

Crafting Intentional Scents: Enriching Cultural Heritage with Educational Olfactory Reproductions

Author

Sofia Collette Ehrich

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Abstract

Museums internationally are using scents as a means of storytelling in their galleries, but a methodological process for developing olfactory reproductions - or historically informed scents - is still lesser known and valued. For the first time, this paper raises the importance of crafting intentional olfactory reproductions for the use in cultural heritage. It discusses how to streamline the process of commissioning olfactory reproductions with a scent designer and how to foster transparency of these productions to benefit visitor education. Insights for understanding aspects of transparency for olfactory reproductions and navigating their level of historical intent are gleaned from already established methodologies of heritage scent preservation. These young methodologies provide a framework for improving methods of olfactory storytelling within the field of cultural heritage. *The Olfactory Reproduction Matrix* presented in this paper compiles methodologies of heritage scent preservation into a table that acts as a practical tool for museum practitioners to use while developing olfactory reproductions in the setting of cultural heritage.

Introduction¹

The Metropolitan Museum of Art in New York City broke headlines earlier this year with the opening of *Sleeping Beauties: Reawakening Fashion*, an exhibition that - according to an article written by Vogue - was “*designed to awaken your senses*” (Borrelli-Persson 2024). With the intervention of tactile (touch) and olfactory (smell) interventions, the MET’s Costume Institute aimed to reanimate fashion garments stripped of their once sensory significance by being put “*to sleep*” in the collection’s depot or placed behind glass (Borrelli-Persson 2024). Specific interest arose from the ‘olfactory interventions’ of the exhibition, developed by olfactory artist Sissel Tolaas, who spent over a year working with the collection, preparing the scents, and designing their distribution into the gallery space (Seipp 2024). Dozens of tubes ran under and between the dresses awing visitors with their spectacle. The tubes are seemingly extracting fragrant air from the heritage objects that then seem to pump directly into the gallery space. It is a once in a lifetime opportunity to sniff the olfactory identity of a garment that was worn over 100 years ago (Seipp 2024).² The work of Tolaas is valuable as it encourages visitors to approach the history of fashion and the museum gallery *nose-first*, but the press, as well as Tolaas herself, were quick to classify the smells presented in the gallery as “*replications of the molecules found in the dresses*” with vague insights into their creation (Seipp 2024). These statements did not seem to negatively impact visitors to the exhibition; however, it raises the question: does it harm a museum and its visitors if scents are presented as true replications, when the true level of interpretation behind these scents is unclear? Although the attention and positive reception that this exhibition received demonstrates steps towards breaking what scholar and art critic Jim Drobnick calls the ‘anosmic cube’, it raises concerns in terms of how museums communicate the level of interpretation behind the scents presented in their galleries (Drobnick 2005).

Conversations around the interpretation and preservation of cultural heritage through scent is relevant at present when “*scent in the museum*”, also known as ‘olfactory storytelling’, is becoming more common (Ehrich, Leemans et al. 2023, 8-9). Experiments that investigate the positive and negative impact of olfactory storytelling is becoming of greater interest to researchers, resulting in exciting new insights about the significant outcomes of implementing these practices (Bembibre & Strlič 2021; Verbeek, Leemans et al. 2022; Alexopoulos & Bembibre 2023; Ehrich, Leemans et al. 2023). Research initiatives are working towards legitimising the impact that ‘olfactory interventions’ have within the cultural heritage domain by establishing methodologies and tested practices for archiving and devel-

oping historically relevant scents as well as presenting those scents safely and meaningfully to the public (Ehrich & Leemans 2023).³ These initiatives are productive as they improve our understanding of the impact olfactory interventions have on visitor experience and in turn, bring forward the importance of using our sense of smell as a tool to engage with the past and the present.

Overall, research suggests that olfactory storytelling is beneficial to visitor experience. One study that conducted interviews and questionnaires on a sample of approximately 800 ‘olfactory exhibition’-goers showed that embracing olfactory storytelling techniques in the museum contributes to an overall positive experience (Alexopoulos & Bembibre 2023). Analysis of these questionnaires showed that most visitors enjoyed the experience, responding that the *“smells made the tour/visit special”* and *“I would like to experience more exhibitions with smell in the future”* (Ehrich, Leemans et al. 2023, 16-17). This is just one example that confirms the positive outcomes of olfactory interventions in the museum. Due to olfaction’s direct connection with the brain’s limbic system (where our emotion and memory are processed), the interaction with smell in the context of heritage results in a more memorable visitor experience that is easier to recall later (Aggleton & Waskett 1999; Levant & Pascal-Leone 2014; Bembibre & Strlič 2017; Verbeek, Leemans et al. 2022). Museum visitors also indicate that olfactory interventions improve their comprehension of topics presented in the galleries, makes them feel closer to the past, and builds stronger connections with those around them (Alexopoulos & Bembibre 2023; Ehrich, Leemans et al. 2023). Lastly, applying multisensory approaches to the museum encourages hands-on involvement and elongates the amount of time visitors spend engaging with the collection (Eardley, Dobbin et al. 2018).

