investigating the Sense of Smell and Human Response to Odors, 1982-1994*, ed. Avery N. Gilbert (Dubuque: Kendall/Hunt Publishing Company, 1995), 117.

¹² *Ibid.*, 118.

¹³ Classen, Howes, and Synnott, 3.

¹⁴ Jütte, 3.

¹⁵ Charles A. Greer, “Anatomical Organization of the Human Olfactory System,” in *Compendium of Olfactory Research: Explorations in Aroma-Chology: Investigating the Sense of Smell and Human Response to Odors, 1982-1994*, ed. Avery N. Gilbert (Dubuque: Kendall/Hunt Publishing Company, 1995), 3.

Scent + Human Ability

The human nose can distinguish thousands of different scents.¹⁶ People could detect fear in human sweat and had the capacity to detect three drops of the odiferous chemical ethyl mercaptan if dripped into a swimming pool.¹⁷ Researchers Lee Sela and Noam Sobel argued in their article “Human olfaction: A constant state of change-blindness,” in *Experimental Brain Research* that humans have a spatial unawareness to smell.¹⁸ Unlike vision and hearing, which are continuous, scent could only be imbibed discretely, sniff by sniff. Thus, it was harder for humans to notice changes in scent that occurred. Yet the strength of the human scent ability was shown in another study by Jess Porter et al. “Mechanisms of scent-tracking in humans,” in *Nature Neuroscience*. The study found that humans had the capacity to scent track. Of 32 human subjects who had all other sensory input blocked, two thirds were able to correctly follow a ten meter long scent trail in an open grass field and their ability to do so improved with training.¹⁹ In a similar study called “Orientation and Navigation in Humans,” in *PLoS ONE*, Lucia F. Jacobs et al. found that participants with all other sensory output blocked and disoriented were capable of orienting themselves and navigating to a different location they had learned using olfaction alone.²⁰

Human olfaction was also subject to a number of challenges. Despite the ability to detect and follow odors, other studies have concluded that humans cannot distinguish individual scents in mixtures very well. According to biomedical scientist Alan Mackay-Sim and neuroscientist Jean-Pierre Royet writing in “Structure and function of the olfactory system,” in *Olfaction and*

¹⁶ Classen, Howe, and Synnott, 109.

¹⁷ Lee Sela and Noam Sobel, “Human olfaction: A constant state of change-blindness,” *Experimental Brain Research* 205, no. 1 (2010): 15, doi: 10.1007/s00221-010-2348-6.

¹⁸ *Ibid.*, 19.

¹⁹ Jess Porter et al., “Mechanisms of scent-tracking in humans,” *Nature Neuroscience* 10, no. 1 (2007): 27, doi: 10.1038/nn1819.

²⁰ Lucia F. Jacobs, et al., “Olfactory Orientation and Navigation in Humans,” *PLoS ONE* 10, no. 6 (2015): 9, doi: 10.1371/journal.pone.0129387.

the Brain, “[h]umans are relatively poor at discriminating the components of mixtures and cannot distinguish more than three or four separate components.”²¹ The limited ability of humans to identify discrete scents in a mixture was confirmed by behavioral scientist and psychologist David G. Laing who found in his article “Anatomical Human Responses to Odour Mixtures” in *Compendium of Olfactory Research* that this held true for both people with untrained noses as well as professional perfumers and flavorists.²² Likewise scent psychologist Rachel Herz suggested in her book *The Scent of Desire* that humans had trouble distinguishing real fragrances from their synthetic counterparts, either because people were more familiar with the manufactured version or because the synthetic version was more concentrated.²³ Additionally, Herz found that despite the strength of the human nose to detect odor, it is capable of being tricked. She produced what she called “olfactory illusions” in her lab by assigning the same odor different names which resulted in human subjects reacting to and perceiving the scents in different ways.²⁴ She qualified her findings by adding that it only seemed to work with unfamiliar scents; trying to trick a subject into thinking garlic was lemon would be unsuccessful.²⁵ The human nose adapted quickly to smells in the environment, but appeared to shut down after encountering too many smells in a process known as olfactory fatigue. Art critic and curator Jim Drobnick cited the personal variability of each person as a challenge to working with scent. He wrote that up to 15% of the population had some kind of olfactory dysfunction,

²¹ Alan Mackay-Sim and Jean-Pierre Royet, “Structure and function of the olfactory system,” in *Olfaction and the Brain*, ed. Warrick Brewer, David Castle, and Christos Pantelis (New York, NY: Cambridge University Press, 2006), 8.

²² David G. Laing, “Anatomical Human Responses to Odour Mixtures: Understanding the Basis for blending of Odours,” in *Compendium of Olfactory Research: Explorations in Aroma-Chology: Investigating the Sense of Smell and Human Response to Odors, 1982-1994*, ed. Avery N. Gilbert (Dubuque: Kendall/Hunt Publishing Company, 1995), 10.

²³ Rachel Herz, *The Scent of Desire: Discovering Our Enigmatic Sense of Smell*, (New York, NY: HarperCollins, 2007), 18-19.

²⁴ *Ibid*, 57.

²⁵ *Ibid*.

whether that be due to aging, disease, or injury and that allergy and illness could increase that number.²⁶

Scent + Anatomy: The Olfactory System

Except where otherwise noted, the following description of the workings of the olfactory system was informed by the work of Alan Mackay-Sim and Jean-Pierre Royet, “Structure and function of the olfactory system,” in *Olfaction and the Brain*.²⁷

The olfactory system is unique in that it is the only sense that has direct contact with the brain. To process information in a scent, every time a human takes a sniff the information first goes to the olfactory mucosa. The olfactory mucosa lies in the back and top of the nasal cavity behind the bridge of the nose, near the cribriform plate. It is the region of the nasal cavity that is specialized for the detection of odor molecules called odorants. It is made up of the olfactory epithelium, tissue on the roof of the nasal cavity, and an underlying moist mucus membrane called the lamina propria. The cribriform plate makes up the top of the spongy ethmoid bone, which separates the nasal cavity from the brain. The ethmoid bone supports the olfactory bulb at the bottom of the brain. It is located in the roof of the nose between the eye sockets in the skull.

Within the olfactory mucosa there are approximately 20 million olfactory receptor neurons.²⁸ Olfactory receptors respond to different odorants. The axons of the olfactory receptor neurons - the projections on neurons that conduct electrical impulses away from the neuron - leave the olfactory epithelium and gather into small bundles that form olfactory nerves. These olfactory nerves travel through the spongy openings in the cribriform plate and enter the

²⁶ Jim Drobnick, “The Museum as a Smellscape,” in *The Multisensory Museum: Cross-Disciplinary Perspectives on Touch, Sound, Smell, Memory, and Space*, ed. Nina Levent and Alvaro Pascual-Leone, (Lanham, MD: Rowman & Littlefield, 2014), 189.

²⁷ See Alan Mackay-Sim and Jean-Pierre Royet, “Structure and function of the olfactory system,” in *Olfaction and the Brain*, edited by Warrick Brewer, David Castle, and Christos Pantelis, 3-27.

²⁸ Herz, *The Scent of Desire*, 20.

olfactory bulb. The bundled axons unpack and enter specialized glomeruli – globular structures of entwined neurons. Inside the glomeruli, the axons synapse, or pass signals, with neurons in the olfactory bulb called mitral cells. Mitral cells then send the information they get from the glomeruli to the olfactory cortex. From there, information travels deeper into the brain.

The olfactory nerves are only two synapses away from the amygdala, which is where the human brain expresses and experiences emotion and emotional memory, and only three synapses away from the hippocampus which is related to memory functions.²⁹ According to Rachel Herz, “the areas of the brain that process smell and emotion are as intertwined and codependent as any two regions in the brain could possibly be.”³⁰ She noted that in studies with rats, if the amygdala was removed, olfactory learning ceased and rats could not use smell to differentiate a nutritious drink from a poisonous one.³¹ She linked scent to emotional associative learning, but argued in a 2010 article “The Emotional, Cognitive, and Biological Basics of Olfaction” in *Sensory Marketing* that humans had immediate reactions to scents that were hedonic rather than analytical in nature.³² In other words, smells were instantly judged on whether or not a person liked or disliked that scent. Scent enjoyment was related to intensity – but whereas unpleasant odors only became more unpleasant over time, a pleasant scent was enjoyed up until a point where it was deemed too potent after which enjoyment decreased.³³

Scent + Psychology: Emotion, Memory, Behavior

²⁹ Rachel Herz, “The Emotional, Cognitive, and Biological Basics of Olfaction: Implications and Considerations for Scent Marketing,” in *Sensory Marketing: Research on the Sensuality of Products*, ed. Aradhna Krishna (New York, NY: Taylor and Francis, 2010), 90.

³⁰ Herz, *The Scent of Desire*, 3

³¹ *Ibid*, 52.

³² Herz, “The emotional, cognitive, and biological basics of olfaction,” 88

³³ *Ibid*.

Regardless of how aware humans were of scent, several studies have shown scent has the power to impact human emotion, memory, and behavior.³⁴ Rachel Herz supported linking scent to associative learning. She followed a line of thinking developed by her mentor Trygg Engen, a pioneer in psychological research on smell, that argued that when someone experiences an odor for the first time, it becomes forever linked with the context and emotion in which it was experienced.³⁵ Once formed, odor associations were extremely difficult to rewrite.³⁶ Herz argued in her 2012 article “Odor memory and the special role of associative learning,” in *Olfactory Cognition* that because most odors were experienced for the first time in childhood, odors seem adept at taking people back to their early years.³⁷ Furthermore, emotional experiences tied to certain odors influenced the hedonic experience of that scent, making scent perception a learned trait.³⁸ Scent perception also played into how humans reacted to odors. Mackay-Sim and Royet reported that unpleasant scents could cause intense negative emotional reactions but pleasant scents did not induce intense positive emotions.³⁹

In a 2004 study, “A Naturalistic Analysis of Autobiographical Memories Triggered by Olfactory Visual and Auditory Stimuli,” in *Chemical Senses*, Herz found that memories recalled using odor cues were significantly more emotional and evocative than the same memories using

³⁴ See Rachel S. Herz, “A Naturalistic Analysis of Autobiographical Memories Triggered by Olfactory Visual and Auditory Stimuli,” *Chemical Senses* 29, no. 3 (2004): 217-224, doi: 10.1093/chemse/bjh025; Rachel S. Herz, “Odor-associative Learning and Emotion: Effects on Perception and Behavior,” *Chemical Senses* 30, suppl. 1 (2005): i250-i251, doi: 10.1093/chemse/bjh209; John P. Aggleton and Louise Waskett, “The ability of odours to serve as state-dependent cues for real-world memories: Can Viking smells aid the recall of Viking experiences?,” *British Journal of Psychology* 90, no. 1 (1999): 1-7, doi: 10.1348/000712699161170; and Maureen Morrin, “Scent Marketing: An Overview,” in *Sensory Marketing: Research on the Sensuality of Products*, ed. Aradhna Krishna (New York, NY: Taylor and Francis, 2010), 75-86.

³⁵ Herz, *The Scent of Desire*, 37

³⁶ *Ibid*, 39

³⁷ Rachel S. Herz, “Odor memory and the special role of associative learning,” in *Olfactory Cognition: From the Perception and Memory to Environmental Odours*, ed. Gesualdo M. Zucco, Rachel S. Herz, and Benoist Schaal (Philadelphia: John Benjamins Publishing Company, 2012), 109.

³⁸ Rachel S. Herz, “Odor-associative Learning and Emotion: Effects on Perception and Behavior,” *Chemical Senses* 30, suppl. 1 (2005): i250, doi: 10.1093/chemse/bjh209.

³⁹ Mackay-Sim and Royet, 18.

verbal, visual, and aural cues.⁴⁰ She hypothesized that because humans encounter impactful scents less frequently than visual and audio stimuli, scent served as a more powerful trigger to emotional memories.⁴¹ Mikisha Doop et al. seemed to agree in “Olfaction and Memory,” in *Olfaction and the Brain* that odor-evoked memories had a particular potency and argued it was because scent activated the amygdala.⁴² They also argued that olfactory memory was resistant to decay and remained intact in old age and over time.⁴³ This corroborated a study by Trygg Engen in *The Perception of Odor* in which he wrote, “odor memory is fairly impervious to the effect of time.”⁴⁴ A study by Aggleton and Waskett, “The ability of odours to serve as state-dependent cues for real-world memories: Can Viking smells aid the recall of Viking experiences?,” in the *British Journal of Psychology*, seemed to confirm the longevity of odor-related memories. They found that scent cues taken directly from fragrances employed in Jorvik Viking Centre aided visitors to better recall their museum experience even though the average experience for those tested occurred 6.7 years before the study.⁴⁵

Susan C. Knasko investigated how scents impact human behavior using a museum as a backdrop in her article “Congruent and Incongruent Odors: Their Effect on Human Approach Behavior,” in *Compendium of Olfactory Research*. After exploring lingering and approach behavior in business settings, she decided to test how scents might affect the same behaviors in a museum. She found that pleasant scents increased the amount of time visitors spent in an exhibit space, regardless of whether the scent made sense in the context of the exhibit, but that when the

⁴⁰ Rachel S. Herz, “A Naturalistic Analysis of Autobiographical Memories Triggered by Olfactory Visual and Auditory Stimuli,” *Chemical Senses* 29, no. 3 (2004): 221, doi: 10.1093/chemse/bjh025.

⁴¹ Ibid.

⁴² Mikisha Doop et al., “Olfaction and Memory,” in *Olfaction and the Brain*, ed. Warrick Brewer, David Castle, and Christos Pantelis (New York, NY: Cambridge University Press, 2006), 74.

⁴³ Ibid, 75.

⁴⁴ Trygg Engen, *The Perception of Odors* (New York, NY: Academic Press, 1982), 111.

