The Preliminary Study on Smellscape Theory

by

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Abstract

Smell urbanism refers to the process of increasing the publicity of urban public space by designing and improving the odor landscape in the design process of public space. As a new sub-field of urban design, the practice of urban scent landscape continues to emerge, such as the experience installation of scent landscape, the healing garden of natural scent, and the creation of place for marketing scent. The urban scent landscape caters to the concept of a city with five senses and expands the perspective of urban construction and planning under visual centralism. Western scholars have carried out multi-disciplinary explorations of odor urbanism, including the perspective of discussing the recognition and protection of odors in the field of cultural heritage, the debate on the relationship between odor art and art and philosophy, and the perspective of odor city mapping and urban odor spatial mapping.

Most studies focus on a certain topic of odor urbanism, or a certain interdisciplinary perspective, and there is no systematic generalization of spatial research. Therefore, from the perspective of architecture and urban design, this research do literature review of smell urbanism relevant studies, and divides the relevant practices and research of urban scent landscape into four categories: distribution law mapping, formal design strategy, behavioral memory marketing, and cultural and historical heritage. Issue a framework.

Keywords: Smell Urbanism; Smellscape; Urban Design; Smell Map; Place Making

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Chapter 1 Intorduction

1.1 Study Subjects

1.1.1 Conceptual discernment

"Odor" refers to the perception of humans and animals through the olfactory organs caused by one or more volatile, usually low concentrations of compounds. In ancient Chinese, the word "odor" was used to refer to good or bad smells, and the rhyme book "Guang Yun - to sound" written in the Northern Song Dynasty says: "odor: where the gas of the name of the common for the sultry", where "odor" refers to all odors. When expressing fragrance, "Xin" is more often used in ancient times to describe pleasant smells. For example, "The virtue of the fragrance of the fragrance is to be heard in heaven." The direct meaning of "xin" is the fragrance of the ritual.

In modern Chinese, "odor" has replaced "stench" as a noun referring to all kinds of odors, and the meaning of "stench" has changed to the characteristic of unpleasant odors, while the opposite concept is "fragrance". There are also words similar to "odor" such as "flavor" and "taste", but both of them also refer to the information perceived by the sense of taste. Therefore, the term "odor" is used consistently in this paper.

In English, the corresponding word for "odor" is "smell" or "odor", the latter of which has a negative connotation in American English, while in British English it is the universal word for odor. The latter has a negative connotation in American English, while in British English it is the universal word for smell. In English, "scent", "aroma" and "fragrance" usually mean pleasant odor, while "stink", "malodor" and "stench" usually mean pleasant odor. stink", "malodor", "reeking", "stench" and other words are used to describe disgusting odors. Another word related to "odor" is "Olfactory", which refers to the perception of odors by the senses of humans and animals. The Japanese word for "odor", "におい", also represents a national character, and the word for "scent" corresponds to "かおり (aroma) " in Japanese and "Duft" in German. In national cultures, scent is often associated with social customs, and therefore a significant part of contemporary research on odor urbanism is devoted to the study of

scent.

Classification according to psychological feelings

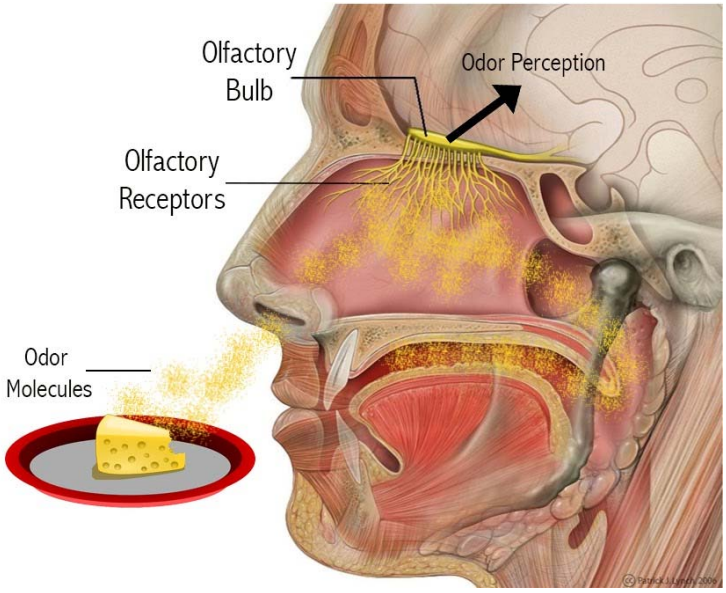


Figure 1.1 Neurological mechanisms of odor perception in the human body (Image source: YAS Psych)

Biological and neuroscientific studies have shown that about 350 olfactory receptors bind to odor molecules in the nasal cavity (Figure 1.1) and that different odors manifest as different emotional sensations after being received by the human nervous system and fed back signals by areas of the brain responsible for emotion and cognition. Therefore, French neurobiologist Gilles Sicard believes that odors are not real, but are the product of the brain's feedback to different molecules.