With legitimate understanding of the positive impact that olfactory interventions have within the context of cultural heritage, the frequency of olfactory storytelling is booming internationally.⁴ However, the field faces growing pains due to its reliance on interdisciplinary exchange between museum practitioners who design exhibitions and scent designers who have the knowledge to access and develop ‘olfactory reproductions’ (Ehrich & Leemans 2022, Ehrich & Leemans 2023). At the heart of this knowledge exchange lies a challenge: cultural heritage institutions and museum professionals still possess limited understanding of the methods for commissioning and accurately contextualizing historically intended olfactory reproductions in collaboration with a scent designer (Bembibre & Strlič 2017; Ehrich & Leemans 2022; Verbeek, Leemans et al. 2022). The existence of this challenge has not yet been acknowledged by the



Figure 1. *Image of a visitor sniffing a scent at the Mondrian Moves exhibition at the Kunstmuseum Den Haag in the Netherlands: 2022. Photograph by: Sofia Collette Ehrich.*

field; however, I would argue it is a barrier that is restricting the influence olfactory interventions have on museum visitors, and as a result reducing educational impact.

A solution to this challenge can be found in the discipline of ‘olfactory heritage’, a relatively young field that raises awareness around the importance and correlation between smells and heritage, including the preservation and presentation of scents in the museum (Bembibre & Strlič 2017; Bembibre, Leemans et al. 2024). The field of olfactory heritage is extensive and includes many disciplines, but my research requires the investigation of two specific subcategories within the field of olfactory heritage: ‘olfactory museology’ and ‘historic scent preservation’. Olfactory museology focuses on the study of using scent in the context of the museum while historic scent preservation deals specifically with methodologies that inform the development of these scents. Together, these aspects form the theoretical framework to investigate my research question: *how can cultural heritage institutions showcase olfactory reproductions in a way that is appealing*

to visitors while also educating them about the research process behind the scent's level of historical interpretation? To address this question, I will first establish and define the theoretical framework of olfactory museology and historic scent preservation and emphasize their interdependency on each other in practice. Next, I will present the available methodologies of heritage scent preservation which in turn establish an 'olfactory reproduction discourse'. This discourse is crucial as it has the power to inform museum practitioners on the methods to shape communication around their historically intended olfactory reproductions. Analysing this discourse will reveal initial insights into how olfactory reproductions can be communicated to museum visitors in a way that is both engaging and educational. The conclusions will explore future research opportunities.

Theoretical Framework⁵

This paper situates itself within the field of 'olfactory heritage', emerging from the idea that smells are a key part of our cultural heritage and that they must be safeguarded and researched. It is a challenging topic to research as it confronts one of our deeply rooted biases: that we should rely mainly on visual experience when engaging with aspects of cultural heritage (Bembibre & Strlič 2017). In 2017, scholars Cecilia Bembibre and Matija Strlič published the first 'comprehensive treatise' on the correlation between olfaction and heritage. One of the first groups to formally propose that smells are *indeed* a part of our cultural heritage, they raise the importance of establishing a structured approach when identifying, analysing, and archiving "*historic odours*" and discuss how these concepts impact the museum sector (Bembibre & Strlič 2017, 1). They argue that visitors benefit from the engagement with smells in the context of cultural heritage; however, curatorial and conservational challenges remain, posing barriers for the field (Bembibre & Strlič 2017). Since then, olfactory heritage research has matured. Odeuropa, a European Funded Horizon 2020 project that advocated for smells and olfaction as an important part of European cultural heritage, formally defined the term earlier this year. Their *Olfactory Heritage Toolkit* defines olfactory heritage as "*materials, objects, places and practices whose significance is defined by, or notably associated with, smells and olfactory experiences meaningful to communities, groups and individuals*" (Bembibre, Leemans et al. 2024, 7). With interdisciplinary exchange at the centre, the field brings together (art) historians, heritage scientists, chemists, archaeologists, anthropologists, museum practitioners, artists, and more (Bembibre & Strlič 2022).

Due to the interdisciplinary nature of this field, it is necessary to further specify the scope of this research by defining two of its theoretical subcategories. Although a commonly used term by olfactory heritage researchers, olfactory museology is yet to be defined. Based on current scholarship, olfactory museology is the study and investigation of museum practices that involve smell as a medium of storytelling (Verbeek, Leemans et al. 2022). Methods and tools that are considered practices of olfactory museology can be found in the theoretical framework of olfactory storytelling. Odeuropa's *Olfactory Storytelling Toolkit: A 'How-To' Guide for Working with Smells in Museums and Heritage Institutions* proposes such a framework, guiding museum professionals and others through the process of applying scent as a medium to their own (curatorial) practice. Odeuropa defines olfactory storytelling as the careful orchestration of scent(s) and the activation of the olfactory sense in a meaningful way that deliberately connects individuals to (heritage) collections, concepts, practices, and objects within a certain setting (museum or otherwise) (Ehrich, Leemans et al. 2023). Olfactory storytelling includes three key actions: (1) the selection of an olfactory narrative; (2) determining the context in which the scent and narrative is communicated; and (3) the design of how the scent is physically presented to the visitor (Ehrich, Leemans et al. 2023; Ehrich & Leemans 2023). These three aspects are shaped from the overall intended effect that the chosen scent - and its related context - has on the visitor experience. Effect may be to educate, raise emotion, capture historical accuracy, preserve a concept of cultural heritage, or for theatrical effect (Verbeek 2016). Here I want to highlight that olfactory museology only considers olfactory storytelling activities that are directly related to museum practice, and therefore does not include the physical *development* process of olfactory reproductions. Olfactory reproduction development currently depends heavily on the knowledge of perfumers, scent designers or chemists who can compose scents that are safe and effective for the noses of the public. This process falls under another subcategory of olfactory heritage called historic scent preservation.