⁴⁵ John P. Aggleton and Louise Waskett, “The ability of odours to serve as state-dependent cues for real-world memories: Can Viking smells aid the recall of Viking experiences?,” *British Journal of Psychology* 90, no. 1 (1999): 5, doi: 10.1348/000712699161170.

scent was congruent to the subject matter of the exhibit, visitors spent more time exploring and engaging with the exhibit.⁴⁶ Upon interviewing the subjects, her study seemed to indicate that a pleasant odor led to a more positive mood but that a congruent odor resulted in visitors learning more about the subject of the exhibit.⁴⁷

Other studies have investigated the subliminal ways scent can impact human behavior. Anat Arzi et al. at the Weizmann Institute of Science found in “Mirror Sniffing: Humans Mimic Olfactory Sampling Behavior,” in *Chemical Senses* that participants would sniff after they heard someone sniff on screen in a movie, in an action dubbed “mirror sniffing behavior.”⁴⁸ Larger sniffs were recorded when the subject could hear the sniffing action but not see it, but no mirror sniffs were recorded if the subjects could just hear the sniff happening.⁴⁹ The researchers concluded humans have an automatic response to the idea of an unknown odor in the air that may be important.⁵⁰ Idan Frumin et al., found in the study “A social chemosignaling function for human handshaking,” in *eLife* that humans tend to smell their own hands if left alone following a handshaking event.⁵¹ Researchers suggested that provided evidence of subliminal social chemosignaling in human behavior.⁵²

Scent + Business: Scent Marketing

The power of scent to affect human behavior has been well documented and researched in the commercial sphere. A whole genre of scent marketing developed to incorporate scent into

⁴⁶ Susan C. Knasko, “Congruent and Incongruent Odors: Their Effect on Human Approach Behavior,” in *Compendium of Olfactory Research: Explorations in Aroma-Chology: Investigating the Sense of Smell and Human Response to Odors, 1982-1994*, ed. Avery N. Gilbert, (Dubuque: Kendall/Hunt Publishing Company, 1995), 68-69.

⁴⁷ *Ibid.*, 70.

⁴⁸ Anat Arzi et al., “Mirror Sniffing: Humans Mimic Olfactory Sampling Behavior,” *Chemical Senses* 39, (2014) 278, doi: 10.1093/chemse/bjt113.

⁴⁹ *Ibid.*

⁵⁰ *Ibid.*, 280.

⁵¹ Idan Frumin et al., “A social chemosignaling function for human handshaking,” *eLife*, (2015): 1, doi: 10.7554/eLife.05154.

⁵² *Ibid.*

multisensory commercial experiences. Scent marketing, defined as the use of scents to set certain moods and improve satisfaction levels in order to promote and position certain products or brands, was built on the premise that certain scents will positively induce consumers to spend more and view certain stores and brands more favorably.⁵³ Scent marketing had its greatest growth in ambient scents that affect the atmospheric qualities of a space. In “Scent Marketing: An Overview” in *Sensory Marketing*, Maureen Morrin found that pleasant ambient scents improved consumer evaluations of both stores and products.⁵⁴ According to Jütte, a study undertaken in German supermarkets discovered that electronically controlled fragrances in the stores increased customers’ willingness to spend money by 15%.⁵⁵ While research demonstrated that scent could influence shoppers to buy more, it came with the caveat that the scent must make sense in the context in which it was employed.⁵⁶ In their book *Whiff! The Revolution of Scent Communication in the Information Age*, Brumfield, Goldney, & Gunning pointed to seasonal scent usage as being an effective way of putting scents into context: for instance, using pine and gingerbread in winter and rose and chocolate around Valentine’s Day.⁵⁷ They argued that scent marketing was an innovative, growing field that was proving quite successful. For example, scented ads improved readership by as much as 136%.⁵⁸

Methods employed in scent marketing were vast and varied. Fragrance mediums were the means by which scent could be dispersed and ranged from scented inks, varnishes, plastics, rubbers, and textiles, to environmental and digitally enabled scents.⁵⁹ Fragrances could be

⁵³ Maureen Morrin, “Scent Marketing: An Overview,” in *Sensory Marketing: Research on the Sensuality of Products*, ed. Aradhna Krishna (New York, NY: Taylor and Francis, 2010), 75-76.

⁵⁴ *Ibid.*, 76.

⁵⁵ Jütte, 276.

⁵⁶ Morrin, 82.

⁵⁷ C. Russell Brumfield, James Goldney, and Stephanie Gunning, *Whiff!: The Revolution of Scent Communication in the Information Age* (New York, NY: Quimby Press, 2008), 232.

⁵⁸ *Ibid.*, 166.

⁵⁹ *Ibid.*, 195-224.

utilized as liquids, solids, gases, gels, beads, and via microencapsulation.⁶⁰ The company AromaSys tied dispensing technology to a building's HVAC system.⁶¹ The company Halloween FX Props offered a range of "fog juice" fragrances for use with a fog machine.⁶²

Many companies online offered essential and fragrance oils in every scent imaginable. EverythingSmells.com advertised itself as the "Home of the Scratch & Sniff Sticker!"⁶³ Brumfield, Goldney, & Gunning linked innovation in scent delivery methods to the need for the commercial world to compete with the advent of online-based consumerism, writing, "survival will be achieved only by making the in-person shopping experience easier and more enjoyable."⁶⁴

Rachel Herz described a business book that instructed emerging business owners to capitalize on the power of fragrance to make customers happy.⁶⁵ Brumfield, Goldney, & Gunning were enthusiastic about the prospects of scent marketing in all types of locations from shopping malls, supermarkets, and department stores, to auto dealerships, hotels, casinos, racetracks, and even hospitals. Likewise, many websites mentioned that their technology could be used anywhere: in businesses, but also at home, work, or events.

Scent technology was also pioneered outside of the business sphere. "E-noses," or electronic noses, were devices to detect and analyze odors and were equipped with an array of sensors that could pick up traces of chemical odors.⁶⁶ By analyzing a patient's breath diseases like tuberculosis, breast cancer, and early stage lung cancer were detected.⁶⁷ SensoryCo, specializing in immersive search and rescue training and simulation, used scent technology to

⁶⁰ Ibid.

⁶¹ Herz, *The Scent of Desire*, 226.

⁶² "Fog Scents," Halloween FX Props, accessed August 2, 2017, <http://www.halloweenfxprops.com/fog-scents-1/>.

⁶³ EverythingSmells, accessed August 2, 2017, <http://www.everythingsmells.com/>.

⁶⁴ Brumfield, Goldney, and Gunning, 238.

⁶⁵ Herz, *The Scent of Desire*, 224

⁶⁶ Ibid, 209.

⁶⁷ Herz, *The Scent of Desire*, 211-212

help rescue teams become accustomed to scents they may encounter during a disaster, such as burning flesh, blood trauma, mustard gas, and burning wood.⁶⁸

Scent + Museums

There was a direct overlap from scent marketing to the museum field. Jorvik Viking Centre (Jorvik) in York, England, was one of the first museums to adopt scent in its exhibit space and hired the emerging Lancashire scent marketing company Dale Air to manufacture its scents.⁶⁹

Jorvik is located at the site of the Coppergate archeological dig where in 1976 a complete street from Viking-era York was discovered.⁷⁰ Because of the wealth of material found, the museum recreated the 10th century settlement and brought it to life with sights, sounds, and smells.⁷¹ Local designer John Sunderland was hired to implement the project. In his memoir, *On My Way to Jorvik*, Sunderland wrote that he wanted to make museums more like films, to be immersive and experiential.⁷² According to Sunderland, the members of the York Archaeological Trust took a risk on a museum with an exhibit design concept that was untested for the field and noted “careers would be tarnished, most likely ruined” if it failed.⁷³ However, he wrote that everyone on the project felt they were creating “something truly groundbreaking.”⁷⁴

Sunderland recalled the first visit he had with the head of Dale Air, describing the scents he wanted to employ in various locations in the exhibit: leather, “a background smell of rotting food, horse dung, fish, bad eggs, dog, dirt, human excrement, and sweat,” wood shavings,

⁶⁸ “About,” SensoryCo TS, accessed August 2, 2017, <http://www.sensorycots.com/about/>.

⁶⁹ John Sunderland, *On My Way to Jorvik: How a boy with a vision became the project designer of Britain’s groundbreaking museum, the original Jorvik Viking Centre*, 2014. Kindle Edition, chapter 1, chapter 12.

⁷⁰ Peter Addyman, “Foreward,” in *On My Way to Jorvik: How a Boy with a Vision Became the Project Designer of Britain’s Ground-Breaking Museum, the Original Jorvik Viking Centre*, 2014, Kindle edition.

⁷¹ Sunderland, chapter 5.

⁷² Ibid, chapter 2 and chapter 5.

⁷³ Ibid, chapter 6.

⁷⁴ Ibid, chapter 8.

cesspit, pig pen, tarry rope, and river water.⁷⁵ He remembered that the head of Dale Air was at first perplexed at the idea of creating unpleasant aromas, saying that it would be challenging and difficult to control.⁷⁶ While Dale Air was not successful in replicating all the desired smells, they did create synthetic fragrance oils that, when placed in the right context, resulted in the desired effect. Sunderland described the fragrance medium technology employed as resembling an oil heater: concentrated synthetic oil was warmed at the bottom of a container and released into the air. They worked successfully and were easy to operate being hidden in accessible locations, controlled by a central circuit, and replenished on a regular basis. A ventilation system drew scented air out of the exhibit space. Sunderland claimed that because of the success of scent at Jorvik, Dale Air became the go-to company for developing scents for museum displays.⁷⁷ While Jorvik has been updated since it opened in 1984, it still employs scents and dispensing technology from Dale Air. According to Dave Boston, the Technical Manager at Jorvik, Dale Air “has made the smell experience at Jorvik one of the most unique memories for the Jorvik visitor” and “has firmly established the use of aroma in our attraction.”⁷⁸

While Jorvik was popular with the public,⁷⁹ some historians, have expressed criticism about the place of smells in history museums. Jütte called sensory experiences in general the “new buzzword of museum culture,” and were created by curators “respond[ing] to the latest popular taste.”⁸⁰ Historian Mark Smith was critical of Jorvik, claiming it “reaffirms the conceit” of a “stench-ridden past,” rather than challenging the narrative.⁸¹ In his view, it was impossible to capture how a 10th century inhabitant of York perceived scents and that instead, visitors

⁷⁵ Ibid, chapter 12.

⁷⁶ Ibid.

⁷⁷ The full description of the Dale Air “smell-pots” is found in chapter 13.

⁷⁸ “Museums, Historical properties & Visitor attractions,” Dale Air, accessed August 2, 2017, <http://www.daleair.com/museums-historical-properties-and-visitor-attractions>.

⁷⁹ Sunderland, chapter 14.

⁸⁰ Jütte, 2-3.

⁸¹ Smith, 120.

brought modern day sensibilities to the exhibit.⁸² John Sunderland himself fell into this trap, writing in his memoir, “[s]urely in such confined space life would have been messy, on top of each other, dirty, and smelly.”⁸³ However, he acknowledged, “we couldn’t place ourselves in the past. But what we shared with the original inhabitants was our humanity and I reckoned that if we could somehow capture that sense in the reconstruction then the public would be engaged at a deep and human level, connected to their own life experience.”⁸⁴ Of these philosophies, Sunderland’s was most in line with a shift in museum practice outlined by John H. Falk and Lynn D. Dierking in *The Museum Experience*.

In *The Museum Experience*, Falk and Dierking argued, “visitors try, often quite desperately, to relate what they are seeing to their own experiences.”⁸⁵ While Falk and Dierking seldom mentioned visitors encountering smells in museums, they did recognize the relationship between how visitors felt and how much they learned and remembered in an exhibit. In interviews with visitors, Falk and Dierking found that visitors described museums as emotional and inspiring as well as intellectual.⁸⁶ Falk and Dierking noticed that the physical feel of a museum, including smell, had a strong influence on visitors’ memories.⁸⁷

Susanne Schmitt wrote one of the only studies focusing on how scent played into the museum experience in her article “Intimacy Out of Place: On the Workings of Smell in an Exhibition on Human Sexuality,” in *Arts and Aesthetics in a Globalizing World*. She observed visitors in an exhibit on human sexuality at the Deutsches Hygien-Museum in Germany. The exhibit had an olfaction corner where visitors could open the lid on metal containers and pull out

⁸² Ibid, 120, 125.

⁸³ Sunderland, chapter 7.

⁸⁴ Ibid, chapter 13.

⁸⁵ Falk and Dierking, 74.

⁸⁶ Ibid, 92.

⁸⁷ Ibid, 121.

ampullae containing ambergris, musk, civet, and castoreum. She wrote, “visitors usually react strongly to these odours, and can often be seen jumping away and expressing their disgust in their encounters with the ampullae.”⁸⁸ In her discussions with museum staff, she found that guides used the ampullae to combat museum fatigue, but that maintenance staff avoided the area because the smells tended to linger in the space.⁸⁹ She concluded that “odours occupy an awkward position within the museum space itself: they are intimate and messy and their use transcends regulations.”⁹⁰

In articles published in the edited volume *The Multisensory Museum*, Stevenson, together with neuroscientist Andreas Keller and art critic and curator Jim Drobnick, theorized on how best to incorporate scent into a museum exhibit and the benefits and challenges of doing so. Stevenson, Keller, and Drobnick all agreed about the difficulty of controlling and stabilizing scent. Keller wrote in “The Scented Museum” that “[i]t is very difficult to create a uniform concentration of an odor that is stable over time in a large space.”⁹¹ Smells are unstable; they blur, overlap, and move around. In his article “The Museum as a Smellscape,” Drobnick highlighted the importance of remembering that smells do not exist in a vacuum, but work either with or against residual odors in the museum environment.⁹² Keller was of the mind that even if scents were unnoticed, the museum experience would still be immersive but risk leaving visitors

⁸⁸ Susanne Schmitt, “Intimacy Out of Place: On the Workings of Smell in an Exhibition on Human Sexuality,” in *Arts and Aesthetics in a Globalizing World*, ed. Raminder Kaur and Parul Dave-Mukherji (New York, NY: Bloomsbury, 2014), 210.

⁸⁹ *Ibid.*, 212.

⁹⁰ *Ibid.*, 214.

⁹¹ Andreas Keller, “The Scented Museum,” in *The Multisensory Museum: Cross-Disciplinary Perspectives on Touch, Sound, Smell, Memory, and Space*, ed. Nina Levent and Alvaro Pascual-Leone, (Lanham, MD: Rowman & Littlefield, 2014), 169.