The perception of odor can be divided into two broad categories: scent and odor, however, this classification method is not absolute. For example, scents are often pleasant, yet scents that are too strong can make people feel sick. Moreover, different individuals react differently to odors. For example, a believer in Islam will feel sick to his stomach when he smells pork as an adult, while a person who is used to eating pork does not smell similarly. The classification method according to psychological perception is not accurate enough, but for a large sample size of odor research tests, which odors give roughly similar impressions, positive or negative, this information can reveal some relationships between odors and people's psychology, and this classification method is more collective in terms of urban research.

Classification according to chemical properties

Odor comes from volatile aromatic compounds of different molecular weights volatile molecules in contact with human receptors, conducted by neural stimuli in the brain to produce electrical signals. Most such molecules are organic, including esters, alcohols, aldehydes, ketones, and amines, such as cyclobutane sulfone, an odor additive for natural gas, and a few inorganic compounds, such as the highly toxic phosphine, nitrogen dioxide from automobile exhaust. in 2011, IFRA, the International Fragrance Association, issued a list of 3059 aromatic compounds, containing almost the entire range of odors produced by humans. The advantage of this classification is that it can help neuroscience and biology to study the mechanism of odor molecules and olfactory receptors binding during odor perception, and help to reveal the pattern of odor perception produced by humans.

Classification by odor type

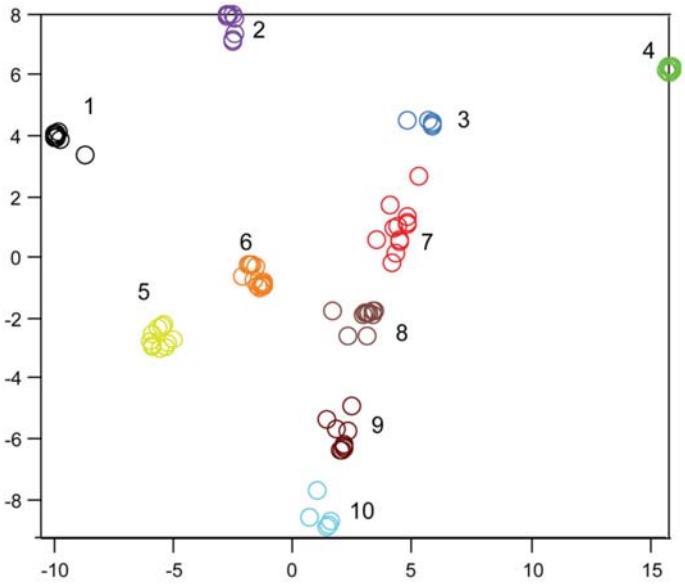


Figure 1.2 A two-dimensional spatial map of odors by Jason B. Castro et al. Ten basic odors basically summarize all odor types. (Image source: Ref. [28])

Some of the more representative odors can be found in many sources of odor. In the coffee industry, for example, the descriptions of various coffee beans are often unrelated to the process or source of the coffee itself, such as "citrusy" or "smoky," but similar odors can be captured in the aroma of the coffee beans. This may be related to the type and molecular formula of the odor molecules. 1985's "atlas of odor character profiles" written by odorologist Andrew Dravnieks was the first scientifically collected description of 144 odor molecules (Figure 1.2), and based on this work, 2013's study by Jason B. (Castro) and others identified ten basic odors (Figure 1.2), and odors such as fruity, aromatic, minty, lemony, chemical taste, woody, sweet, popcorn, sour, and putrid can then build the basic framework of all human odors. This way of classification is commonly used in business and can quickly lead to the perception of unfamiliar odors.

Classification by source of odor

Another very popular type of odor classification is by odor source, and this approach is particularly applicable in the study of odor cities because odor sources come from several major categories in cities, and classifying sources identifies both spatial and formal distributions. Chapter 4 will detail the efforts of researchers in odour urbanism theory to classify from odour sources.

1.1.2 Research content

Nature's scents predate the emergence of humans, and the development of human history has always been accompanied by the development of scents. Throughout history, odours have constantly changed, becoming deeply connected to social culture, urban space and personal history. Most of the ancient cultures around the world are very closely related to odor, however, modernism has simultaneously brought about an odorless social and moral culture. Research on odor urbanism in Japan, Europe and the United States has progressed rapidly in the last decade, and many groups and individuals in society are aware of the importance of odor in the city. In China, odor-related research and practice are progressing rather slowly, and most of the existing experiments belong to the field of odor marketing. In such a context, it is urgent to recognize the significance of urban scent landscapes and to master the design and

conservation of scent landscapes.

This thesis looks at the study of theories related to odour urbanism. Urban scent maps, scented public landscapes, marketing of scented places and scented cultural heritage are studied from the perspective of flexible urban boundaries. The research is based on literature including research findings of national and international scholars, the history of urban change, exhibitions and actual cases. Based on research in different field disciplines such as psychology, marketing, history, chemistry, and tourism, the research framework of odor urbanism is initially established from the spatial perspective of architecture and urban design. Based on the research, we further understand the theory of odor urbanism through the design of the Andingmen odor complex in Beijing and try to apply the knowledge related to odor in the design approach.