Historic scent preservation relates to any situation where the noses of today are exposed to interpretations of the "*scented past*" via the reconstruction or recreation of a historic scent (Bembibre 2021, 155). According to Cecilia Bembibre, there are four focuses of olfactory reproductions created within the scope of historic scent preservation: (1) smell creations that preserve a smell source that is no longer existing and soon to be extinct, including the preservation of (historic) perfumes; (2) scent creations that give an olfactory impression of the past but were created without access to a "*representation in the real world*" (Bembibre 2021, 157); (3) scent cre-

ations that are developed to represent a(n) (historical) autobiography of a person; and (4) scent creations meant to interpret a historical concept with the intention to be presented to the “contemporary nose” (Bembibre 2021, 162). Like the three actions that are key to olfactory storytelling, these four focuses act as a guideline for shaping the intent of an olfactory reproduction and when understood can greatly inform the way that an olfactory reproduction is presented in the museum.

Together, olfactory museology and historic scent preservation establish a theoretical framework that guides both the development of impactful olfactory storytelling practices in museums as well as informs the contextualization of olfactory reproductions to the public. However, we must acknowledge the dependent relationship between these concepts, requiring museum practitioners and scent designers to work together. Direction for streamlining these collaborations is found in the four methodologies of historic scent preservation, which each provide the information necessary for museum practitioners to effectively shape the historic intent of their olfactory reproduction with both scent designer and museum visitor. This methodological understanding informs the process of olfactory reproduction development by providing a guideline for defining and classifying types of olfactory reproductions based on their background of research and development.

Methodologies of Historic Scent Preservation

In this section, I present four methodologies for heritage scent preservation proposed by known scholars in the field of olfactory heritage. Collectively they set a guideline for classifying olfactory reproductions which can be applied to shape the way these scents are presented and contextualized for the public. Each methodology falls under one or more of the four focuses of historic scent preservation, as mentioned above in the ‘Theoretical Framework’. Their versatility and adaptability across different fields will be illustrated by describing how they lean more heavily toward one focus or the other. The table ‘Methodologies of Historic Scent Preservation’ (figure 2) provides an overview of the methodologies of heritage scent preservation from first published (left) to most recently published (right).

The earliest methodology was published in 2022, and the latest methodology was published in 2023. The table indicates (1) the name of the methodology and its year of publication, (2) the focus within the scope of historic scent preservation, (3) the term these scholars use to refer to olfactory reproductions, and (4) the citation of the original publication. Methodologies are named for their published work. Publishing platforms

of these methodologies vary, with two of them published in academic journals, one published as a key deliverable of a European Funded project, and one published via an open access research platform. Methodologies were chosen based on the prominence that their authors hold in the field of olfactory heritage.

Methodologies of Historic Scent Preservation				
Methodology	In Search of Lost Scents by Dr. Caro Verbeek (2022)	Whiffstory by Odeuropa (2022)	The NOMEN Project by the Osmothèque and its Scientific Committee (2023)	Olfactory Storytelling Toolkit by Odeuropa (2023)
Focus of Historic Scent Preservation *	② ④	① ② ③ ④	① ④	① ② ④
Overarching Term for 'Olfactory Reproductions'	None specified	Olfactory Representations: scents created by perfumers, olfactory artists, heritage scientists, museum curators and the entertainment industry to re-present historical scents and bring them to the noses of the present.	Olfactory Reconstitutions: scents that aim to recreate a scent or perfume from the past based on any information that exists on how to do so.	Heritage Scents: scents created by a perfumer or scent designer for the use of olfactory storytelling and presented to the public. Scents are employed to convey narratives which are significant to a specific culture and/or are gleaned from the analysis of historical texts and images.
As Published In	Verbeek, Leemans, and Fleming (2022, 315-342).	Leemans et al. (2022, 849-879).	Chazot et al. (2023).	Ehrich et al. (2023).

* As proposed by Cecilia Bembibre in 'Archiving the intangible: preserving smells, historic perfumes and other ways of approaching the scented past' (2021): ① smell creations that preserve a smell source that is no longer existing and soon to be extinct. This includes the preservation of (historic) perfumes; ② scent creations that give an olfactory impression of the past but were created without access to a "representation in the real world" (157); ③ scent creations that are developed to represent a(n) (historical) autobiography of a person; and ④ scent creations meant to interpret a historical concept with the intention to be presented to the "contemporary nose" (162).

Figure 2. *Table of Methodologies for Historic Scent Preservation: 2024.*
Created by: Sofia Collette Ehrich.