⁹² Jim Drobnick, “The Museum as a Smellscape,” in *The Multisensory Museum: Cross-Disciplinary Perspectives on Touch, Sound, Smell, Memory, and Space*, ed. Nina Levent and Alvaro Pascual-Leone, (Lanham, MD: Rowman & Littlefield, 2014), 183.

unsatisfied. On the other hand, using strong scents could be noxious to the visitors.⁹³ Drobnick noted that the reaction of visitors to scents was based on personal experience and thus could result in visitors reacting in unexpected ways.⁹⁴ In his article “The Forgotten Sense: Using Olfaction in a Museum Context,” Stevenson agreed but qualified that it was enough if the museum conjectures that most people would react in the appropriate manner.⁹⁵ Keller and Drobnick seemed to disagree when it came to notices making visitors aware of scents. Keller hypothesized that announcing that a scent would be present would create an expectation for its existence and visitors may be disappointed if they could not detect it.⁹⁶ Drobnick argued that visitors tended to be suspicious of smells they could not identify.⁹⁷ Keller alone stated that scents result in increased visitor engagement and active exploration of an exhibit.⁹⁸ Only Drobnick noted how scents had the added challenge of needing to be maintained, as well as advising that museums should be aware of health conditions related to scent.⁹⁹ However, he wrote that “no . . . museum can predict or cater to all [health] contingencies to guarantee every visitor the same scent experience.”¹⁰⁰ He seemed to provide leeway for olfactory fatigue, saying that museums could avoid it.¹⁰¹ He advocated for separating scented components in either different rooms, localized diffusers, or smelling stations.¹⁰²

Adding it All Together

⁹³ Keller, 169.

⁹⁴ Drobnick, 188.

⁹⁵ Richard J. Stevenson, “The Forgotten Sense: Using Olfaction in a Museum Context,” in *The Multisensory Museum: Cross-Disciplinary Perspectives on Touch, Sound, Smell, Memory, and Space*, ed. Nina Levent and Alvaro Pascual-Leone, (Lanham, MD: Rowman & Littlefield, 2014), 158.

⁹⁶ Keller, 170.

⁹⁷ Drobnick, 193.

⁹⁸ Keller, 174.

⁹⁹ Drobnick, 191

¹⁰⁰ Ibid, 189.

¹⁰¹ Ibid, 191.

¹⁰² Ibid, 190.

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There had been studies exploring the place of the sense of smell in human culture, documenting the capacity of the human sense of smell and mapping the anatomy of the nose, investigating the affect of scent on psychology and consumer behavior. A few of these studies had taken place in museums and some of the results had informed the best practices of using scent in museums that do exist. However, the literature did not demonstrate the decision-making process for why a museum might choose to engage a visitor's sense of smell or what the museum might hope to achieve by doing so.

CHAPTER THREE: METHODOLOGY

This chapter introduced the methodological approach for this study and provided a rationale for taking a case study approach.

The purpose of this study was to describe the phenomenon of using scented or aromatic materials to engage the visitor's sense of smell in museum settings. Three questions guided this study:

1. What was the decision-making process to include a scented component in a museum exhibit?
2. What were the design and implementation considerations to include a scented component?
3. What impact did museum staff feel scent had on visitors?

In order to provide insight into these questions, a collective, instrumental case study approach was selected and guided interviews with museum staff at each case study site was used. A. J. Pickard author of *Research Methods in Information* wrote that case studies were, “a method designed to study the particular within context” and could lead to understanding a particular phenomenon.¹⁰³ For this reason, a case study approach was applicable to study specific instances of scent inclusion in museum exhibits in order to understand scent inclusion as a wider phenomenon. As qualitative case studies were emergent in nature, unstructured, guided interviews were selected to provide space for interviewees to express their thoughts and feelings in their own words, but also to ensure all the necessary topics of the interview were covered. While an interview guide was employed, the semi-structured nature of the interviews allowed questions to be skipped when answered without being asked or deemed not relevant for the

¹⁰³ Alison Jane Pickard, *Research Methods in Information* (2nd ed.) (Chicago, IL: Neal-Schuman, 2013), 101.

interview at hand. Guided interviews also provided the opportunity to follow-up on any unexpected responses that emerged in the course of the interview.

Sampling: Case Sites

Two criteria were used to choose institutions as case-study sites: 1) the institution fell under the definition of museum as defined by the International Council of Museums¹⁰⁴ and 2) the institution currently or in the past included fragrant or aromatic material to engage visitors' sense of smell in an exhibit or exhibition. Potential case study sites were identified through word-of-mouth in discussing this research project with others. Sites were confirmed to fall under the above criteria through further investigation by looking at the website of the museum or reading reviews of the exhibit posted online.

The case study sites chosen included: The Tech Museum of Innovation (The Tech) in San Jose, California and the exhibition *Innovations in Health Care*, which allowed visitors to test their sense of smell against technology that used scent to diagnose cancer; the Dixon Gallery and Gardens (the Dixon) in Memphis, Tennessee and the exhibition *Sense and Symbolism* which paired impressionist paintings and perfume bottles with a smell gallery ("Smellery") and fragrant gardens to teach visitors about smell and perfumery; and the Museum of History and Industry (MOHAI) in Seattle, Washington and the traveling exhibition *Chocolate*, which pumped in ambient chocolate scent during the exhibition.

Sampling: Participants

¹⁰⁴ "A museum is a non-profit, permanent institution in the service of society and its development, open to the public, which acquires, conserves, researches, communicates and exhibits the tangible and intangible heritage of humanity and its environment for the purposes of education, study and enjoyment." "ICOM Definition of a Museum," *International Council of Museums*, accessed August 16, 2017, <http://archives.icom.museum/definition.html>.

Participants for this research consisted of staff or volunteers from the three case study sites. Contact was initiated via email, either directly or through the general museum information email found on the website of the institution. See Appendix A for *Description of Recruitment Email and Consent*. Subsequent participants were identified via snowball sampling: at the conclusion of the first interview(s) at a site, the interviewee was asked if there were any other individuals associated with the institution they would recommend be interviewed. All participants were museum staff or volunteers who worked on, contributed to, or were in some way involved with an exhibit at the museum that incorporated scent. A total of seven individuals were interviewed: five at the Dixon Gallery and Gardens, one at the Tech Museum, and one at MOHAI. A list of participants can be seen in Table 1.

Table 1: List of Participants

<u>Case Study Site</u>	<u>Staff Role at Site</u>
Tech Museum	Exhibit Developer/Curator
Dixon	Director
Dixon	Curator
Dixon	Director of Education
Dixon	Gardens Education and Volunteer Coordinator
Dixon	Volunteer
MOHAI	Exhibits Manager

Data Collection: Guided Interviews

Interviews were conducted in-person or over the phone. Interviews lasted approximately 20-35 minutes and were audio-recorded with permission from participants. In one case, because of technical difficulties, the interview was not audio-recorded but transcribed during the interview itself. There was one interview guide encompassing 22 questions; some questions had multiple parts or additional follow-up questions (See Appendix B for *Interview Guide*). Because the interviewees were drawn from multiple different positions and/or departments within the case study sites, the questions most salient to the case study site and the participant's position at that

site were identified prior to the interview. The tailoring of the interview guide per participant was non-binding: if it became clear during the interview that a question identified as relevant was in fact not so, it was skipped and if a question hypothesized to be non-relevant became pertinent to the discussion, it was asked. In addition to the interviews, one participant was emailed two follow-up questions.

Data Analysis

All interviews were uploaded to a research project file in NVIVO software and transcribed. After transcription, interviews were coded using emergent coding. For each interview, key themes and quotes were identified according to each research question. Codes were drawn from these themes. A coding rubric was created to organize themes on one side and supporting quotes separated by institution on the other (See Appendix C for *Coding Rubric*). Case studies were then compared using pattern matching and cross-case synthesis.

Limitations

This study had four limitations. First, because this research took the case study approach and only examined three sites, the ability to generalize beyond them was limited for wider field applications. Secondly, the number of interviews conducted at each site was unequal. With only one interview conducted at the Tech Museum and MOHAI, it was difficult to generalize about these sites as it pertained to the codes used. This was a limitation in the use of snowball sampling as a sampling technique to fulfill the goals of this study. It hinted at the resilience of departmentalism in the museum field. A third limitation was that this study did not focus on one fragrance medium technology in particular since each site used different fragrance delivery techniques. A fourth limitation was that each case study site covered a different subject matter – technology, art and gardens, and history – as well as being differently sized museums. Therefore,

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no generalizations about scent inclusion art museums, history museums, or technology museums, large museums or small museums could be made. Future research in this topic could expand knowledge by controlling more variables.

CHAPTER FOUR: FINDINGS AND ANALYSIS

This chapter presented the findings of the study. It began with a description of each case study site. It then described the themes that emerged from the interviews for each of the three research questions this study examined.

Descriptions of Case Study Sites

Three museum exhibitions that used scent in some way were the focus of this case study. These museum exhibitions were *Innovations in Health Care* at the Tech Museum of Innovation (The Tech) in San Jose, California; *Senct and Symbolism: Perfumed Objects and Images* at the Dixon Gallery and Gardens (the Dixon) in Memphis, Tennessee; and *Chocolate* while on tour at the Museum of History and Industry (MOHAI) in Seattle, WA from The Field Museum in Chicago, Illinois.

***Innovations in Health Care* at the Tech Museum of Innovation, San Jose, CA**

The Tech Museum of Innovation referred to itself as “a family-friendly interactive science and technology center”¹⁰⁵ and is located in Silicon Valley. The mission of the museum is “to inspire the innovator in everyone.”¹⁰⁶ According to the Exhibit Developer/Curator of The Tech in response to introductory interview questions (See Interview Guide, Questions 1 – 2, Appendix B), the museum received between 400,000 and 500,000 visitors every year. The museum offered many different ways for visitors to engage with science and technology, including lab experiences, exhibitions, programs, and IMAX experiences. The Exhibit Developer/Curator of The Tech stated that *Innovations in Health Care* is the first exhibit of the museum that used scent. The wider exhibit showcased advances in health care technology coupled with the story of innovative design process for each one. There were interactives

¹⁰⁵ “About the Tech Museum of Innovation,” *The Tech Museum of Innovation*, accessed August 2, 2017, <https://www.thetech.org/about-tech-museum-innovation>

¹⁰⁶ Ibid.

throughout the exhibition demonstrating the technologies. One interactive was called “Sniff,” and displayed an electronic nose that can detect cancer by analyzing a patient’s breath. The interactive asked visitors how sensitive their sense of smell was. Visitors leaned over, pressed a button, and were tasked with distinguishing separate odors in a fragrant mixture produced with scented pellets.

Scent and Symbolism: Perfumed Objects and Images at the Dixon Gallery and Gardens, Memphis, TN¹⁰⁷

The Dixon, a fine art museum and public garden, was the home and garden of Hugo Norton Dixon and Margaret Oats Dixon. It was left in trust to the city of Memphis after they passed away in 1974. The site also hosted the Canale Conservatory and its additional exhibit space. The Dixon is composed of 17 acres of gardens and has “a permanent collection of over 2,000 objects, including French and American Impressionist paintings and significant holdings of German and English porcelain.”¹⁰⁸ *Scent and Symbolism* paired paintings and works on paper that evoked the sense of smell with 140 perfume bottles dating from the 17th to the mid-20th centuries on loan to the United States for the first time from the Umi-Mori Art Museum in Hiroshima, Japan. The exhibition of the objects was paired with the gardens, the Canale Conservatory, and a discovery room. The Director of the museum wrote in the forward of the exhibition catalog that the exhibit “represent[ed] the most vital, symbiotic, and resonant exhibition [the Dixon has] ever produced . . . embracing both art and horticulture in the way it does. Never before have the twin aims of [their] mission been so perfectly aligned.”¹⁰⁹ The gardens were devoted to showcasing fragrant plants used in perfumery. In the Canale

¹⁰⁷ Description of the Dixon and scents used in *Scent and Symbolism* were informed by introductory interview questions during the interview process except where otherwise noted (See Interview Guide, Questions 1 – 2, Appendix B).

¹⁰⁸ “About,” *Dixon Gallery and Gardens*, accessed August 1, 2017, <http://www.dixon.org/about>.

¹⁰⁹ Kevin Sharp, “Forward: Something in the Air,” in *Scent and Symbolism: Perfumed Objects and Images*, x.

Conservatory there were fragrant flowers in vases on display, all the plant materials used in two fragrances, Chanel No. 5 and Old Spice, and visitors could smell bottles filled with essential oils or rub the leaves of scented geraniums. Indoors, the discovery room was called “the Smellery,” and had three scented components: “Soap Bar,” “Art Stinks,” and “Smell This!”. Visitors could stack fragrant soaps to explore the different notes used in perfumery. They could use scented pencils to color in objects being smelled in representations of art used in the exhibition. Finally, visitors could engage with scratch and sniff stickers on a board on the wall to prompt discussion of odor-evoked memories.

Chocolate at MOHAI, Seattle, WA¹¹⁰

Chocolate was developed by the Field Museum in Chicago with the goal of telling “the complete story behind the tasty treat that we crave.”¹¹¹ It contained “more than 200 objects and highly detailed replicas, immersive exhibitry, interactives, and media.”¹¹² *Chocolate* was exhibited at the Field from February to December, 2002. Since that time it has toured the United States continuously. *Chocolate* was on display at MOHAI in Seattle from June 14-September 28, 2014. MOHAI’s mission is that,

By collecting and preserving artifacts and stories of the Puget Sound region’s diverse history, MOHAI highlights our tradition of innovation and imagination. Through compelling exhibits, scholarship, education, public programs, and community engagement, MOHAI bridges the past, present, and future.¹¹³

In *Chocolate*, visitors could smell the ambient fragrance of chocolate throughout the exhibition gallery.

¹¹⁰ Description of the use of scent at MOHAI was informed by introductory interview questions during the interview process except where otherwise noted (See Interview Guide, Questions 1 – 2, Appendix B).

¹¹¹ “Chocolate,” *The Field Museum*, accessed August 1, 2017, <https://www.fieldmuseum.org/about/traveling-exhibitions/chocolate>.

¹¹² Ibid.

¹¹³ “Mission,” *Museum of History and Industry*, accessed August 1, 2017, <http://mohai.org/about/#mission>.