1.2 Research background

1.2.1 The disappearance and change of modern urban smells

Scent is widespread in pre-modern cultures and has an important place in religion, art, culture and other aspects of social life. The perfume cultures of ancient European Central Asia, the incense cultures of ancient China, and the indigenous African scent cultures that still exist today are all examples of scent in social life. However, the modern Western values represented by colonialism, modernization and globalization, as well as warfare, have caused the decline and discrimination of scent cultures in many regions where traditional scent cultures exist. Many traditional and historically informed odors and their associated behaviors, events and rituals have been silently lost to history due to the lack of attention to odors.

Among pre-19th-century medical views, the problem of negative odors in early cities in terms of infrastructure was closely linked to infectious diseases until the discovery of bacteria in the 19th century, when a public health campaign that swept through European and American cities aimed to eliminate negative odors in cities. after the 19th century, the push for odorlessness under modernism spread to the colonies and became an important tool for eliminating aboriginal culture and indoctrinating "savages". Surprisingly, today's pleasant-smelling European cities were also filled with all kinds of stench three centuries ago, reminiscent of the urban stench documented by missionaries to China in the late Qing Dynasty. The public sanitation campaigns that

emerged in China thus enhanced the quality of the urban environment on the one hand, and made many culturally distinctive smells disappear on the other.

The Odeuropa project, funded by the European Union in 2020, identifies, preserves and studies odours in European history through research on historical documents, machine learning and chemistry. The project, "In Search of Scents Lost - Reconstructing the volatile heritage of the avant-garde" at the Free University of Amsterdam in the Netherlands, examines early 20th century futurist perspectives on scent. In Search of Scents Lost - Reconstructing the volatile heritage of the avant-garde" at the Free University of Amsterdam, the Netherlands, examines the views of odours of early 20th century futurists; Cecilia Bembibre, a PhD student at the Centre for Sustainable Heritage at University College London, UK, conducted a study of heritage odours called "smell of heritage". In 2001, the Ministry of the Environment of Japan published the Kaori Scent 100, which aims to identify impressive and culturally valuable scent landscapes in Japan. In addition, odor, as a ubiquitous sensory perception object in the environment, has a profound impact on people's psychological state and perception of places.

1.2.2 The State of the Urban Smellscape in China

After hundreds of years of being shaped by modern notions of smell, urban spatial practice has tended to focus primarily on the elimination of negative smell impacts, while neglecting the understanding and use of positive smells. The hegemony of the visual in urban design has allowed urban designers to rarely think about space in terms of the other senses. In contrast to touch, smell, and hearing, which are passive experiences, people often do not control these aspects of their perceptions, and the stimuli generated by the perceptions are directly transformed into mental feelings via the nervous system, vision is an active sense, where people actively select what they see and filter it through the nervous system to notice only what they subconsciously focus on. Thus, the absence of urban design for the passive senses has largely compromised the positive impact of interfaces, smells and sounds as contextual elements in the urban experience. Smell, as the only sense that bypasses the thalamus and reaches directly to the cerebral cortex, can influence the urban experience at a deep level; indeed, the most widespread active scented landscape plantings and water features available in cities

already largely shape people's impressions of place.

Diffusion of negative odors in urban spaces

Odour is not a topic that is never a concern for urban management, and the experience and perception of negative odours in existing urban spaces accounts for a significant proportion of people's overall impression of the urban odour environment. Negative odors in the form of odors tend to be of high intensity and spread widely. Taking the impact of PM2.5 on the experience of urban space in China in the last decade as an example, pollutants not only damage people's health, but their negative visual and olfactory impressions also affect the psychological state of urban residents. On the other hand, car exhaust has similar negative effects, with the difference that the road space where car exhaust is concentrated is often the windway of the city, with odors spreading more widely along the road. In the historical development of urban odour landscapes, inhibiting the spread and diffusion of negative urban odours has often been the first step taken by urban administrations. The Odour Guidance for Local Authorities (Odour Guidance for Local Authorities), published by DEFRA in the UK, is precisely a guidance document for the management of negative urban odours.

Instability of the scent landscape

Odor landscapes tend to be concentrated in areas where odor characteristics are strongly clustered in urban public spaces, such as markets, parks, green spaces and areas where some characteristic industries are clustered. Due to the lack of awareness of odor landscapes, urban management agencies are not aware of the protection of odor landscapes and often allow the disappearance of odors when urban spaces change.

One of the major characteristics of odor landscapes comes from the instability of odors, which means that even in urban spaces with positive odors, the distribution range, intensity and even the degree of vulnerability to interference from other odors are quite variable in the odor itself, which leads to difficulties in identifying odor landscapes. In the case of markets, for example, the odours of various markets contain a wealth of cultural, social and living information, with farmers' markets, flower markets, fish markets and other odours being quite distinctive. However, with the rapid disappearance of markets in the urbanization process and the classification of markets as chaotic objects of governance in the urban governance process, these odors are also quickly lost in the city.

Lack of awareness of existing perceptions

Relevant urban design guidelines in China are very limited; the odor-related chapter in the Shanghai Street Design Guidelines focuses on street plants, but does not mention its significance in the context of scent landscapes, and the Beijing Urban Design Guidelines for Street Renewal and Governance has no odor-related content. The reason for this, of course, may also be the difficulty of standardizing the design of scent, which, unlike sight and sound, first needs to address ethical and moral issues - how can one be sure that scent is welcomed by all? It is for this reason that the concept of 'smoke-free zones' has begun to spread to 'scent-free zones' in the US, in response to opposition from urban allergy sufferers and odour-averse people. However, this hostile attitude towards odour has achieved its goal of eliminating negative odours while also occasionally eliminating some characteristic odours.