‘In Search of Lost Scents’ was proposed in November 2022 by Dr. Caro Verbeek, an art historian, researcher and curator based in the Netherlands. It was developed as part of her PhD research, *In Search of Scents Lost - Reconstructing the volatile heritage of the avant-garde*, which took place between 2014 and 2019.⁶ During her PhD, Verbeek produced various olfactory projects including an olfactory guided tour at the Rijksmuseum, Amsterdam in collaboration with IFF (International Flavors and Fragrances) (Verbeek, Leemans et al. 2022; Ehrich, Leemans et al. 2023).⁷ Verbeek is a pioneer in the field of olfactory museology setting precedent specifically for developing exploratory practices of olfactory storytelling at the intersection of academia and industry (Bembibre & Strlič 2022). One of her olfactory projects was an olfactory guided tour that paired twenty artworks from the Rijksmuseum’s collection with scents. The process required the expertise of museum practitioners, perfumers, and Verbeek herself who worked together to create scents that captured the (art) historical background and olfactory relevance of the artworks (Verbeek, Leemans et al. 2022). It was through this process that Verbeek realized that olfactory reconstructions could have different (historic) intentions. Her findings provide a dichotomy of olfactory reconstruction types. On one side she places ‘historically informed scents’ or those based on (art) historical research that have as little interpretation as possible. Historically informed scents can be based on materiality, textual evidence, and visual imagery. On the other side she places ‘artistic creations’, or scents based on creative interpretation. Her work also mentions the use of ‘single raw materials’, or the use of a single fragrant material, and ‘scent compositions’ when several raw materials are combined. The decision behind their use is based on the intention of the storytelling and can fall under both categories (Verbeek, Leemans et al. 2022). Verbeek’s methodologies fit within focuses two and four of heritage scent preservation as the methods cover scents presented to the contemporary nose that are of historical intent.

‘Whiffstory’ was published in June 2022 by researchers of the Odeuropa project. The development of this methodology is based on interdisciplinary knowledge from science, chemistry, and the humanities. This methodology has a similar dichotomy to Verbeek’s; however, it names further subcategories of historically intended scents. The scholars of this methodology aim to further establish and formalize types and descriptions for what they call “*olfactory representations*” (Leemans, Tullett et al. 2022). Sources of inspiration for forming this methodology come from previously developed scents that represent historical clothing and “*consumables*” as well as those developed based on the scientific analysis of (historic) objects

(Leemans, Tullett et al. 2022). It is the most comprehensive historic scent preservation methodology that exists, including six categories of olfactory reproductions that are based on the review of multiple case studies. The categories distinguish between olfactory reproductions that are developed based on several types of olfactory-related evidence (i.e. texts, images, fragrant residues, etc.) and achieved through different research methods or analysis (i.e. textual analysis, chemical investigation, etc.). For a comprehensive description of each of the terms, please consult ‘The Olfactory Reproduction Matrix’ (figure 3). One challenge of this methodology is that it lacks disciplinary focus. The scholars claim that the categories can describe olfactory reproductions developed from and for various purposes, including ‘olfactory art’. This makes it difficult for some to understand and apply these methods in practice. ‘Whiffstory’ encompasses all focuses of historic scent preservation as it can be applied to olfactory reproductions developed for a variety of reasons which are usually presented to the contemporary nose.

‘The NOMEN Project’ was published in July 2023 by the scientific committee of the Osmothèque Conservatoire International des Parfums. The Osmothèque is a non-profit organization founded in France in 1990 that dedicates their practice to archiving perfumes from the past and present. In addition to the preservation of historic perfumes, they design programmes and function as a place to disseminate trainings and research about perfume-making and its history (Bembibre 2021). They not only safeguard an archive of perfumes (today that number is 4,000), but they are also entrusted as guardian of perfume formulas which they are able to access in order to “*reweigh*”, or authentically reproduce, if the physical perfume is no longer available (Bembibre 2021).⁸ The Osmothèque is unique as they are able to reconstruct historic perfumes using the original materials and formula, ensuring that perfumes are authentically preserved for posterity (Bembibre 2021). ‘The NOMEN Project’ includes five distinct categories that further define the categories of perfumes made with historical intent or what they call an ‘*olfactory reconstitution*’ (Chazot, Camus et al. 2023, 2). For a comprehensive description of each of the terms, please consult ‘The Olfactory Reproduction Matrix’ (in the following chapter). This methodology is very comparable to ‘Whiffstory’ as it further defines olfactory reproductions based on the olfactory-related evidence and type of research analysis applied. However, although the writers claim that their methodology includes all olfactory reproductions that have a “*historical dimension*”, the language they choose to describe these categories is tied to the preservation of “*historic perfumes*” (Chazot, Camus et al. 2023, 3). The reproduction and preservation of these perfumes is not done explicitly for

“Does it harm a museum and its visitors if scents are presented as true replications, when the true level of interpretation behind these scents is unclear?”

public access, but rather to protect a scent at risk of extinction. This means that ‘The NOMEN Project’ falls under historic scent preservation focus one. Focus four is also relevant as the Osmothèque implements the reproduced perfumes into workshops and trainings for the public.