Research Question One: What was the decision-making process to include a scented component in a museum exhibit?

This question was aimed at discovering why a museum would choose to use scent. To answer this question, interviewees participating in the study were asked questions relating to how the idea to use scent in the exhibit developed, what their reaction and the reactions of their colleagues were to an exhibit with a scented component, what concerns participants had if any, how the interviewee felt scent fit into the narration of the exhibit, and what decisions factored into the fragrances that were chosen (See Interview Guide, Questions 3 – 8, Appendix B).

Five key ideas guided why to include scent in an exhibit: 1) scent was suitable for the museum and its mission, 2) scent enhanced the exhibit 3) scent unified the exhibit, 4) working with scent was fun, and 5) concerns about using fragrance were addressed (See Coding Rubric, Question 1, Appendix C).

Scent was suitable for the museum and its mission

Participants at all three sites indicated that using scent depended on how suitable it was for the museum and how it fit into the museum's mission. The Exhibit Developer/Curator at The Tech explained how the interactive scent station "Sniff" factored into the museum's mission:

The mission of the Tech Museum is to inspire the innovator in everyone. So, what we're doing in that entire exhibition is talking about a variety of innovations and the innovation that we're highlighting is this really cool tool that detects cancer early using a really simple test. And so, I can imagine that this activity kind of gets people thinking [about] simple tests we can do to detect something as serious as cancer.

The Exhibit Developer/Curator elaborated that the interactive asks "can you distinguish what this scent is . . . If we combine, let's say chocolate and clove and you breathe that in, can you distinguish the clove and that this is chocolate. . . . And that's essentially what that tool does."

The scent interactive served as a way to help the exhibit tell the story of *Innovations in Health Care*.

Staff at the Dixon similarly identified scent as a way to accomplish their mission of interpreting art and horticulture. The Director said there was a very tight connection between the museum and the gardens. Both the museum and gardens were always looking for combinations and synergies. When asked about how the idea to use scent got started, the Curator said the person who approached them with the idea for *Scent and Symbolism* “thought that the perfume bottles would be a great exhibition for us given our garden setting.” The Director of Education said that “senses in general play a big part in what we do in the museum, specifically in the gardens.” The Gardens Education and Volunteer Coordinator explained that *Scent and Symbolism* was “about fragrance and in the gardens we see strongly the connection between plants and fragrance.”

The Exhibits Manager at MOHAI said of *Chocolate* that it “admittedly was a bit of a stretch for a local history museum to do an exhibit on the history of chocolate, which really had nothing to do with Seattle,” but that because the exhibit “was somewhat historical,” and MOHAI “complimented the exhibit with some local content,” that the exhibit, including the scented component, were deemed suitable for MOHAI.

Scent enhanced the exhibit

Participants at all three sites made statements that scent was included because it could enhance the exhibit. Scent made the exhibit better, gave it life, or animated the exhibit. For the Exhibit Developer/Curator at The Tech, using scent allowed the museum to give a demonstration of the technology behind the story of cancer detecting e-nose: “the interaction actually mimicked the tool that we were highlighting in the exhibition.”

The Curator at the Dixon said that “[the discovery room] was kind of an added component that brought [the exhibition] to life.” The Director agreed, emphasizing how scent animated the theme of the exhibit significantly. He clarified that visitors could smell scents in keeping with the idea of the exhibit and that, without scent, the exhibit would be much, much less effective.

The Exhibits Manager at MOHAI agreed that scent helped to enhance the exhibit. “The subject of the exhibit was so focused and everybody was so familiar with chocolate that though they might not have expected it walking in, it really added another dimension to the experience. Overall it made for a better exhibit.”

Scent unified the exhibit

Participants at both the Dixon and MOHAI indicated that scent helped to unify the exhibit and contributed to linking all the parts of the exhibit together. The Volunteer at the Dixon said that in the Canale Conservatory “we had set up with the breakdown of the perfumes, with each level and how they extracted the oil and, you know, it worked hand in hand with what was in the museum.” The scented component was informed by the part of the exhibition showcasing perfume bottles: “It all came from the perfumes.” The Curator at the Dixon explained that scent was expected to tie all the components of *Scent and Symbolism* together in all areas of the museum and gardens: “we knew, if we were going to do this, it was going to be a total Dixon experience where people would encounter fragrance from the moment that they stepped on to the property.”

The Exhibits Manager at MOHAI stated of the ambient scent used in *Chocolate* that “I think, and I'm not being a denier, but I suppose, the function was to unify, to give an experiential component to the exhibit that would help unify the experience.”

Working with scent was fun

In response to questions asking about the response of staff to using scent in an exhibit – both in thinking about themselves and their colleagues – staff at all sites said that staff was on board with the idea, enjoyed it, and/or had fun.

The Exhibit Developer/Curator at The Tech linked enjoyment to engagement: “our staff has been trained to think about visitor interaction and visitor engagement and so our staff thought it was a lot of fun. . . I can tell you that our exhibit staff was totally on board because it's a fun activity.”

The Dixon Curator said that “we really enjoyed it ... we liked having something like that in the galleries. And I thought it was just fun, on top of all that.” The Volunteer said that she “was excited” about the prospect of working with scent. The Gardens Education and Volunteer Coordinator agreed everyone was on board with using scent and explained that “we all, a lot of folks on staff are either garden designers or huge plant nerds and we feel like designing fragrance into a garden is a conscious choice.” Only the Director and the Director of Education mentioned reactions that were not immediately positive. The Director said that upon introducing the idea of incorporating scent, the reaction was largely positive but mixed. He said the education team embraced the idea early on. The Director of Education qualified that by saying excitement to work with scent was not immediate, but that “when we got to the point where we decided what the theme was gonna be, we got excited. This could be super fun. This is completely the opposite of what the show is: glass bottles behind the pedestal. This is the opposite. This is hands-on. Smell, in your face, kind of thing.”

The Exhibits Manager at MOHAI qualified staff support for scent saying that it was not universally accepted at first, but that “the collections folks were concerned about scent in the

galleries, and so long as the ‘scent’ wasn’t organic, and didn’t linger after the exhibit closed they were okay with it. Everybody else thought it was a great/clever addition to the exhibit.”

Concerns were addressed

Staff at the Dixon and MOHAI had concerns about working with scent, but moved forward with including a scented component in the exhibit because those concerns were taken into account. Only the Exhibit Developer/Curator at The Tech indicated that concerns were not a factor in including scent: “Nobody came up to me and said ‘you can't do this’ or ‘I think this is a bad idea.’”

At the Dixon, the Curator, the Director, and the Director of Education mentioned gallery rules meant to protect the collection as influencing why to use scent. The Curator said that “we did not want any liquid. We were pretty intent on not having any liquid fragrance inside the galleries. Just for – I mean, we don't allow water in the galleries or, you know, drinks or anything like that so it was kind of the same thing.” The Director elaborated on concerns regarding the artifacts: he knew in the galleries, that they could not have scent wafting through the 17th and 18th century paintings or affecting the perfume bottles. It would not be permitted. The Director of Education worked within the parameters set by the Curator and the Director’s concerns and said that “I try to follow the curator's rules. For example, the soap was something that I was very reluctant to do because I didn't want to get in trouble. But they – we work closely with them. We're a small team. So they were like ‘okay, that's fine. As long as the soap's not coming out of the container, we're fine.’ Also, we can't have any liquids in the gallery.” Concerns on the garden side took a different form. The Volunteer said one concern was that “there were some flowers that had a bad fragrance. And, you know, that was taken into consideration too. That not all flowers smell great. So, it was like, we gotta do this but it *smells!*” Instead of being mitigated, the

garden education staff decided to teach visitors about bad smells that occurred in gardens.

The Exhibits Manager at MOHAI was also concerned about being able to control the scent and to protect the objects: “two main concerns with scent in general is: control of the scent, keeping it in a specific area and the other is the conservatorial consequences of having something in the air, presumably organic, distributed throughout and on top of artifacts.” However, he said that for *Chocolate*, neither concern needed to be addressed because “it wasn't our exhibit, there were no artifacts in it. They were all reproductions. ... And it was a whole exhibit revolved around the one subject, chocolate, so we didn't need to restrain it to one side or the other of the exhibit space. So we were absolved of any of those responsibilities and concerns.” Despite this, he wrote in answer to a follow-up question asking about staff reaction to scent that “the collections folks were concerned about scent in the galleries, and so long as the ‘scent’ wasn't organic, and didn't linger after the exhibit closed they were okay with it.”

Research Question Two: What were the design and implementation considerations to include a scented component?

This question related to how the museum implemented fragrance in the exhibit and what guided those decisions. Participants were asked the extent to which they were involved in the design of the exhibit, what design considerations were taken in regards to implementing scent, what technology the museum used to get scent into the air, if they experienced any challenges with working with scent, how working with scent related to working with other senses, and what the process for maintaining the fragrance was (See Interview Guide, Questions 9 – 16, Appendix B).

Three main design and implementation considerations were identified for museum decision-making purposes: 1) technology choices were guided by the purpose of the scent; 2)

choices were influenced by the ease of implementation; and 3) choices were influenced by how surmountable any challenges were. Staff at two sites indicated that, in retrospect, they wished they could have incorporated more fragrance or for a longer span of time (See Coding Rubric, Question 2, Appendix C).

Guided by purpose

At each site, considerations informing what technology to use were guided by the purpose of scent in the exhibit.

At The Tech, the purpose of the scented interactive was to contribute to the story of the exhibit. The Exhibit Developer/Curator explained that “[authenticity] wasn't a big deal for us. Really, the idea was to get people invested in the story rather than – I mean, it's to get people thinking about innovation rather than what the smell is.”

The Gardens of the Dixon chose to tie into *Scent and Symbolism* by teaching about perfumery. One of their fragrance mediums was in their botanic specimens. The Gardens Educator and Volunteer Coordinator said that “we have a small conservatory that's all about perfume and flowers and then the container planting. That was our choice: it's gotta be fragrant. So we just doubled up on fragrance.” She elaborated saying that, “we switched over wherever we could to something that was fragrant.” Because the purpose of the scented component in the garden was focused on teaching about fragrance, garden staff felt that authenticity was important in contrast to the discovery room in the gallery that used synthetic scents: “outside, you can actually smell the orange blossoms because we do have a few fruit trees in bloom. We can smell the real thing. So it's very nice that we can offer the authenticity that you can't get inside.” The Volunteer agreed, describing that “we had some bottles that we had the essential oil that would diffuse on cotton balls put inside these bottles that had a bulb that people could smell different

fragrances. And they were all fragrances that would be around in the, that they could find out in the garden." The Gardens Education and Volunteer Coordinator also "wanted the public to understand, it's not always the bloom" that carried the fragrance, which guided decisions to incorporate fragrant leaves, grasses, vines, and roots into the garden component of *Scent and Symbolism*.

The fragrance medium technology in the discovery room was also chosen with intentionality. Instead of authenticity, the Director of Education mentioned accuracy: "for the Soap Bar, we wanted to be as accurate as possible. So there are certain notes, smells that are specific." For the scratch and sniff stickers, the Director of Education said, "we wanted to have crazy smells, things that are completely – you would be like, 'what is that?' and also recognizable smells so that gave us the playfulness." For the drawing section called Smell This!, the Director of Education said "we use these smelly pencils ... When you draw with them, your art stinks, your art smells." Drawing with scented pencils met the purpose relating to an idea in the exhibition "that scent is represented in art."

For MOHAI, the scent technology was provided by the Field Museum. The Exhibits Manager described how "the exhibit came with scent built into the design. There were two aromatic dispensers about a third of the way into the beginning and a third of the way from the end of the exhibit that would on a timer to add a little scent to the air." While MOHAI did not make their own choices with regards to this technology, the Exhibits Manager did say that the dispenser did serve the purpose of creating an ambient chocolate aroma: "it applied evenly throughout the experience. There was no area of the design that it would be inappropriate and everything dealt in some way with chocolate and it worked well."

Ease of implementation

At each site, participants mentioned how design choices were influenced by how easy it was to implement the fragrance technology, how easy it was to acquire the technology, and how easy it was to maintain the fragrance.

The Exhibit Developer/Curator at The Tech said the ease of acquiring the scent pellets informed the choice to use them: “I think how easy it was to get scent pellets for things. It was as simple as that.” She elaborated by saying that “I think that the technology was pretty well known, both from our designers' standpoint and from our staff standpoint.”

On the garden side of the Dixon, two guiding factors determining what to include in the fragrant garden were ease of care for the plant and how well the plant would grow in Memphis. The Gardens Education and Volunteer Coordinator explained that “we moved all of our roses that had not done well last year and we had a different exhibit in the rose beds last summer, but in the meantime we ordered all the fragrant roses that are easy to care for and might do better in Memphis.” The Volunteer agreed and elaborated that “we did vines, shrubs, trees, perennials, annuals, bulbs, and the water lilies and lotuses. So we did all of those ... We can accommodate all of those in our garden.” The Volunteer also said that maintaining the cut fragrant flowers in the conservatory was as simple as “[changing the cut flowers] at least once or twice a week so the fragrance would stay fresh.”

For the discovery room inside the gallery, the Curator said that the section using scratch and sniff stickers “was really easy, I think. I think they just had them up on the board. We mounted the board onto the wall.”

At MOHAI, the Exhibits Manager said that the components came with the exhibit from the Field and were easy to implement. “They came with their own scent. We did not have to provide anything other than to plug it in.” He elaborated saying that MOHAI did not have to do

anything to maintain the dispensers. “It was plug and play. It had a reserve of scent, if you will, that lasted for the run of the exhibit. If I'm correct, the little tanks would probably run for another full exhibit. So it was six months worth of chocolate smell in each one.”