On the other hand, odor is an implicit aspect of human culture. Due to the direct connection between odours and the brain, there is a relative dearth of odour-related vocabulary in various cultures, where people can become aware of odours but instead lose the perception of this smelly environment once they have adapted to certain everyday smells. Thus, among existing perceptions, odors do not seem to be a necessary component of urban space.

1.2.3 Scentscape Quality Enhancement in Urban Spatial Renewal

The reliance on visual means to enhance the quality of urban public space overlooks the fact that the various senses work together to shape urban space. Sensory urbanism, which overlaps with the claims of odor urbanism, argues that the design of various sensory experiences can help to greatly enhance the perception of the urban spatial experience. Among the available studies, touch is the sense that has received the most attention from architects because of its close association with materials, interfaces and the body. Parasma believes that the vehicle of touch, the skin, is the basis of all the senses, and even the vehicle of vision, the retina, can somehow be considered a skin. Researchers in auditory cityscapes started earlier with the study of soundscape and have progressed quite rapidly because the measurement and character of sound is relatively easy to define. In stark contrast to these studies, research in the field of odorscapes, despite an equally early start, has been slow to develop and has always struggled to produce sufficient breakthroughs in the spatial domain. However, with a change in perception in the last decade, a "scent renaissance" has been taking place, with good

progress in scent theory and practice in all fields.

The practice of odorscape in Europe, America and Japan has already reaped good results, confirming the necessity of odor urbanism in terms of public acceptance, environmental quality improvement and place creation. At present, the means of urban space renewal in China is more limited to visual effects, and making achievements in the field of odor will help the creation of characteristic urban public places.

1.3 research significance

theoretical significance

The public health and colonial movements in Europe and the United States after the 18th century largely affected the integrity of the urban odor landscape, but also objectively enhanced the health quality of urban spaces. Modernism in architecture, which defined vision as the absolute dominant sense, also inhibited the development of odor-related practices in design, and it was not until the emergence of postmodernism, which criticized the dogma and oppression of modernism at the level of the senses, and the progress of research in other related disciplines, that odor urbanism-related topics received the attention of many Western scholars in the 21st century.Most of the 20th century research on odor belonged to chemistry, marketing, history, etc., and it is only in the 21st century that research on the spatial perspective of architecture and the city is just beginning, and the studies are more scattered and span multiple disciplines, with no systematic compendium or framework establishment yet to emerge. This thesis attempts to organize the existing research from the perspective of urban space, organize the topics related to odor urbanism based on the basic knowledge of various disciplines, and initially establish a theoretical framework of odor urbanism, which will provide some reference for further research and practice of domestic scholars and students in the fields of odor urbanism and odor landscape in the future.

practical significance

Recent years have seen the emergence of odor city theories, exhibitions, and practices used to enhance the quality of urban space. Of course, odor urbanism has limited practice to refer to at the moment, however, as mentioned above, the preservation and design of urban odor landscapes can in fact improve the spatial quality of cities. Chinese cities have not yet even established comprehensive guidelines for negative odor elimination, however, this does not mean that we can wait for a long time

yet. Urban smells are closely related to urban memory, place and citizen psychology, but they can also activate urban vitality at a deep level, increase citizen participation and renew old neighborhoods. The relationship between practice and theory is complementary, and the theory of scent urbanism, which is in fact progressing rather slowly and difficult at the moment, may well find a breakthrough with the help of more practice, which in turn will help the practice. If this paper can arouse architects, landscape architects, urban designers and researchers to pay attention to the smell landscape, establish a methodological framework for architectural design and urban landscape design, help urban management to improve the quality of urban smell landscape, and make citizens aware of the precious value of urban smell, then the overall spatial quality of the city will benefit from it.

social significance

Scent hides a person's deepest memories and psychology and can change human behavior on a mental level. The study of the theory and practice of scent cities in a psychological sense can help to enhance the mental health status of urban residents. For city dwellers, a positive smelling environment and a character-filled scented landscape means not only a high-quality urban experience, but also the establishment of an intimate relationship between the city and the individual. Sound design methodology streams for odor, involving citizens in the design process of odor and collaborating; research, identification, and preservation of the meaning and value of odor as the intangible cultural heritage of society, and the study of odor in historical spaces can help present a cold site as an urban place that was once active.

1.4 Overview of domestic and international research

1.4.1 An overview of Western odor urbanism research

The study of Western scent urbanism began in the 1980s, but of course, research related to the senses, including scent, started much earlier, with the pioneering European design group ZERO in the 1950s and the pioneering Japanese design group GUTAI, which first began experimenting with the meaning of the senses in art. However, frankly speaking, these studies in the name of the senses expressed more opposition to the hegemony of the visual, and they promoted the sense of touch, including at most the sense of hearing.