The ‘Olfactory Storytelling Toolkit’ was published in November 2023 by Odeuropa. The methodology was published in *The Olfactory Storytelling Toolkit: A ‘How-To’ Guide for Working with Smells in Museums and Heritage Institutions*, a handbook created to equip museum practitioners and others with the information they need to use scent as a storytelling technique in their own practice. To develop this guide, the Odeuropa team researched and evaluated previous methods of olfactory storytelling through the production of five olfactory events (Ehrich & Leemans 2021; Ehrich & Leemans 2022, Ehrich & Leemans 2023). The key learnings from this research informed the development of Odeuropa’s categorization of what they call “*Heritage Scent Creations*” (Ehrich, Leemans et al. 2023, 77).⁹ Like the methodologies before, Odeuropa further defines olfactory reproductions created with historic intent. They name three types of olfactory reproductions: ‘Materially Informed Reconstructions’, ‘Historically Informed Interpretations’, and ‘Artistic Translations’ (Ehrich, Leemans et al. 2023, 77-78). These three categories have two sets of subcategories: ‘Single Ingredient Representation’ vs. ‘Smell Composition’, and ‘Malodours’ vs. ‘Fragrance’ (Ehrich, Leemans et al. 2023, 77-78). For a comprehensive description of each of the terms, please consult ‘The Olfactory Reproduction Matrix’ (described in section 3.1). The ‘Olfactory Storytelling Toolkit’ took inspiration from Verbeek’s ‘In Search of Lost Scents’ but further distinguishes between olfactory reproductions that originate from a fragrant materiality and those interpreted from a historical source (written or otherwise). This shows consideration of ‘Whiffstory’, although simplified to ensure comprehension by a broader audience. The ‘Olfactory Storytelling Toolkit’ encompasses historic scent preservation focuses one, two, three and four, as the methodology can be applied to a variety of olfactory reproduction types. Focus four is key though, as *The Olfactory Storytelling Toolkit: A ‘How-To’ Guide for Working with Smells in Museums and Heritage Institutions* was developed to inform about how to use olfactory storytelling methods on the public.

The Olfactory Reproduction Matrix

Olfactory heritage scholars argue that olfactory museology lacks comprehensive scholarship that outlines best methods and practices for applying olfactory storytelling (Bembibre & Strlič 2017; Ehrich & Leemans 2021; Verbeek, Leemans et al. 2022; Ehrich & Leemans 2023). Although such

scholarship is on the rise, the research outcomes rarely reach the museum community. In fact, training programs for museum practitioners to learn techniques for olfactory storytelling do not exist (Bembibre & Strlič 2021; Bembibre & Strlič 2022). In response to this issue, I present a tool for museum practitioners to use when commissioning and contextualizing their own olfactory reproductions: the ‘Olfactory Reproduction Matrix’ (figure 3). The tool is a table that systematically organizes the information presented in each methodology of historic scent preservation (as presented in section 3), setting these methodologies in comparison with each other and prompting analysis of their different criteria. This allows the user to easier navigate the methodologies available to them and make a choice based on their description. The matrix also guides users through understanding the level of interpretation that their olfactory reproductions will have. By applying these terminologies to olfactory reproduction development, users can (1) streamline communication between museum practitioner and scent designer; (2) gain insights to effectively shape the communication and context in which the olfactory reproduction is presented in the museum; and (3) understand the research methods required to achieve these olfactory reproduction types.

Terminologies are listed for each methodology in rows 1-6. Terms listed in row 1 involve little/ no interpretation while terms in row 6 are creative interpretations.	Terminologies of In Search of Lost Scents by Dr. Caro Verbeek (2022)	Terminologies of Whiffstory by Odeuropa (2022)	Terminologies of The NOMEN Project by the Osmothèque and its Scientific Committee (2023)	Terminologies of the Olfactory Storytelling Toolkit by Odeuropa (2023)
#1		Preservation + Conservation + Restoration: an olfactory reproduction created within the domains of heritage and museum studies that restores its previous olfactory relevance, usually contributing to the safeguarding of a place or object of cultural significance. Research Methods: the collection of archival evidence (perfume formulas) and raw materials (that no longer exist).	Reweighting: a (historic) perfume composed by a modern-day perfumer from the original formula that outlines exact raw materials, quantities and techniques. The creation is true to the original formula without creative liberty. Research Methods: the collection of archival evidence (perfume formulas) and raw materials (that no longer exist).	
#2	Historically Informed Scent: an olfactory reproduction composed for the museum that is based on (art) historical research. Research Methods: archival research, historical research, visual analysis of artwork, sensory panels, chemical investigations of fragrant residues.	Olfactory Re-creation: an olfactory reproduction created within the domains of history and perfumery that start from a detailed instruction or textual evidence. Research Methods: archival research, historical research, visual analysis of artwork.	Adaptation: a historic perfume from before 1800 composed by a modern-day perfumer which is based on a recipe. Exact raw materials, quantities and techniques used to create that perfume are limited or vague. Perfumer may take creative liberty to fill in the gaps, but they remain true to the written recipe. Research Methods: archival and historical research.	Historically Informed Interpretation: an olfactory reproduction created for olfactory storytelling that is informed by archival research and/or visual analysis. The goal is to be as historically accurate as possible. Research Methods: archival research, historical research, visual analysis of artwork
#3		Olfactory Reconstruction: an olfactory reproduction created within the domains of heritage science that starts from the olfactory materiality of an object. New fragrant materials which were not part of the original are usually necessary. Research Methods: Chemical investigations (e.g. VOC and Headspace Analysis) of fragrant residues, sensory panels with the public.	Reconstruction: a (historic) perfume remade based on chemically analysed residues. The perfumer intervenes as necessary only to fill in missing information. Research Methods: archival research, historical research, and chemical investigations (e.g. VOC and Headspace Analysis) of fragrant residues.	Materially Informed Reconstruction: an olfactory reproduction created for olfactory storytelling that starts from the fragrant materiality of a collection item or space. This item or space can be considered while an olfactory reproduction is being developed. Research Methods: Chemical investigations (e.g. VOC and Headspace Analysis) of fragrant residues, sensory panels with the public.