Challenges were surmountable

One question asked to participants was what kind of challenges existed in the process of getting the scented component up and running. The first challenge to overcome was mentioned by the Director of the Dixon. He said that early on in the development stage of the exhibit, he was persuaded there was no way to do it [add real scent] and that was an obstacle. However, he qualified that early position by saying that he had underestimated the importance of scent and realized the wonderful things the Dixon could do. For the Dixon, a few conditions of their location and space presented challenges. Fragrance technology choices were informed by the ability to overcome the challenges that were faced. The Gardens Educator and Volunteer Coordinator explained that in Memphis, “soils are clay and soggy and we have a lot of variations so we were looking for something that was a little more tolerable of our conditions and Phenomenal [lavender] has done pretty well for us.” She continued, “we have very little sun ... and we just have to carve out some spots.” Working with living specimens was also a challenge. The Volunteer explained that “we could not get all the flowers all the time. We started with lavender and verbena. And then the verbena started looking kind of raggedy.” To address the issue of blooming times and certain botanic specimens going in and out of season, the Gardens Educator and Volunteer Coordinator “insisted on putting, doing a fragrance calendar. A lot of time you'd see a bloom calendar and it goes through months and winds and what's in bloom when. We just changed that and we made it a fragrant calendar because gardening is, blooms for three weeks in Memphis and then they're gone.”

According to the Director of Education, while she encountered some challenges in getting the containment methods of the sections of the Smellery up and running, working with scent was enjoyable. She said that “we had to seal shut all the containers. And we had to do the slits, so it took a long time.” At the same time, “it's a little bit more challenging mostly because if you think of something that's scented, it's something that doesn't go in a gallery, but I think it's more fun.”

The only challenge MOHAI faced was where to place the scent dispensers: “The only trick was where to place them discreetly that they would be as effective as possible. Their system was designed to fit any number of different exhibit spaces.” The Exhibits Manager elaborated that “installation so obvious that you'd wonder why you never did it.” In a follow-up email, he wrote that “we installed the spritzers near the air vents and the gallery's air handling equipment did the rest.”

The Tech did not face challenges regarding layout or available space. The Exhibit Developer/Curator said, “we had enough space. It wasn't really paramount in my thinking. Like, ‘oh, how am I going to execute that?’ We had designers on board that figured out the layout. We knew that we wanted to include the scented component and so we made sure that happened.” Maintenance issues were not a challenge either: “I don't think it's that great of an issue.” No other challenges were mentioned.

More fragrance

One question participants were asked was what would they change or keep the same about the scented component they worked on. The Exhibit Developer/Curator at The Tech and the Gardens Education and Volunteer Coordinator, the Volunteer, and the Director of Education of the Dixon expressed that they would have liked to include more scents, more aromatic

material, or extended the length of the exhibit. The Exhibit Developer/Curator at The Tech said that she would have liked to include “more, like, a variety of scents rather than just the few that we have right now.” Likewise, the Volunteer at the Dixon said she would have had “more white flowers. The white flowers are more fragrant. We had some in our selection of flowers, but I would put more white in.” The Director of Education agreed on the desire for more scents but qualified that she wished to have more bad smells: “I wish the Smencils or pencils would have had smells not just scents.” The Gardens Education and Volunteer Coordinator expressed the wish that *Scent and Symbolism* had lasted for longer to complement the extended duration of the garden half of the exhibit and to allow the gardens to focus more in-depth about plants used in perfumery:

Our exhibit goes on all summer because everything's planted and we wouldn't dare pull it out ... it would've been nice to have an extended period on the curatorial side to match up with our growing side. And that way, the herbs would've become more involved and we could've told that story too and spices are part of the vast plant life that contributes to fragrance that we didn't get into much. The whole sets of fragrant orchids that every plant community has a fragrant element because of pollination that we could've done more with, but it just, it's too brief a time.

Research Question Three: What impact did museum staff feel scent had on visitors?

The goal of this question was to discover the results of using scent and find out what impact museum staff felt the scent in the exhibit had on visitors. Participants were asked about health issues relating to scent, olfactory fatigue, what kind of response they have received from visitors, what the museum's intended outcomes were regarding visitor emotion and behavior, if it adding scent was worthwhile, what they would change to improve the exhibit, and if they would work with scent again in the future (See Interview Guide, Questions 17 – 22, Appendix B).

Museum staff felt scent impacted visitors in the following ways: 1) scent contributed to a positive experience, 2) scent helped connect visitors to the content of the exhibit, and 3) scent

had an impact on memory. Staff felt that 4) scent did not adversely impact the health of visitors, but had a 5) mixed reaction about the affect of olfactory fatigue. Staff had a 6) mixed reaction to whether scent was necessary to experience the exhibit, but felt 7) scent was worthwhile, and staff 8) would consider incorporating scent in their museum to engage a visitor's sense of smell in the future (See Coding Rubric, Question 3, Appendix C).

Contributed to a positive experience

Participants at all three museums were asked how visitors reacted to the scented component in the exhibit. All participants stated that visitors reacted positively to scent, that visitors enjoyed the experience, and that the exhibit was well-received.

The Exhibit Developer/Curator at The Tech said that “in general, reactions have been pretty positive.”

Staff at the Dixon agreed that visitors reacted positively to scent in their museum and gardens. The Gardens Education and Volunteer Coordinator said, “I think it's been positive and they've been involved.” The Volunteer agreed: “It went over really, really fabulously.” The Curator said, “I think everybody who visited [the Smellery] really enjoyed it. As far as I know and from what I heard, we got nothing but positive feedback.” The Director of Education mentioned examples of how some visitors behaved in the Smellery: “we have people who are really into it. They go, ‘ah, this is great!’ and of course, usually the adults, who go, ‘oh that's cute for the kids.’ And there's the, like, 30 year old like, ‘this is great!’ putting on everything, so we see a little bit of everything. But mostly it's been positive ... I think people had a good experience.”

At MOHAI, the Exhibits Manager also found that visitors “enjoyed it. They certainly noticed it. For the most part they enjoyed it and they wondered ‘where is the chocolate?’”

Connected visitors to exhibit content

Participants at all three case study sites expressed that visitors were connecting to the story of the exhibit through the scented components and that visitors engaged with the exhibit, interacted with it, asked questions about exhibit content, and commented on the scent in relation to the exhibit.

At The Tech, the Exhibit Developer/Curator observed that visitors were interacting with the scented component and that doing so contributed to understanding the content of the larger exhibit: “I think we did see that people were interested in interacting with the interactive and we did see that people were, they were kind of going through those steps of making the connection between the interactive and the content that we were interested in sharing.” She elaborated, saying “that was the goal, to get people excited by doing this interactive and then they go and read about kind of the connection between this thing, this interactive and the content about that particular interactive.”

Staff at the Dixon agreed, saying that they could tell visitors were thinking about the content, story, and themes of *Scent and Symbolism* by engaging and interacting with scented components in the exhibit. The Director said that he took people on tours and in doing so he could see visitors start to think about the five senses and where the sense of smell fits. He said visitors were definitely interacting with the scents in the exhibit. The Volunteer described how visitors were engaged in discussions of scents, would ask questions, and interact with the scents: “They were sniffing different plants and we have garden docents which did tours with the gardens and you stop and, you know, you discuss each plant and how they smell and they would ask questions. So there was lots of interaction there. And trying to answer any questions that they had.” The Director of Education said that the drawing station was not as successful as she had

hoped, but that when it came to scents, visitors were engaging with the scented pencils: “people are very afraid of drawing something on their own, even if we get them started with part of the drawing. They do appreciate the smells and the pencils. And sometimes what they do is they leave behind where they've tried it. And we can see that they smelled it. Just to smell it. It kind of works.” Likewise, for the stickers she said that she could measure engagement because “I can also see the scratch and sniff that are being used the most because we have to replace them, so we keep track of that.”

At MOHAI, while visitors did not interact with the ambient scent, the Exhibits Manager said “People commented on it and came away wanting to eat chocolate.”

Impacted memory

All participants were asked what their museum’s intended outcomes regarding visitor memory, behavior, or emotion were. However, only participants at the Dixon indicated that memory played a role in how scent impacted visitors.

The Gardens Education and Volunteer Coordinator said that fragrance in the garden impacted visitor memory: “We think that from our research and our digging into the subject, we think fragrance is a really important but overlooked element in garden design. It appeals to a memory and everyone has a different reaction based on their memory of that fragrance.” She continued saying that the exhibit contributed to improving visitors’ memory for odors: “Some people have an interesting reaction that they don't know or they don't have it in their memory.” The Director of Education agreed and described how memory came into play for the scratch and sniff wall: “so when you smell something, it triggers some kind of memory or experience that you had in the past or sometimes it's just a new smell.” While the scratch and sniff section in the Smellery was designed so visitors could be prompted to talk about their odor-evoked memories,

the Volunteer observed how fragrance triggered visitors' memories in the garden too: "One thing that was really impressive would be that lots of them would speak of childhood, or of their mothers or their grandmothers when they would smell a certain plant or flower. 'Oh, this takes me back to when I was a child.' And the memories would probably be them recalling childhood memories with their mother or their daddy or their grandparents. That was very rewarding." The Dixon Curator expressed the hope that scent used in *Scent and Symbolism* would create memorable experiences for their visitors:

A big part of our message is that scent, the sense of smell, is really tied to memory. And our hope was that people would go in the discovery room and smell all these very specific things in there and, for the rest of their life, that might be a little dramatic, but from there on out, when they smell that smell, maybe they remember going to the exhibition and being in the discovery room and having a positive experience. So, the same thing with the gardens. With the fragrant plants that we grow in the gardens, those, some of those are really specific smells, and our hope is that people will, through that smell, through that scent, that they'll remember their experience at the Dixon and with the exhibition.

No adverse health reactions

Participants at all three sites said they were concerned about whether visitors would have adverse health reactions to the scents in the exhibits, but that no adverse health reactions had been observed.

The Exhibit Developer/Curator at The Tech explained that, for their museum, the risks outweighed the costs: "that is always a concern that health can be, that smelling something won't agree with them. But, we did kind of think about that. We just felt that the experience itself, that connection that that exhibit could have with this really interesting story outweighed the risks. ... I haven't heard anything untoward happening with this, people getting sick or having allergic reactions to what they're smelling."

At the Dixon, the Gardens Education and Volunteer Coordinator said health had been a concern and concern was associated with a member of the Dixon community who had allergies: “we've had a woman here 16 years who is allergic to everything and especially pollen and fragrance. ... I said, ‘I'm afraid we will have to bury [her]. This will kill her.’ But she's really tolerated it quite well. ... it's kinda been her test and she's passing it so far.” The Volunteer agreed that allergies were a factor in the gardens and said, “Memphis is really bad about allergies and problems like that ... But there were no real issues with the allergies on this.” She observed that visitors looked out for themselves with regards to scent: “most people would know what's coming and say ‘I have sinus issues’ and ‘I can't smell’ or ‘it would be better for me not to get down close to the plant.’”

In the Smellery inside the galleries, the Director of Education agreed that they did not want to bother their visitors with smells: “we didn't want anything overwhelming in there obviously because we didn't want, in general, you know, to harass people or whatever with what's in there.” She said that they were “not at all” concerned with adverse health reactions, but that “we did choose to take out for example, just to be safe, any of the scratch and sniff stickers that had peanut butter ... so we did go through that ... We tried.”

The Exhibits Manager at MOHAI reported that staff was also concerned about how the chocolate scent in the exhibit could adversely affect visitors' health, but they trusted that the Field had taken those concerns into account in the development of the exhibit. “We did nothing more to what the Field museum supplied. Presumably they took those concerns into account. We didn't, I don't recall anybody complaining about it, although it was a concern to the staff. They were concerned that it may be an issue.”

At both the Dixon and at MOHAI, staff offered hypotheses about why scent did not impact visitors in a negative way. The Volunteer believed there were no adverse health issues because the scents were encountered outside: “And most of the flowers were not, did not bother the people as much as ... perfumes do. So they, in being out in open garden, made it a lot better.” The Director of Education had multiple theories about why no adverse health reactions were observed: “I think because the gallery is very small. And the components are fairly kinda small and not too intense. You know the scratch and sniff won't smell until you scratch it, really. But it's also the soaps are pleasant smells, so maybe people haven't said anything because it's not a bad smell, but it's a good smell.” The Exhibits Manager at MOHAI believed that “the fact that it didn't become a problem I think had something to do with its synthetic nature and not an organic compound.”

Olfactory fatigue

Staff at both The Tech and the Dixon said that the idea of olfactory fatigue had been discussed. However, results were mixed as to whether olfactory fatigue was a concern.

At The Tech, the Exhibit Developer/Curator did not believe it to be a concern: “Initially we talked about olfactory fatigue, but it wasn't that big of a concern for us.” Responses at the Dixon were more varied. The Gardens Education and Volunteer Coordinator said that “we didn't talk much about that because ... certain sources on fragrance say you can smell coffee beans and they say that negates it and you can start over. We didn't do that here.” However she did observe the effects of olfactory fatigue in visitors in the conservatory: “we have over thirty scented geraniums where you rub each leaf and smell your fingers and read the card that says what fragrance it's supposed to be and I think after a few of them, people realize that they're all smelling alike and they go back to reading or they change to a different venue.” At the same

time, it is clear in a comment made by the Volunteer – “and then we would have to walk around for a while and not get too many smells too close together” – that practices that benefit the mitigation of olfactory fatigue had factored into the layout of the garden. For the Smellery, the Director of Education said they did not offer a way to negate olfactory fatigue, but left the management up to the visitor: “I think we gave them the choice. I think the scratch and sniff and ‘Smell This!’, you can select. It doesn't say, smell all of this. Just smell some of this. So it was optional. For the soaps – it was sometimes choose not to smell it.”

Necessity of scent

In response to being asked how necessary scent was to the exhibit, results were mixed. Participants at The Tech and MOHAI did not feel as though scent was necessary to tell the story of the exhibit. The Exhibit Developer/Curator at The Tech said that the scent interactive was just one component in a larger exhibit: “It's not like that was an integral part of the exhibition, but it's not like people spend the majority of the time there compared to everything else.”

The Exhibits Manager at MOHAI agreed that the scent in *Chocolate* was not necessary, but qualified his statement saying that it impacted the museum experience: “I don't know that it was necessary, but I think it was a significant enhancement to the experience.”

Staff at the Dixon felt that scent was necessary to *Scent and Symbolism*. For the Director, his opinion changed from the development stage to recalling the exhibit: In development he thought it did not matter. In the aftermath, he felt it mattered a great deal. The Gardens Education and Volunteer Coordinator explained that having real scent was part of the story of the exhibit:

I think it was integral. I don't think they could have carried it off without it because we are the scent. And just showing a perfume bottle, it doesn't really tell the story or show them the painting of someone smelling a flower doesn't tell the story. Or having a drawing of fragrant flowers. We really carry the story here because we get to show the real thing.