The 21st century has seen the emergence of scent research in psychology, marketing, cartography, historical and heritage conservation, the arts field and architecture. The field of psychology studies the mechanisms, effects, and potential of odor and the human psyche; large commercial companies work with odor branding consultants to study how to build brand identity through odor and the communication potential of odor advertising; the field of cartography studies and practices of odor mapping investigate and map odors in existing urban spaces; historians study and recover from written records and archaeological materials the ancient The history of urban smells can reveal undiscovered aspects of space; scent art continues to provide artists with creative material closely related to memory and perception from a sensory level; and research in the field of scent cities and spaces explores the meaning and value of design methods and design examples. Especially in the last five years, there are more and more exhibitions and compilation studies related to scent and space, and it shows a situation from perfumer-led to architect-led, so it can be said that the study of scent urbanism is on the rise in the West.

1.4.2 Overview of domestic odor city research

There is not much research on domestic scent cities, and most of the limited research comes from the landscape science community on five-sense gardens and Chinese gardens. Chen Yiwei of South China University of Technology's "Progress in Scent Landscape Research" summarizes the research overview of domestic garden scentscape from the perspective of landscape science, focusing on the connection between plant scent and classical garden landscape. Yin Min et al. of Nanjing University's "A Trial on the Olfactory Design of Urban Public Space" initially explores the research of odor landscape, but the focus remains mainly on garden fragrance landscape and negative odor elimination. Long Ying of Tsinghua University leads a team to complete "Odor Landscape - A Dimension of Street Space Quality" to advance the odor landscape at the practical level research. In general, there are still relatively few discussions related to odor urbanism in China.

1.5 Research Structure

1.5.1 Research methodology

Based on odor-related research in various fields abroad, including treatises, compilations, papers and reports and studies on the Internet, we sort out the results of research from the perspective of architecture, and refine and classify different perspectives. Through understanding and mastering the basics of interdisciplinary research, we further analyze the role and operating mechanism played by odor in it, and explore the topic and macro context of odor urbanism under the viewpoint of flexible urban boundaries.

In addition, a series of case studies on the theme of smell, or smell as an aspect of it, including infrastructure, architecture, urban spaces, historical heritage, scent art installations and commercial facilities were found through internet research and literature collection to understand the historical background and evolution of the featured projects, analyse the links between the cases and theories and summarise and summarise them in some form.

Finally, through a self-imposed topic, a scenario of the future development of Beijing's odorscape is hypothesized, a suitable location is selected to design an odor complex, and the odorscape of the urban area is optimized. While deepening the understanding of the theory through design, we explore the language and form of odor urbanism in design. To better demonstrate the value and potential of odor urbanism.