Figure 3. *The Olfactory Reproduction Matrix*: 2024. Created by: Sofia Collette Ehrich.

Terminologies are listed for each methodology in rows 1-6. Terms listed in row 1 involve little/ no interpretation while terms in row 6 are creative interpretations.	Terminologies of In Search of Lost Scents by Dr. Caro Verbeek (2022)	Terminologies of Whiffstory by Odeuropa (2022)	Terminologies of The NOMEN Project by the Osmothèque and its Scientific Committee (2023)	Terminologies of the Olfactory Storytelling Toolkit by Odeuropa (2023)
#4		Single Ingredient Representation: A scent applied in the domains of olfactory museology, history and perfumery that presents a historical smell narrative through a single raw material. Research Methods: archival research, historical research, visual analysis of artwork.		
#5		Historical Smell Scene Composition: an olfactory reproduction created within the domains of history, perfumery and archaeology where accuracy is not the goal. Instead the scent is developed as a creative interpretation. Research Methods: archival research, historical research, visual analysis of artwork.	Interpretation & Atmospherisation: a perfume composed based on historical resources about a person, narrative or place. Perfumer is allowed a lot of creative liberty. Research Methods: archival research, historical research, visual analysis of artwork.	
#6	Artistic Creation: an olfactory reproduction created for the museum that is based on creative interpretation. These creations are meant to immerse visitors and stimulate them creatively. Research Methods: visual analysis of artwork's colour, shape and form, historical research.	Olfactory Imaginations – Conceptual Creations: an olfactory reproduction created within the domain of olfactory art, perfumery and history that works with a historical concept but is not intended to be historically accurate. Here, theatricality trumps accuracy. Research Methods: archival research, historical research, visual analysis of artwork.	Evocation: a work of an imaginary past that allows the perfumer complete creative liberty. Historical sources only act as initial inspiration. Research Methods: archival research, historical research, visual analysis of artwork.	Artistic Translation: an olfactory reproduction created for olfactory storytelling that translates a work of art, artefact and environment in a creative way. Here, theatricality is trumps accuracy, but the reproduction should add value to the storytelling. Research Methods: archival research, historical research, visual analysis of artwork.
Subcategories:	The following categories can fall under the two above types: ① Single Raw Material: an olfactory narrative communicated in the museum with single fragrant material (e.g. myrrh). ② Scent Composition: an olfactory narrative communicated in the museum through the combination of several raw materials (e.g. a smell of an Amsterdam canal house).			The following categories can fall under the three above types: ① Single Ingredient Representation: an olfactory narrative communicated in the museum with single fragrant material ② Smell Composition: an olfactory narrative communicated in the museum through the combination of several raw materials ③ Malodour: an olfactory narrative presented in the museum using a foul smell. ④ Fragrance: an olfactory narrative presented in the museum using a pleasant smell.

The four methodologies presented on the ‘Olfactory Reproduction Matrix’ are: ‘In Search of Lost Scents’ by Dr. Caro Verbeek from 2022, ‘Whiffstory’ by Odeuropa from 2022, ‘The NOMEN Project’ by the Osmothèque and its Scientific Committee from 2023, and lastly, ‘Olfactory Storytelling Toolkit’ by Odeuropa from 2023, which are put into chronological order from left to right. Olfactory reproduction terms are listed in each column by methodology. All information presented in the matrix is gathered from the published papers outlining the methodologies in detail. As an olfactory heritage researcher myself, I examined the terminologies and placed them in the matrix based on their similarities in application. The user can understand similarities and differences by navigating the rows on the matrix from left to right: terminologies that are on rows that are next to each other are comparable whereas terminologies next to an empty box imply differences. The column farthest to the left states that terminologies are listed from lowest level of modern interpretation (row #1) to most (creative) interpretation (row #6). This listing was possible due to the descriptions attributed to each terminology in the published papers as well as my own understanding of these terms and their application. Note that the level of modern interpretation indicated in this column is to be used as a helpful aid and not as a prescriptive guideline.

Analysis

The theoretical framework presented in this research offers a new understanding of olfactory interventions designed for the museum. Let us revisit the olfactory interventions designed by olfactory artist Sissel Tolaas for the MET’s exhibition, *Sleeping Beauties: Reawakening Fashion* (2024). About the scent design for the project, Tolaas said:

“What all these smells do is bring back or reawaken hidden life in all the items of concern. Visitors can engage with the items and exhibition through emotions and memory in the most efficient way and start to imagine the people who have been wearing the various garments” (Seipp 2024).

Tolaas’ reflection emphasizes the intent of her olfactory work: to trigger emotion and to enhance the imaginations of visitors via theatricality. When compared with the methodologies of historic scent preservation, we can understand Tolaas’ scents as level six ‘creative interpretations’. Created for theatrical effect rather than historical accuracy, this approach contradicts Tolaas’ repeated claim that her scents replicate the molecules identified

“Together, olfactory museology and historic scent preservation establish a theoretical framework that guides both the development of impactful olfactory storytelling practices in museums as well as informs the contextualization of olfactory reproductions to the public.”

on the MET's garments. Additionally, the curation and communication of Tolaas' olfactory reproductions is vague, leaving visitors uninformed about how her research and development *actually* contributed to the final reproductions presented in the gallery space. This approach overlooks a valuable chance to educate visitors on the olfactory heritage of fashion through the nose and offer a meaningful opportunity to critically engage with the olfactory reproductions presented in the gallery.