The Curator agreed that having scent was important to the Dixon: “It was part of the planning of the exhibition from day one. It was really important to us to have a space in the museum where people could go and experience scent.” The Director of Education agreed, and said that talking about scent was one of the first things the education team did: “So the first thing we said was we have to have scent, it has to happen in some way or another.”

Adding scent was worthwhile

Participants at all three sites responded positively when asked if adding scent to the exhibit were worthwhile.

The Exhibit Developer/Curator at The Tech said scent was worthwhile because it helped the exhibit tell the story: “I do [think it was worthwhile], because when you do that particular interactive, it actually brings the story of the innovator more into focus.”

The Director of Education said that the “Education Department is convinced” that adding scent was worthwhile and the Volunteer said scent was “most definitely” worthwhile.

The Exhibits Manager at MOHAI said of adding scent that “overall it made for a better exhibit.”

Would work with scent in the future

Participants at all sites answered positively when asked if they would work with scent again. The Exhibit Developer/Curator at The Tech and the Exhibits Manager at MOHAI both mentioned that they had already considered adding scent to another exhibit. At The Tech, the Exhibit Developer/Curator has been thinking about a new “kind of exhibition in there that would talk about these are the scents of a bygone era.” At MOHAI, while the idea of using scents in a food exhibit was discussed, the museum chose not to include scents. The Exhibits Manager explained, “the reason we chose not to was we couldn't control that experience. It was relevant in

front of the Cinnabon section, but not in the other places. And we, they didn't have a way to control it or time it or money to invest in a way to do that.”

At the Dixon, the Curator said she would work with scent again “if the opportunity presented itself.” The Director of Education agreed and elaborated that she wished the Dixon “could do more scented things in the galleries.” The Director of the museum, however, said that the Dixon will probably not work with scent again as it did with *Scent and Symbolism*, but that but that the museum will think more about scent than before.

CHAPTER FIVE: DISCUSSION

The purpose of this study was to describe the phenomenon of using scented or aromatic materials to engage the visitor's sense of smell in museum settings. Three questions guided this study:

1. What was the decision-making process to include a scented component in a museum exhibit?
2. What were the design and implementation considerations to include a scented component?
3. What impact did museum staff feel scent had on visitors?

Discussion

What informed the decision to include a scented component in a museum exhibit?

Five key ideas guided why to include scent in an exhibit: 1) scent was suitable for the museum and its mission, 2) scent enhanced the exhibit 3) scent unified the exhibit, 4) working with scent was fun, and 5) concerns about using fragrance were addressed.

This study revealed that for all case study sites, the museum mission factored into why staff decided to incorporate scent. The exhibits at each site fit the mission of the museum and scent was a tool to help tell the story of the exhibit. In the case of MOHAI, the connection to mission was weaker and scent came with the exhibit, but the interviewee still indicated mission as influencing why the museum decided to put on the exhibit. While Jütte seemed to think incorporating sensory experiences into exhibits was the result of curators responding to fads, this study suggested the opposite. Interviewees did not indicate that scent was included for the sake of scent. Including scent was an intentional decision because it suited the goals the museum was trying to achieve.

All three sites agreed that scent inclusion made the exhibit better. They used words and phrases like “mimicked,” “brought to life,” “animated,” “enhanced,” and “brought another dimension” to describe the impact scent had on the story of the exhibit. This suggested that staff at these museums did not feel that choosing to incorporate scent was a gimmick or that it cheapened the exhibit. Instead, scent was a valuable design tool that added to the story-telling capabilities of the sites, making them more effective.

Two of the three sites indicated that scent had a unifying power in the exhibit and that it contributed to linking all the parts of the exhibit together. At the Dixon, there were several different components to *Scent and Symbolism*: the exhibition of fine art and perfume bottles, the Smellery discovery room, the gardens, and an accompanying exhibit about perfume in the Canale Conservatory. Interviewees expressed that the exhibitions components went “hand in hand” because they all dealt with scent and scent contributed to offering a “total” museum/garden experience. At MOHAI the interviewee said the chocolate scent unified the experience of an exhibit devoted to the history of chocolate. The study suggested that museums choose to incorporate scent where it can speak to the theme or the context of the exhibit.

All three case study sites reported that staff was on board with the idea of using scent and that staff reaction was largely positive. Across the sites, interviewees said they enjoyed working with scent, they were excited to so, and that staff in general thought it was fun or a great idea. When reaction was reported to be mixed or less than entirely positive, interviewees said that was not a permanent state, but that either excitement grew or the reason for concern was mitigated. Staff enthusiasm spoke against the scholarly indication that the sense of smell was undervalued. Instead, staff excitement seemed to be informed by seeing scent as a tool with which they could engage the visitor.

Two sites indicated that addressing staff concerns regarding scent in the museum was important in proceeding to use scent in the exhibit. One area of concern seemed to be collections-based and centered on ensuring the protection of museum objects. The study would have benefited from speaking with collections staff at either of these case study sites to gain clarity about how they felt scent would impact museum objects. Staff at both sites “followed the rules” set down by curatorial and collections staff to make sure scent would impart no harm to the objects. The other area of concern was in using unpleasant aromas in the exhibit. The site addressed this concern by turning unpleasant aromas into a teaching moment for visitors. Being cautious about unpleasant smells was supported by Mackay-Sim and Royet who reported that unpleasant scents can result in negative emotional reactions. However, Susanne Schmitt observed that having visitors smell ampullae filled with unpleasant scents was an effective design tool at a museum in Germany. The data did not indicate how visitors reacted to unpleasant aromas encountered at the Dixon.

What were the design and implementation considerations to include a scented component?

Three main considerations were identified in how museums made design and implementation decisions: 1) technology choices were guided by the purpose of the scent; 2) choices were influenced by the ease of implementation; and 3) choices were influenced by how surmountable any challenges were.

This study revealed that the purpose of the scent inclusion informed what technology the site decided to use. How the museum incorporated scent depended on why they wanted to incorporate scent. Data suggested that for these sites, authenticity of fragrance was only important for botanical specimens because for the exhibit in which they were featured, plants were the real fragrance.

All sites indicated that ease of implementation factored into what scent technology was used at each site. For The Tech, fragrant technology was chosen based on how easy it was to find. For the Dixon, data suggested that technology choices were informed by how easy it was to 1) care for botanic specimens, 2) maintain cut flowers and the amount of scratch and sniff stickers, and 3) build the board to hold the stickers. MOHAI did not choose the dispensers that pumped out chocolate scent, but interview responses noted how easy the dispenser was to implement and maintain. Jorvik Viking Centre also used fragrance dispensing technology and exhibit designer Sunderland wrote that it was easy to operate, control, and maintain. Jim Drobnick listed the necessity of maintaining a fragrance as one of the challenges of working with scent, but data suggested that these case study sites picked fragrance technology that would be easy for them to maintain. In the case of MOHAI, the interviewee expressed that the Field chose a dispenser that would be flexible and easy to maintain for any museum.

Interviewees at both the Dixon and MOHAI indicated there were challenges in getting the fragrance technology up and running, but those challenges were something that staff could overcome. Interviewee responses from the Dixon indicated that finding fragrant plants that would do well in Memphis was a challenge, but that successful plants were found. In response to the challenge of maintaining fresh fragrant plants during the exhibition, the Dixon came up with a fragrance calendar to guide and inform staff and visitors when botanic specimens would be fragrant. Despite challenges getting one of the sections of the Smellery up and running, the Director of Education made it work. At MOHAI, the “trick” was in where to place the fragrance dispensers, but they placed them where the scent could be drawn away through the ventilation system. This solution was supported by how Jorvik Viking Centre placed their dispenser: in an accessible location where a ventilation system could draw away scented air.

What impact did museum staff feel scent had on visitors?

Museum staff felt scent impacted visitors in the following ways: 1) scent contributed to a positive experience, 2) scent helped connect visitors to the content of the exhibit, and 3) scent had an impact on memory. Staff felt that 4) scent did not adversely impact the health of visitors but had a 5) mixed reaction about the impact of olfactory fatigue. Staff had a 6) mixed reaction whether scent was necessary to experience the exhibit, but felt 7) scent was worthwhile, and staff 8) would consider incorporating scent in their museum to engage a visitor's sense of smell in the future.

This study revealed that museum staff felt that visitors responded positively to scent in museum spaces. Data suggested that staff felt visitors enjoyed the scented components of these exhibits and that visitors had a good experience. Visitor reaction was supported by Morrin who stated that pleasant ambient scents improved how positively consumers rated stores and products. The Tech and the Dixon employed controlled fragrances, but Brumfield, Goldney, and Gunning reported that scented tangible objects have the ability to improve satisfaction. Likewise, reports of positive visitor reactions spoke to Knasko's finding that pleasant scents in museum spaces resulted in positive moods.

At all three case study sites, staff felt visitors engaged with the exhibits by commenting on the smell, asking questions, doing the interactive, and connecting with the stories and themes of the content of the exhibit. For both the Dixon and MOHAI, these findings were supported by the Knasko study, which found that putting a contextually appropriate scent in an exhibit increased the amount of time visitors spent engaging with the exhibit. Floral scents were contextually appropriate for a garden and a chocolate fragrance was contextually appropriate for an exhibit about the history of chocolate. In contrast to Knasko, Keller posited that scent –

regardless of context – increased visitor engagement in an exhibit. This agreed with the data from The Tech, where the interviewee also observed visitors interacting with the scented interactive. An evaluative study at each site which compared how much visitors engaged with exhibit content when the space was unscented with how much they engaged with exhibit content when the same space was scented would make these findings more conclusive.

Only the Dixon responded that scent impacted visitors' memories. Interviewees responded that the scratch and sniff stickers in the discovery room were intended to evoke childhood memories. Data also suggested that visitors in the garden recalled their childhoods after smelling fragrant plants. These findings were supported by Herz who posited that odors were adept at getting people to remember their childhoods because most odors were encountered for the first time during childhood.

The Curator of the Dixon was the only interviewee who expressed the idea that scent would affect how a visitor viewed one of the case study sites. She hoped that encountering a specific smell at the Dixon would result in the visitor recalling their museum experience when they smelled the scent again. This hypothesis was supported by studies done by Doop et al., Trygg Engen, and Aggleton and Waskett who found that olfactory memory lasted a long time, was formed quickly, and aided recall of museum experiences. The Curator expressed that it “might be a little dramatic” for a visitor’s memory of their experience at Dixon to be triggered by a scent encountered there “for the rest of their life.” However, Herz found that once a person encountered a scent for the first time, it was difficult to ever re-write the association that was made during the encounter. This suggested that a visitor who encountered a new fragrance during a visit to the Dixon during *Scent and Symbolism* might recall the visit whenever they smelled that fragrance.

While all of case study sites were concerned about the impact scent could have on visitor health, they did not feel that scent negatively impacted visitor health. Despite being aware of health concerns, all three case study sites included scent in their exhibitions. This was supported by best practices expressed by Drobnick: that museums should be aware of how scent could negatively affect a visitor's health, but that museums could not predict every way a visitor may experience a health concern related to scent. Interviewees speculated on why visitors did not experience negative health reactions, but each interviewee had a different idea.

Museum staff also did not feel olfactory fatigue was a concern, yet may have alleviated it anyway. Interviewees at The Tech and the Dixon knew what olfactory fatigue was, but said it was not a concern. However, the Gardens Education and Volunteer Coordinator described seeing olfactory fatigue in the conservatory. Even though visitors stopped smelling fragrant materials in the conservatory, they were still engaging with the exhibit in other ways. Some data suggested that interviewees at the Dixon did account for olfactory fatigue in spacing scents apart. Spacing was one way Drobnick recommended avoiding olfactory fatigue in museums. However, the data was inconclusive that staff felt visitors were experiencing olfactory fatigue in a way that impeded their enjoyment of the exhibition.

The study revealed that while not all case study sites felt scent was necessary for their exhibitions, all case study sites felt scent was worthwhile. The Tech and MOHAI did not feel like the scented component was necessary to their exhibitions, but the same interviewees felt that scent was worthwhile or made the exhibition more enjoyable. In contrast, all interviewees at the Dixon felt that scent was necessary. The mixed reaction may speak to the purposes behind each exhibition: while the sense of smell was a key theme for *Scent and Symbolism*, it was not for either *Innovations in Health Care* or *Chocolate*.

Interviewees at all case study sites indicated that they would work with scent again. Interviewee responses at The Tech and MOHAI indicated that scent was being considered or had been considered for another exhibit. Responses from the Dixon suggested that staff would be on board with using scent again, though not to the same extent as in *Scent and Symbolism*. The data suggests that museum staff felt that scent offered visitors a valuable experience.

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The goal of this study was to describe the phenomenon of scent inclusion in museum spaces. It did so by investigating three primary questions: what were the important decision-making considerations for including a scented component in a museum exhibit, what were the critical design and implementation considerations for including a scented component in an exhibit, and what were the effects of a scented component in a museum exhibit on visitors. Three conclusions resulted from this study. The first was that the museums in this case study chose to use scent because they feel it was a valuable tool to meet the goals of their institution and create a better exhibition. The second was that the museums in this case study chose the scent technology that was most applicable to achieve the effect they wished to employ and the easiest for them to implement. The third was that the museums in this case study felt that scent contributed to a positive and engaging visitor experience. As multisensory experiences in museums become more popular, more museums might consider using scent in their exhibitions.

Recommendations

The following recommendations were developed based on the results of the study. First, museums should consider bringing controlled scent into galleries with real objects. Second, museums should use a scent that is contextually appropriate for the theme of the exhibit but unfamiliar to the average visitor. Third, using many scents, museums should choose a wide variety and allow for the capacity to acquire more scents. Fourth, museums should evaluate how scent impacts visitors' memory, emotion, and behavior to determine how museum learning is impacted by the inclusion of scent.