1.5.2 Research framework

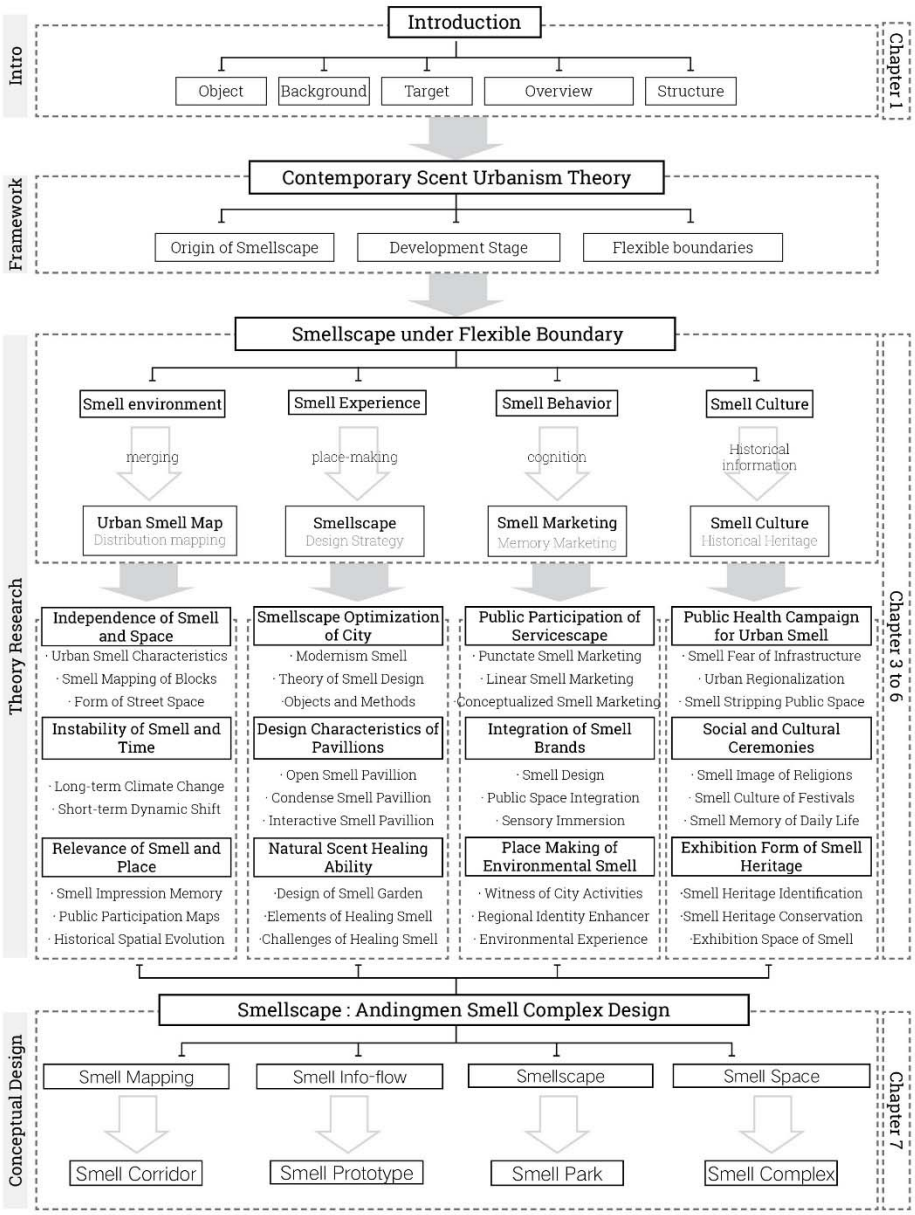


Figure 1.3 Thesis research framework (Image source: author's own drawing)

This thesis is structured into four parts and seven chapters.

The first part is the origin of the study, which clarifies the object, background and significance of the study, and provides a brief overview of research and practice on odour urbanism at home and abroad.

The second part is a framework construction. This part mainly includes an overview of the traceability and development stages of odor urbanism research, trying to present a panoramic knowledge structure. The connection between urban flexible boundary theory and odor urbanism is also discussed.

The third part provides a literature review and theoretical framework specific to the field of odor urbanism. Starting from the four perspectives of flexible urban boundaries and scent - the convergent penetration of scent environments, the experiential creation of scent spaces, the psycho-cognitive memory of scent places and the historical information of scent culture - each of the four existing aspects of scent urbanism research - odor city maps, odor public landscapes, odor business marketing and odor cultural heritage - and suggests research implications for each of the four topics. Research in fields including psychology, historical and cultural heritage, art, architecture, tourism, and marketing are addressed. Each study is subdivided into different research areas, initially constructing links between different topics of odor urbanism and the spatiality of the corresponding flexible urban boundaries.

The fourth part is the conceptual design. The North Moat of Beijing is selected as the lot for urban design and the Andingmen Bus Station is selected as the lot for architectural design, in an attempt to explore the possible opportunities and challenges of spatial design under odor urbanism. The design is divided into odor city scale, odor building scale and odor detailing scale according to the scale, and explores design methods and spatial forms in the design process by combining the four aspects of odor city map, odor public landscape, odor commercial marketing and odor cultural heritage and their subordinate sub-topics. Possible future research directions of odor urbanism are foreseen.

Chapter 2 Contemporary Theories of Odor Urbanism

2.1 Scented urbanism traces its roots

In the eyes of ancient philosophers, smell was the lowest of the human senses and sight was considered the highest. Heraclitus, Plato and Aristotle all greatly appreciated the significance of sight, seeing the eye as a human metaphor for knowledge and truth. Richard Sennett in 1994 in Flesh and Stone: The Body And The City In Western Civilization suggests that the dislocation from the body is manifested in The lack of awareness by city managers and building professionals of the bodily nature of the body in the environment and, as a result, missed opportunities to create places in the city that offer different experiences.

The fear of contagious diseases that had been expressed in the Middle Ages was manifested in the fear of urban odors, which led to a public health movement that swept the world, and the construction of New York's Central Park in the 19th century was closely linked to the enhancement of the quality of the urban odor environment. It was not until the 20th century that odor gradually ceased to be considered an inferior sense and became a distinct domain in terms of the senses. Freud linked the rise of civilization to the suppression of the sense of smell. It has been suggested that the connection of smell with instinct and emotion led to its interdependence with rational thought and language, which may explain the considerable lack of odor-related vocabulary in human language.

In the 1950s, smell appeared as a part of the senses in the work of some artists, and in 1985 Douglas Portelli introduced "odorscapes" in reference to "soundscapes", marking the birth of odor urbanism. This was followed by a long period of stagnation in research.