Through the description of the four methodologies of historic scent preservation, my research describes solutions for streamlining interdisciplinary collaboration between museum practitioners and scent designers. These solutions support transparency throughout the development process of olfactory reproductions, hence bringing forward olfactory reproductions that are both informative and engaging for the public. After the comparison of these methodologies, four key points for the olfactory storytelling process should be considered when shaping the communication of olfactory reproductions to the public:

1. Does the olfactory reproduction come from historical evidence or is it heavily interpreted through creative interpretation? Careful attention is placed on reproductions based on historic evidence, as historic scent preservation methodologies outline thirteen different options to choose from.
2. What type of research did the olfactory reproduction require? Did it require archival research, historical research, or chemical investigation/analysis? Is the olfactory reproduction informed by material investigation of the place or object?
3. What level of creative liberty was the creator allowed when composing the olfactory reproduction? Is this clearly a modern interpretation of the intended concept? How did the creator consider the research method when developing the final olfactory reproduction?
4. Is the olfactory reproduction presented as one raw material or a composition or materials? Is the olfactory reproduction a malodour or fragrance?

Taking these factors into account when designing olfactory interventions in the museum can enhance the educational value and impact of the olfactory reproduction presented.



Figure 4. Press package for the Scent of the Afterlife card. Scientific Analysis Barbara Huber, Perfume Creation Carole Calvez and Creative Direction Sofia Collette Ehrich. Artwork by Michelle O' Reilly: 2023. Photo courtesy of Barbara Huber.¹⁰

Through a case study, I will demonstrate the potential of presenting olfactory reproductions that not only captivate visitors but also effectively convey the details of the research methods behind their creation. In 2022, archeo-chemist Barbara Huber, olfactory museologist Sofia Collette Ehrich, and perfumer Carole Calvez worked together to create *The Scent of the Afterlife*, an olfactory reproduction developed based on the GC-MS, HT-GC-MS, and LC-MS/MS analyses carried out by Huber and her team on the canopic jar housing the organs of the noble Lady Senetnay, a the high-ranking Egyptian wet nurse of Pharaoh Amenhotep II (Huber, Hammann et al. 2023; Ehrich 2024).¹¹ The olfactory reproduction was greatly informed by Huber's peer reviewed publication detailing the chemical analysis that was performed on the jar, which was excavated by Howard Carter from a tomb in the Valley of the Kings over a century ago (Huber, Hammann et al. 2023). *The Scent of the Afterlife* was not only based on a credible scientific study, but the development process of the scent was closely documented. This ensured that the olfactory reproduction crafted by Calvez reflected the findings of Huber's research as closely as possible. This careful documentation process informed the final reproduction as well as the way the scent was communicated to the public via a QR code on the back of a scented card (figure 4 and 5). The QR code leads to a website that clearly outlines the research process that led up to the final scent and the evaluation process that the team conducted working towards the final reproduction.



Figure 5. *Museum display for the Scent of the Afterlife at the Moesgaard Museum in Denmark’s exhibition, Ancient Egypt – Obsessed with Life: Denmark, 2023. Photograph by: Barbara Huber.*



Figure 6. *Barbara Huber sniffing the Scent of the Afterlife at the Moesgaard Museum in Denmark’s exhibition, Ancient Egypt – Obsessed with Life: Denmark, 2023. Photograph courtesy of Barbara Huber.*

This project also raises an interesting point about how modern interpretation does not only happen during the development of the olfactory reproduction, but also when that scent is curated in the museum space. In 2023, *The Scent of the Afterlife* was displayed at the Moesgaard Museum in Denmark at their exhibition, *Ancient Egypt – Obsessed with Life*. Visitors to the exhibition were able to learn about ancient funerary practices via curated wall texts and canopic jars. In the exhibition, *The Scent of the Afterlife* functioned as an educational tool that provided visitors with a *fragrant* understanding of Egyptian funerary practices. The curators of the exhibition paid careful attention to how the olfactory reproduction was situated in the context of the exhibition, guaranteeing educational impact for the visitor. This was achieved in the following ways:

1. The olfactory reproduction was presented inside of a reconstructed canopic jar that mimicked the original jar from which the funerary balm was sampled from. This allowed visitors to experience the olfactory reproduction as if it were still inside its original canopic jar (figure 6).
2. The olfactory reproduction was situated next to the original canopic jar (on loan from Museum August Kestner, Germany) from which Huber and her team had extracted and analysed the balm. This allowed visitors to view the original jar that housed Lady Senetnay's organs after sniffing the balm's olfactory reproduction (figure 6).
3. The olfactory reproduction was placed in the exhibition's "*mummification workshop*", a part of the exhibition that presented the processes and substances that were employed during the ancient Egypt embalming process.¹²
4. The olfactory reproduction was presented together with a wall text that clearly indicated the research methods and materials that informed the creation of the olfactory reproduction.
5. *The Scent of the Afterlife* provides valuable steps forward for the field of olfactory museology. Projects like these are a perfect example of how we can develop olfactory experiences in museums that are both engaging and educational. I hope that successful projects like these encourage further collaboration between olfactory heritage researchers and museum practitioners - forging new paths forward that strengthen and legitimize the practices of olfactory storytelling into museum practice.