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APPENDIX A: DESCRIPTION OF RECRUITMENT EMAIL AND CONSENT

Consent points in the email will include:

- Data collector's name and affiliation
- If contacting subject directly, how I received their email
- Purpose of the study
- Voluntary nature of participation, and that there are no consequences for choosing to not participate
- Participation involves a 15-20 question in-person or phone interview of about 30 minutes that will be recorded; only the research team will hear the recordings
- Subject's name, institution, and position at institution will be stored with the interview
- Subject's responses will remain confidential; subjects may be quoted without identifying name
- Name and phone number of a study contact person

APPENDIX B: INTERVIEW GUIDE

Talking points prior to the start of the interview included the purpose of the study, the guiding questions of the study, the voluntary nature of the study and that any question may be skipped with no consequence, that the interview would be recorded, that the participant's responses would remain confidential but may be quoted in the research without identifying name, and that any questions after the interview may be directed to the email previously provided.

Introductory Questions

1. Tell me a little bit about your institution and your role in the museum.
2. Would you briefly describe how your museum is currently using scent – or has in the past?

What was the decision-making process like to include a scented element in the exhibit?

3. How did the idea to add scent get started?
 - a. (*Probe, if their idea*) Why do you feel scent was an important aspect to include?
4. What was the general reaction to the idea? Were people on board or was there pushback?
 - a. How did you get people on board? What were some of the sticking points?
 - b. What were the arguments for/against?
5. (*If not their idea*) What were your thoughts when you heard this idea was brewing?
 - a. Was there any aspect of including scent in the exhibit that gave you pause?
 - i. How were you convinced?
6. What scents did you decide on and why? What influenced that decision?
7. How does the scented element contribute to the educational mission of the museum? The visitor's learning experience?
8. What role does scent play in the narration of the exhibit?

What were the design and implementation considerations?

9. What were the major design considerations when planning the exhibit?
 - a. To what extent were you involved in the design of the exhibit?
 - b. How did the layout of your museum and the available space influence your design decisions?
 - i. How did you decide where to place the scents?
 - c. Was there anything that you wanted to include that you couldn't?

10. What technology did you use to get fragrance into the air?
 - a. Why did you decide on that method rather than another?
 - b. Did you have any input in this decision?
 - c. How well has it worked?

11. Were there any challenges in getting the scented dimension up and running?
 - a. Did anything surprise you about the process?

12. How did scent interact or counteract with any other sensory dimension of the exhibit?
 - a. How does working with scent compare to working with other senses?

13. How important was authenticity?
 - a. In terms of real vs. synthetic scent and in placing a scent in the proper context?

14. How do you prevent the scent from overwhelming the visitor or how do you neutralize it from the exhibit area (ventilation, concentration, delivery method)?

15. What is the process of maintaining the scent like?
 - a. Who maintains the scent (e.g. refilling oil, scented beads, turning diffuser on, etc.)?

16. (*If exhibit temporary*) Do you have plans to deodorize the museum after this exhibit?

What impact did museum staff feel scent had on visitors?

17. People can have various health issues related to scent and level of ability can vary: to what extent did you account for this?
 - a. Did you advertise in any way that there was going to be a scent in this exhibit?
 - b. Do you account for “olfactory fatigue” in any way?
 - c. Does the scent impact you and your ability to work in any way?

18. What were your intended outcomes regarding visitor memory, behavior, and/or emotion?
 - a. Did you include any interpretive material regarding the scent (e.g. tell people how to react or feel about it)?
 - b. What have you actually observed?
 - c. Did you get response you were expecting?
 - d. Were there unexpected reactions?

19. Have you done any evaluation and if so, what were the major results?

20. What has been the reaction of visitors to the scented element? (e.g. feedback positive or negative, popularity, complaints, confusion, level of engagement)

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21. Overall, how necessary would you say scent was to experiencing the exhibit?
 - a. Do you think adding scent was worthwhile?
 - b. Do visitors get a memorable experience from the scent exhibit?

22. Would you work with scent again?
 - a. What would you change or keep the same?

APPENDIX C: CODING RUBRIC

Guide to acronyms:

- EDC: Exhibit Developer and Curator, The Tech Museum of Innovation
- D: Director, Dixon Gallery and Gardens
- C: Curator, Dixon Gallery and Gardens
- DoE: Director of Education, Dixon Gallery and Gardens
- GEVC: Gardens Education and Volunteer Coordinator, Dixon Gallery and Gardens
- V: Volunteer, Dixon Gallery and Gardens
- EM: Exhibits Manager, Museum of History and Industry (MOHAI)

Question One: What was the decision-making process to include a scented component in a museum exhibit?

Theme	Description	The Tech	Dixon	MOHAI
Scent was suitable for the museum mission	Statements regarding how exhibit using scent was suitable for the museum, how the gardens or scented interactive fit the museum mission. "can you distinguish what this scent is, can you distinguish, if you combine these two scents. ... And that's essentially what that tool does."	EDC: "The mission of the Tech Museum is to inspire the innovator in everyone. So, what we're doing in that entire exhibition is talking about a variety of innovations and the innovation that we're highlighting is this really cool tool that detects cancer early using a really simple test. And so, I can imagine that this activity kind of gets people thinking simple tests we can do to detect something as serious as cancer. "	DoE: "Senses in general play a big part in what we do in the museum, specifically in the gardens" D: The gardens are a very active part [of the museum and they are] always looking for combinations, synergies, ways to pair up [and have] a very tight connection GEVC: "Scent and Symbolism, it was based on a couple of paintings that we own where it's obvious in the painting that they're smelling something, flowers or sitting at a dressing table and applying perfume or that sort of thing. That was the justification for it." "it is about fragrance and in the gardens we see strongly the connection between plants and fragrance" "What we want people to do is fall in love with gardens at any level where they are so I think we've added that next idea, 'oh yeah, when I buy my next plant, it could be fragrant.' It's just adding that other element that elevates all we do and think. It should be all about excitement or peacefulness or an emotion that makes life worth it." C: "And I think that Martine	EM: "It was somewhat historical. And, admittedly was a bit of a stretch for a local history museum to do an exhibit on the history of chocolate, which really had nothing to do with Seattle. We complimented the exhibit with some local content."

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			<p>thought that the perfume bottles would be a great exhibition for us given our garden setting. So, as soon as it was presented to us as a possibility to do the exhibition, we got our Director of Horticulture involved, because we knew, if we were going to do this, it was going to be a total Dixon experience where people would encounter fragrance from the moment that they stepped on to the property. So we knew that the garden component of the exhibition was going to be key.”</p>	
<p>scent enhanced the exhibit</p>	<p>Statements regarding how scent helped to enhance the exhibit, brought it to life, or animated it.</p>	<p>EDC: “We were, you know, trying to find, develop interactives in that exhibit that had a riff on the various technologies that we were highlighting.” “the interaction actually mimicked the tool that we were highlighting in the exhibition.”</p>	<p>C: “So, in the exhibition we had perfume bottles but we also had paintings or two dimensional works of art that spoke to the notion of flowers or fragrance or scent or to perfume. ... And then [the discovery room] was kind of an added component that brought it to life. People looking at perfume bottles and, not actually having perfume in the galleries, it was nice to have a space where you could start smelling different smells. I thought that was, you know, really important for us to have.” “I think it brought another level to the exhibition.” D: It animated theme significantly. Much much less effective without it. Could smell scents in keeping with idea of exhibit. Much much less effective without it</p>	<p>EM: “The subject of the exhibit was so focused and everybody was so familiar with chocolate that though they might not have expected it walking in, it really added another dimension to the experience. Overall it made for a better exhibit.”</p>
<p>Scent unified the exhibit</p>	<p>Statements regarding how scent unified the exhibit and how scent contributed to linking all the parts of the exhibit together</p>	<p>Data did not speak to this.</p>	<p>V: “And the fragrance had to be in the conservatory, we had set up with the breakdown of the perfumes, with each level and how they extracted the oil and, you know, it worked hand in hand with what was in the museum.” “It all came from the perfumes.” C: “And we told that story throughout the</p>	<p>EM: “I think, and I'm not being a denier, but I suppose, the function was to unify, to give an experiential component to the exhibit that would help unify the experience.”</p>

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			<p>communication.”</p> <p>“So, as soon as it was presented to us as a possibility to do the exhibition, we got our Director of Horticulture involved, because we knew, if we were going to do this, it was going to be a total Dixon experience where people would encounter fragrance from the moment that they stepped on to the property.”</p>	
Staff found scent fun	Statements regarding how staff responded positively to the idea of working with scent and enjoyed the process.	<p>EDC: “our staff has been trained to think about visitor interaction and visitor engagement and so, our staff thought it was a lot of fun. . . I can tell you that our exhibit staff was totally on board because it's a fun activity.”</p>	<p>GEVC: In response to question “were people on board”: “Yeah and we all, a lot of folks on staff are either garden designers or huge plant nerds and we feel like designing fragrance into a garden is a conscious choice, almost like color or acclimation or type.”</p> <p>V: “I was excited.”</p> <p>C: “It was really neat, it was really great. I mean, there were smells like pizza and then was, like, smelly garbage or something like that.”</p> <p>“We really enjoyed it ... we liked having something like that in the galleries. And I thought it was just fun, on top of all that.”</p> <p>DoE: “But I think, when we got to the point where we decided what the theme was gonna be, we got excited. This could be super fun. This is completely the opposite of what the show is: glass bottles, behind the pedestal. This is the opposite. This is hands-on. Smell, in your face, kind of thing.”</p> <p>D: Mixed reaction, largely positive. . . . But idea [was] embraced [by the education team] early on.</p>	<p>EM: “The collections folks were concerned about scent in the galleries, and so long as the ‘scent’ wasn’t organic, and didn’t linger after the exhibit closed they were okay with it. Everybody else thought it was a great/clever additin to the exhibit.”</p>
Concerns were alleviated	Statements regarding anything staff were concerned about with regards to adding scent in a gallery or	<p>EDC: “Nobody came up to me and said ‘you can't do this’ or ‘I think this is a bad idea.’”</p>	<p>V: “There were some flowers that had a bad fragrance. And, you know, that was taken into consideration too. That not all flowers smell great. So, it was like we gotta do this but it <i>smells!</i>”</p> <p>C: “We did not want any</p>	<p>EM: “Two main concerns with scent in general: is control of the scent, keeping it in a specific area and the other is the conservatorial consequences of</p>

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	<p>exhibition space prior to embarking on putting the exhibit together and how these concerns were allayed.</p>		<p>liquid. We were pretty intent on not having any liquid fragrance inside the galleries. Just for -- I mean, we don't allow water in the galleries or, you know, drinks or anything like that so it was kind of the same thing.” DoE: “I try to follow the curator's rules. For example, the soap was something that I was very reluctant to do because I didn't want to get in trouble. But they, we work closely with them. We're a small team. So, they were like ‘okay, that's fine as long as the soap's not coming out of the container, we're fine.’ Also, we can't have any liquids in the gallery.” D: I knew in galleries, couldn't have scent wafting through 17th century, 18th century paintings or affect the perfume bottles. It wouldn't be permitted.</p>	<p>having something in the air, presumably organic, distributed throughout and on top of artifacts. In the case of Chocolate, it wasn't our exhibit, there were no artifacts in it. They were all reproductions. And, let's see. What else. And it was a whole exhibit revolved around the one subject, chocolate, so we didn't need to restrain it to one side or the other of the exhibit space. So we were absolved of any of those responsibilities and concerns.” “As I remember it only the collections folks were concerned about scent in the galleries, and so long as the ‘scent’ wasn't organic, and didn't linger after the exhibit closed they were okay with it.”</p>
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Question Two: What were the design and implementation considerations to include a scented component?

Theme	Description	The Tech	Dixon	MOHAI
<p>Guided by purpose</p>	<p>Statements regarding how the purpose of the scent in the exhibit influenced design considerations, implementation considerations, how scent was used, or what fragrance technologies were used.</p>	<p>EDC: “[Authenticity] wasn't a big deal for us. Really, the idea was to get people invested in the story rather than - I mean, it's to get people thinking about innovation rather than what the smell is.”</p>	<p>GEVC: “We have a small conservatory that's all about perfume and flowers and then the container planting. That was our choice: it's gotta be fragrant. So we just doubled up on fragrance.” “We switched over wherever we could to something that was fragrant.” “Outside, you can actually smell the orange blossoms because we do have a few fruit trees in bloom. We can smell the real thing. So it's very nice that we can offer the authenticity that you can't get inside.”</p>	<p>EM: “It applied evenly throughout the experience. There was no area of the design that it would be inappropriate and everything dealt in some way with chocolate and it worked well.” “I think the way they did it was entirely appropriate.” “The exhibit came with scent built into the design. There were two aromatic</p>

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			<p>"this is the other thing we wanted the public to understand, it's not always the bloom"</p> <p>V: "Well, we had some bottles that we had the essential oil that would diffuse on cotton balls put inside these bottles that had a bulb that people could smell different fragrances. And they were all fragrances that would be around in the, what they could find out in the garden."</p> <p>DoE: "Well, for the soap bar we wanted to be as accurate as possible. So there are certain notes, smells that are specific."</p> <p>"For the scratch and sniff we wanted to have, we wanted to have crazy smells, things that are completely you would be like 'what is that?' and also recognizable smells so that gave us the playfulness."</p> <p>"the idea that the imagery of scent, or related to scent in some of the paintings and the drawings that we had in the exhibition, so what we did was kind of represent illustration like parts of one of the paintings, a couple of paintings, leaving out whatever the character was smelling. ... And we use these smelly pencils - pencils being the only thing allowed out in the galleries. ... When you draw with them, your art stinks, your art smells. Basically, so that's kind of behind the idea that scent is represented in art."</p>	<p>dispensers about a third of the way into the beginning and a third of the way from the end of the exhibit that would on a timer add a little scent to the air."</p> <p>"And it was a whole exhibit revolved around the one subject, chocolate, so we didn't need to restrain it to one side or the other of the exhibit space."</p> <p>"Well, I know that it was synthetic. But it did smell real."</p>
<p>ease of implementation</p>	<p>Statements regarding how easy it was to implement the fragrance technology, how easy it was to acquire the technology, how easy it was to maintain the</p>	<p>EDC: "I think how easy it was to get scent pellets for things. It was as simple as that." "I think that the technology was pretty well known, both from our designers' standpoint and</p>	<p>GEVC: "We moved all of our roses that had not done well last year and we had a different exhibit in the rose beds last summer, but in the meantime we ordered all the fragrant roses that are easy to care for and might do better in Memphis."</p> <p>V: "We did vines, shrubs, trees, perennials, annuals,</p>	<p>EM: "They came with their own scent. We did not have to provide anything other than to plug it in." "It was plug and play. It had a reserve of scent, if you will, that lasted for the run of the exhibit. If</p>