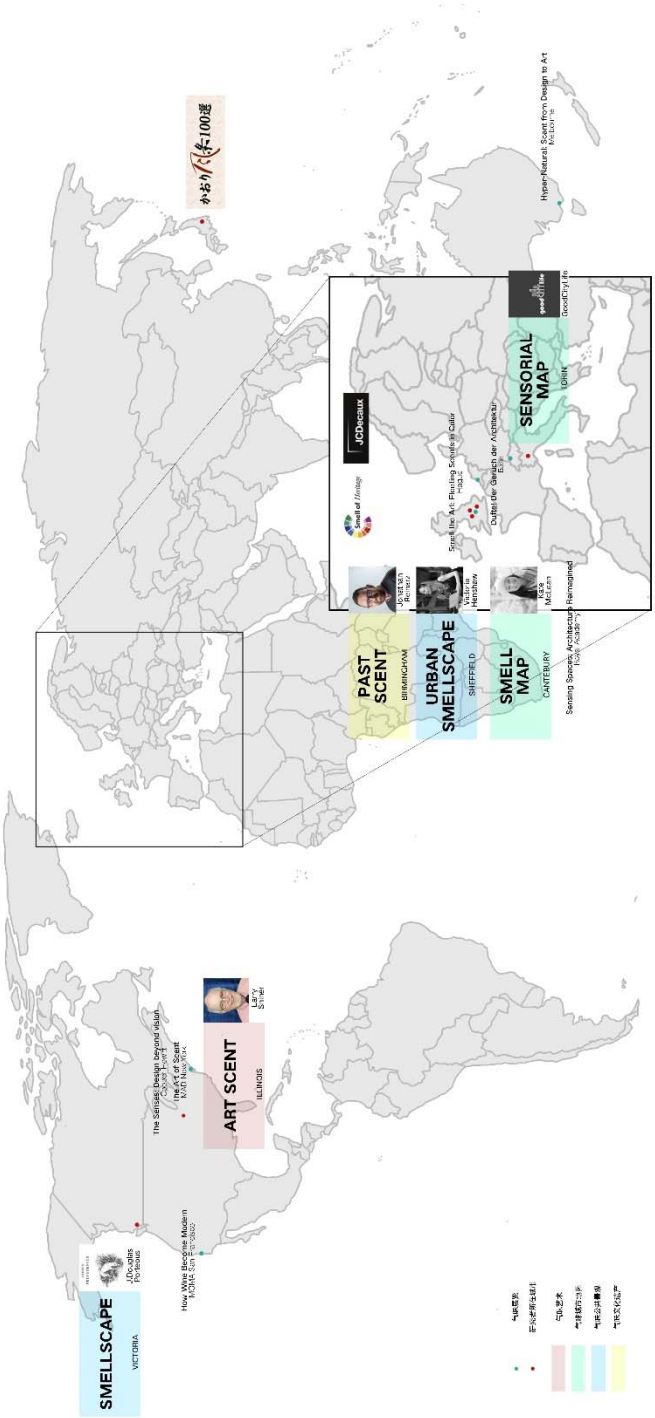


Figure 2.1 Distribution of research scholars and events related to odorous urbanism. (Image source: Author's compilation from sources)

Since the 21st century, interdisciplinary pioneering research related to odor urbanism has gradually started to be conducted in Europe and the United States. In terms of the distribution of research, there are several types of odour research directions

and scholars distributed in Europe, especially in the UK, such as Kate McLean, a major scholar of odour urban mapping, and Victoria Henshaw, a founding father of odour urbanism. This is also somewhat related to the wider distribution of odorscapes in Europe. In contrast, due to the generally skeptical attitude of American society towards odors in public spaces, there is less research related to odors in the United States, focusing on odors in more art and exhibition areas, with a number of odor-related exhibitions in museums on the East and West coasts. In addition to this, there is some research on odor urbanism from other regions, such as one hundred selections of Kaori landscapes in Japan and African odor heritage. Overall, the study of odor urbanism is still in its early stages, with research and practice concentrated in Europe and the United States, and research in other regions and countries is just beginning.

2.2 Stages of development of scented urbanism

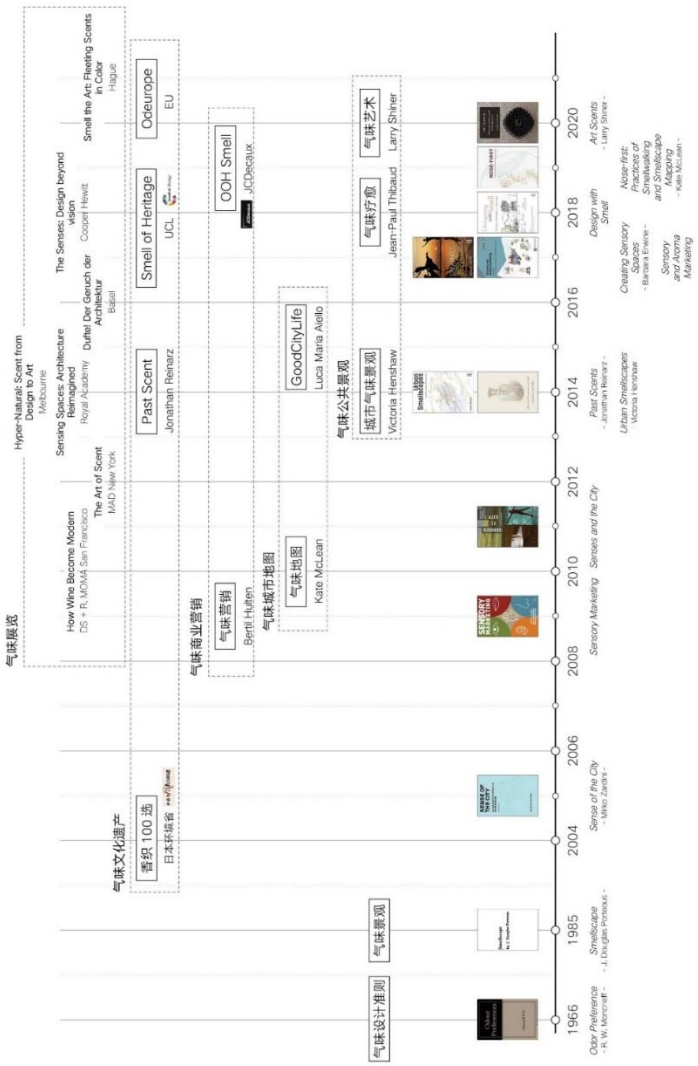


Figure 2.2 A timeline of important documents and events in the development of scented urbanism. (Image source: drawn by the author from the cover of the document)

The stages of research development in scent urbanism can be divided into three periods: foundations, beginnings, and emergence.