Conclusion

Museums internationally are using scents as a means of storytelling in their galleries, but a methodological process for developing olfactory reproductions is still lesser known and valued. By contributing pioneering research to the realm of olfactory heritage, this paper raises the importance of crafting intentional olfactory reproductions for the use in cultural heritage. Situated at the boundary of olfactory museology and historic scent preservation, the paper further legitimized the relevance of olfactory heritage research within museum practice. It addressed one of the main challenges that museum practitioners face when using modes of olfactory storytelling: designing olfactory interventions for topics of cultural heritage that are both engaging and educational. Solutions to this challenge lie in the four historic scent preservation methodologies, which can function as a tool to understand olfactory reproductions created for the interpretation of cultural heritage. When compiled and compared, the methodologies establish an olfactory reproduction discourse that officially defines and categorizes these scents based on the research methods and historical intent that they represent. This research offers a framework which museum practitioners and visitors can use to critically engage with olfactory reproductions designed for museums and understand their historic intent. With this new understanding of olfactory interventions, we can better measure the level of modern interpretation placed on olfactory reproductions, providing a new perspective to analyse and measure the integrity of olfactory related projects.

However, this research is only a first step to addressing the challenges of olfactory heritage and its place in museum practice. It is important that we continue to define the field of olfactory museology and its subsequent methodologies, which requires attention to two gaps in the field: firstly, the current historic scent preservation methodologies only allude to the field of olfactory art and inadequately defines its place in museum practice. We must clearly define the boundaries between olfactory art and olfactory museology and decide how these concepts impact the practices of olfactory museology. Secondly, scholars have specified methodologies for scents that carry historic intent but have neglected those with artistic interpretation. Further work on this second point would further define our understanding of how interpretation impacts olfactory reproductions that are a creative or abstract take on subjects of cultural heritage. As we continue to shape the field of olfactory museology, it is key that we also continue to evaluate visitor experience through measurements that aim to understand how olfactory reproductions effect educational impact on visitors. Lastly – and most importantly – olfactory heritage researchers and museum practi-

tioners must come together to establish a training program where museum practitioners can learn methods of olfactory storytelling. It is only with cooperation from the museum sector that this field will continue to grow, and that future olfactory heritage research will flourish.

“This research offers a framework which museum practitioners and visitors can use to critically engage with olfactory reproductions designed for museums and understand their historic intent.”

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Endnotes

- 1 My research would not have been possible without the incredible, cumulative knowledge that I gained working with my colleagues at Odeuropa, a European funded, Horizon 2020 project that concluded in 2023. I would also like to thank my former collaborators Carole Calvez and Barbara Huber for experimenting on olfactory projects with me. Lastly, appreciation goes to those who helped me with this paper along the way: my husband Maximilian Ehrich and mentors Nezka Pfeifer and Sabrina Sauer.
- 2 Detailed visuals can be consulted via Tolaas's Instagram @sssl_berlin. The post shared on June 24th, 2024, shows the work in detail.
- 3 Examples of such projects are Odeuropa (2021-2023), Alchemies of Scent (2021-Present), and ODOTHEKA (2022-present). To read more about Odeuropa, visit www.odeuropa.eu. To read more about ODOTHEKA, visit hslab.fkkt.uni-lj.si/2021/09/24/odotheka-exploring-and-archiving-heritage-smells/. To read more about Alchemies of Scent visit www.alchemiesofscent.org.
- 4 For example, *Fleeting – Scents in Colour* (Netherlands, 2020), *Smell It!* (Germany, 2021), *L'Odyssée Sensorielle* (France, 2021), *London: Port City* (United Kingdom, 2021), *Sensational Books* (United Kingdom, 2022), *Sleeping Beauties: Reawakening Fashion* (United States, 2024).
- 5 Please note that because olfactory heritage research is still a growing field, some scholars will question the legitimacy of what I use as a 'theoretical framework' and as 'methodologies'. I deliberately establish the framework of my research around these concepts to further legitimize the field and practices of olfactory storytelling. Literature in the reference list can be consulted should any of the concepts be unfamiliar.
- 6 Verbeek's methodology was technically published five months after '*Whiffstory*'. However, I consider Verbeek's methodology first on the timeline. It was developed as part of her PhD in 2014 but never formally published until November 2022.
- 7 International Flavors and Fragrances Inc. is an American corporation that develops products for food, scents and nutrition which is marketed on a global scale. For more information see www.iff.com.
- 8 For more information about the Osmothèque Conservatoire International des Parfums, see www.osmotheque.fr/en/.
- 9 Odeuropa co-developed the production of multiple olfactory events and projects as a way of experimenting and testing methods of olfactory storytelling. These findings were closely monitored and documented for the reports written for the European Union as deliverables. The author of this paper led this development.
- 10 For more information, visit barbara-huber.com/scent-of-the-afterlife-a-peek-into-ancient-egyptian-mummification/.
- 11 To see the website for *Scent of the Afterlife*, visit barbara-huber.com/scent-of-the-afterlife-a-peek-into-ancient-egyptian-mummification/.
- 12 Find more information about the exhibition here: www.moesgaardmuseum.dk/en/exhibitions/ancient-egypt-obsessed-with-life/