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	<p>fragrance.</p>	<p>from our staff standpoint.”</p>	<p>bulbs, and the water lilies and lotuses. So we did all of those. . . . We can accommodate all of those in our garden” “We would change [cut flowers] at least once or twice a week so the fragrance would stay fresh.” “once flowers were going out, we were adding more in. C: on scratch and sniff board: “that was really easy, I think. I think they just had them up on the board. We mounted the board onto the wall.”</p>	<p>I'm correct, the little tanks would probably run for another full exhibit. So it was six months worth of chocolate smell in each one.” “It was simple. And it was affordable and available. And so from a practical side, it was an ideal solution. The way they did it, it worked for their design.”</p>
<p>Challenges were surmountable</p>	<p>Statements regarding challenges that each museum faced, if any, and the solutions that were found.</p>	<p>EDC: “We had enough space. It wasn't really paramount in my thinking. Like, ‘oh, how am I going to execute that?’ We had designers on board that figured out the layout. We knew that we wanted to include the scented component and so we made sure that happened.” On maintenance: “I don't think it's that great of an issue.”</p>	<p>GEVC: “Our soils are clay and soggy and we have a lot of variations so we were looking for something that was a little more tolerable of our conditions and Phenomenal [lavender] has done pretty well for us.” “we have very little sun ... and we just have to carve out some spots” “I insisted on putting, doing a fragrance calendar. A lot of time you'd see a bloom calendar and it goes through months and winds and what's in bloom when. We just changed that and we made it a fragrant calendar because gardening is, blooms for 3 weeks in Memphis and then they're gone.” V: “We could not get all the flowers all the time. We started with lavender and verbena. And then the verbena started looking kind of ragly.” DoE: “I think the soap bar took a long time to get organized because we had to seal shut all the containers. And we had to do the slits, so it took a long time. With the stickers, it's just a matter of sorting them out and figuring out a way to put them on the wall without actually being on the wall.” “We weren't allowed to put them on the wall directly. That was a little bit challenging.”</p>	<p>EM: “The only trick was where to place them discreetly that they would be as effective as possible. Their system was designed to fit any number of different exhibit spaces.” “I think it was uniquely adaptable to the subject, was so specific and installation so obvious that you'd wonder why you never did it.” “As I recall, you could adjust the timing between spritzes to control the saturation of the scent within the gallery. We installed the spritzers near the air vents and the gallery's air handling equipment did the rest.”</p>

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			<p>"I think it's a little bit more challenging mostly because if you think of something that's scented, it's something that doesn't go in a gallery, but I think it's more fun."</p> <p>D: Early on I was persuaded there was no way to do it, in vital experience of scent, that there was an obstacle there. Underestimated the importance of scent. Process of discovery. Wonderful things we could do.</p>	
Wanted more fragrance	Statements regarding how staff wished they could, if given the chance, include more fragrance, more smells, or extend the exhibit	EDC: "I'd probably include more, like a variety of scents rather than just the few that we have right now."	<p>GEVC: "Our exhibit goes on all summer because everything's planted and we wouldn't dare pull it out ... it would've been nice to have an extended period on the curatorial side to match up with our growing side. And that way, the herbs would've become more involved and we could've told that story too and spices are part of the vast plant life that contributes to fragrance that we didn't get into much. The whole sets of fragrant orchids that every plant community has a fragrant element because of pollination that we could've done more with, but it just, it's too brief a time."</p> <p>V: "The only thing that I would say that I would change is that I would have more white flowers. The white flowers are more fragrant. We had some in our selection of flowers, but I would put more white in."</p> <p>DoE: "I wish the Smencils or pencils would have had smells not just scents."</p>	Data did not speak to this.

Question Three: What was the perceived impact on visitors?

Theme	Description	The Tech	Dixon	MOHAI
contributed to a positive experience	Statements regarding the positive reaction of visitors to	EDC: "But in general, reactions have been pretty positive."	<p>GEVC: "Yes, I think it's been positive and they've been involved."</p> <p>"we have a comment book in the conservatory where they</p>	EM: "They enjoyed it. They certainly noticed it. For the most part they enjoyed it and they

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	scents, their enjoyment of them, and how well the scent in this exhibit was received.		<p>write and we've gotten all positive notes.”</p> <p>V: It went over really, really fabulously.”</p> <p>C: “people thought it was really fun.”</p> <p>“We want our visitors to be happy and to take something unusual away from the exhibition. So I think everybody that visited the discovery room, the Smellery, it was really cute, I think everybody who visited it really enjoyed it. As far as I know and from what I heard, we got nothing but positive feedback.”</p> <p>DoE: “We have people who are really into it. They go, 'ah this is great!' and of course, usually the adults, who go, 'oh that's cute for the kids.' And there's the, like, 30 year old like, 'this is great!' putting on everything, so we see a little bit of everything. But mostly it's been positive”</p> <p>“I think people had a good experience.”</p>	wondered ‘where is the chocolate?’”
connected visitors to exhibit content	Statements regarding visitors’ behavior and thought process in relation to scent: engaging with the scent or interactive, asking questions, connecting ideas.	<p>EDC: “I think we did see that people were interested in interacting with the interactive and we did see that people were, they were kind of going through those steps of making the connection between the interactive and the content that we were interested in sharing.”</p> <p>“And my goal, the museum's goal is always engagement. A fun engagement that leads to some kind of content sharing. So, that was the goal, to</p>	<p>D: I took people on tours. Think on five senses, where sense of smell fits. Very provocative question, could see visitors start to think about it. In both places [garden and smell room]. Visitors were definitely interacting with it.</p> <p>V: “They'd be going along and would be in the conservatory or out of the gardens. And we would talk about it, you know, ‘what is this fragrance?’, ‘what do you smell?’”</p> <p>“They were sniffing different plants and we have garden docents which did tours with the gardens and you stop and, you know, you discuss each plant and how they smell and they would ask questions. So there was lots of interaction there. And trying to answer any questions that they had.</p> <p>DoE: “people are very afraid of drawing something on their</p>	<p>EM: “People commented on it and came away wanting to eat chocolate.”</p>

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		<p>get people excited by doing this interactive and then they go and read about kind of the connection between this thing, this interactive and the content about that particular interactive.”</p>	<p>own, even if we get them started with part of the drawing. They do appreciate the smells and the pencils. And sometimes what they do is they leave behind where they've tried it. And we can see that they smelled it. Just to smell it. It kind of works.” “I can also see the scratch and sniff that are being used the most because we have to replace them, so we keep track of that.”</p>	
<p>scent had an impact on memory</p>	<p>Statements regarding what effect scent had or was hoped to have on visitors' memory, how scent led visitors to recall their childhood, and how the exhibit helped build their odor memory</p>	<p>Data did not speak to this</p>	<p>GEVC: “We think that from our research and our digging into the subject, we think fragrance is a really important but overlooked element in garden design. It appeals to a memory and everyone has a different reaction based on their memory of that fragrance.” “Some people have an interesting reaction that they don't know or they don't have it in their memory” V: “One thing that was really impressive would be that lots of them would speak of childhood. Or of their mothers or their grandmothers. When they would smell a certain plant or flower. Oh, this takes me back to when I was a child. And the memories would probably be them recalling childhood memories with their mother or their daddy or their grandparents. That was very rewarding.” C: “A big part of our message is that scent, the sense of smell, is really tied to memory. And our hope was that people would go in the discovery room and have smell all these very specific things in there and, for the rest of their life, that might be a little dramatic, but from there on out, when they smell that smell, maybe they remember going to the exhibition and being in the discovery room</p>	<p>Data did not speak to this</p>

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			<p>and having a positive experience. So, the same thing with the gardens. With the fragrant plants that we grow in the gardens, those, some of those are really specific smells, and our hope is that people will, through that smell, through that scent, that they'll remember their experience at the Dixon and with the exhibition.”</p> <p>DoE: “So when you smell something, it triggers some kind of memory or experience that you had in the past or sometimes it's just a new smell.”</p>	
<p>did not adversely impact health</p>	<p>Statements regarding to concerns staff had about the impact of scent on visitor health, that scent did not have an adverse reaction on visitors or staff, and what staff did to address health concerns</p>	<p>EDC: “That is always a concern that health can be, that smelling something won't agree with them. But, we did kind of think about that. We just felt that the experience itself, that connection that that exhibit could have with this really interesting story outweighed the risks. I mean, people, and I haven't heard anything untoward happening with this, people getting sick or having allergic reactions to what they're smelling.”</p>	<p>GEVC: “Yes, very much so because we've had a woman here 16 years who is allergic to everything and especially pollen and fragrance. And up until this exhibit, in fact, when we first existed, we did fragrance in the garden I said, 'I'm afraid we will have to bury [her].' [laughs] 'This will kill her.' But she's really tolerated it quite well. And I don't know if it's because it's real as opposed to somebody's strong perfume or if she's just been thinking I'm gonna make it through these three months [laughs] but I can just see her passed out and dying for lack of breath. So it's kinda been her test and she's passing it so far [laughs]”</p> <p>V: “You always kind of -- Memphis is really bad about allergies and problems like that. So, most people would know what's coming and say I have sinus issues and I can't smell or it would be better for me not to get down close to the plant.”</p> <p>“And most of the flowers were not, did not bother the people as much as the, like perfumes do. So they, in being out in open garden made it a lot better. But there were no real issues with the allergies on</p>	<p>EM: “We did nothing more to what the Field museum supplied. Presumably they took those concerns into account. We didn't, I don't recall anybody complaining about it, although it was a concern to the staff. They were concerned that it may be an issue. I think that probably has something to do with the, well, let me put it this way. The fact that it didn't become a problem I think had something to do with its synthetic nature and not an organic compound.”</p> <p>“I didn't notice any adverse reactions to it.”</p>

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			<p>this.”</p> <p>DoE: “Not at all. I think because the gallery is very small. And the components are fairly kinda small and not too intense. You know the scratch and sniff won't smell until you scratch it, really. But it's also the soaps are pleasant smells, so maybe people haven't said anything because it's not a bad smell, but it's a good smell.”</p> <p>“We were aware that one of the things we didn't want anything overwhelming in there obviously because we didn't want, in general, you know, to harass people or whatever with what's in there.”</p> <p>“We did choose to take out for example, just to be safe, any of the scratch and sniff stickers that had peanut butter or that had, you know, so we did go through that, hey we don't know if this actually has anything, any ingredients in it, let's make sure. So it did kinda affect a little bit. We tried.”</p>	
olfactory fatigue	Statements regarding whether olfactory fatigue was a concern, was discussed, and how it was addressed.	EDC: “Initially we talked about olfactory fatigue, but it wasn't that big of a concern for us.”	<p>GEVC: “Yeah, and we didn't talk much about that because you know when you go and you certain sources on fragrance say you can smell coffee beans and they say that negates it and you can start over. We didn't do that here. But for instance in the conservatory we have over thirty scented geraniums where you rub each leaf and smell your fingers and read the card that says what fragrance it's supposed to be and I think after a few of them, people realize that they're all smelling alike and they go back to reading or they change to a different venue.”</p> <p>V: “And then we would have to walk around for a while and not get too many smells too</p>	Data did not speak to this.

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			<p>close together.”</p> <p>C: “[scratch and sniff stickers] were far enough apart from each other that they didn't really compete with each other.”</p> <p>DoE: “I think we gave them the choice. I think the scratch & sniff & "smell this," you can select. It doesn't say, smell all of this. Just smell some of this. So it was optional. For the soaps - it was sometimes choose not to smell it.”</p>	
necessity	Statements regarding whether or not scent was necessary to telling the story of the exhibit.	EDC: “It's not like that was an integral part of the exhibition, but it's not like people spend the majority of the time there compared to everything else.”	<p>GEVC: “I think it was integral. I don't think they could have carried it off without it because we are the scent. And just showing a perfume bottle, it doesn't really tell the story or show them the painting of someone smelling a flower doesn't tell the story. Or having a drawing of fragrant flowers. We really carry the story here because we get to show the real thing.”</p> <p>C: “I think it was hugely important. ... It was part of the planning of the exhibition from day one. It was really important to us to have a space in the museum where people could go and experience scent.”</p> <p>DoE: “how are we going to do something interactive with scent when we can't have anything in the gallery? So the first thing we said was we have to have scent, it has to happen in some way or another.</p> <p>D: In development: I thought it didn't matter. Aftermath: mattered a great deal</p>	EM: “I don't know that it was necessary, but I think it was a significant enhancement to the experience.”
worthwhile	Statements regarding whether adding scent to an exhibit was worthwhile.	EDC: “I do, because when you do that particular interactive, it actually brings the story of the innovator more into focus.”	<p>V: “Most definitely. Most definitely.”</p> <p>DoE: “I think so. Education Department is convinced of that.”</p>	EM: “Overall it made for a better exhibit.”
would work with	Statements	EDC: “We are	C: “Sure! Yeah! If the	EM: “Yes. We

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<p>scent again</p>	<p>regarding whether staff would work with scent again, in what ways, and about exhibits staff are considering.</p>	<p>considering it, actually. ... we were thinking about some kind of exhibition in there that would talk about these are the scents of a bygone era.” “And I like the idea of engaging all of your senses in an exhibition so usually we're visual creatures and we're engaging just the visual sense, but the idea of touch or smell and taste, the taste and smell I've already thought about pretty deeply for this new exhibition.”</p>	<p>opportunity presented itself.” DoE: “I wish we could do more scented things in the galleries, absolutely.” “I think some of those components or other kinds of components could have been installed within the gallery to have the experience next to the bottles.” D: Probably not. [as in, not another exhibit that focuses on the sense of smell] but will think about scent [more, harder in what they do]</p>	<p>would. And in fact for our food exhibit, we debated it. ... The reason we chose not to was we couldn't control that experience. It was relevant in front of the Cinnabon section but not in the other places. And we, they didn't have a way to control it or time it or money to invest in a way to do that.</p>
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