2.2.1 Conceptual groundbreaking period (1966-2000)

The foundational period refers to the guidelines for odor design proposed by R. W. Moncrieff in 1966 and the odorscape proposed by Porterley in 1985, both of whom identified some of the basics related to odor urbanism, and although they did not propose odor urbanism or conduct subsequent research, their influence on subsequent urban odor management guidelines and odor urbanism research have both been highly

influential.

2.2.2 Topic formation period (2000-2010)

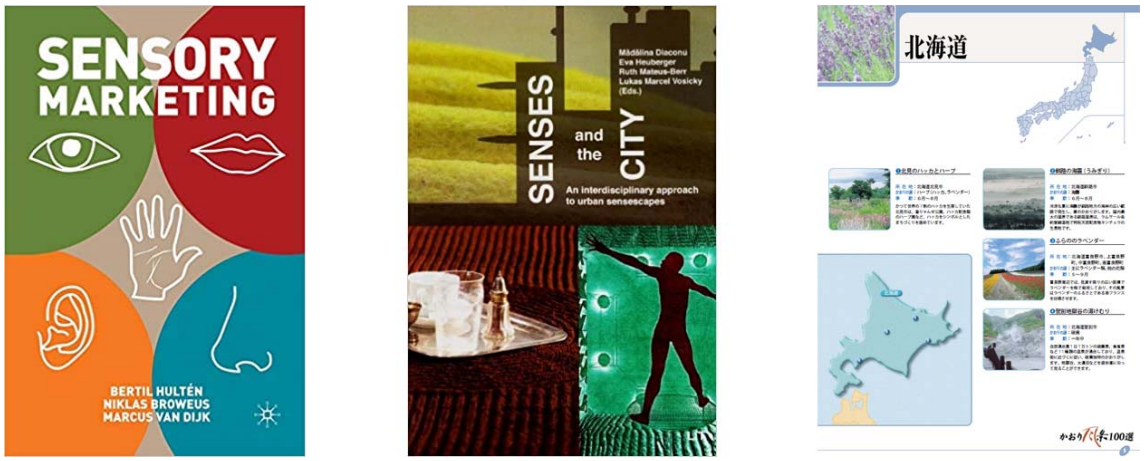


Figure 2.3 The Practice of Sensory Urbanism 2000-2010. Left: Sensory Marketing, Bertil Hultén; Middle: Senses and the City: An Interdisciplinary Approach to Urban (Sensescapes), Mirko Zardini; right: page from Hokkaido, selected by Kaori Scenic One Hundred. (Image source: compiled by the author from book covers and web materials)

From 2000-2010, the study of odor urbanism began to take off. Sensory urbanism also became a hot topic of discussion in the academic community during this period. Although odor belongs to one of the directions, the content is limited, because on the one hand, sensory urbanism promotes the synergy of various senses, and the role of odor is often weaker than that of touch, hearing and sight, and on the other hand, scholars also admitted the difficulties and challenges of odor research. At the same time, European scholars began to notice the presence of urban odors in the last years, and research and practice on odor maps, odor cultural heritage, and odor commercial marketing were gradually developed.

The 2001 book Senses and the City: An Interdisciplinary Approach to Urban Sensescapes, edited by Madalina Diaconu, a scholar at the University of Vienna, brings together research in the fields of touch and smell. In 2005 Mirko Zardini edited Sense of the city : an alternate approach to urbanism, which explores the connection between the senses and space from an architectural perspective. The City and the Senses: Urban

Culture Since 1500, edited by Alexander Cowan, examines the history of smell in European cities such as Venice and Vienna from a historical perspective; in 2009, Bert Herten, a professor of marketing at the University of Linnaeus, Sweden, explored the connection between the senses and space from an architectural perspective. Bertil Hultén, professor of marketing at the University of Linnaeus in Sweden, published Sensory Marketing (Sensory Marketing), a study of sensory marketing from the large scale to the microscopic, in 2009.

During this time, the practice first focused on the use and conservation of scent heritage. 1999 saw the first use of scent in an exhibition at the Viking Museum in the UK, attracting researchers curious about this type of exhibition. 2001 saw the first practice of scent urbanism in which the Ministry of the Environment of Japan publicly selected a hundred selections of scented landscapes as a direction for the administration of scent cultural heritage. 2008 saw Rosabelle Boswell Rosabelle Boswell presented the absence and challenges of intangible cultural heritage in terms of odor through the study of odor cultural heritage in the ancient city of Zanzibar.

2.2.3 Period of emergent research (2010 to present)

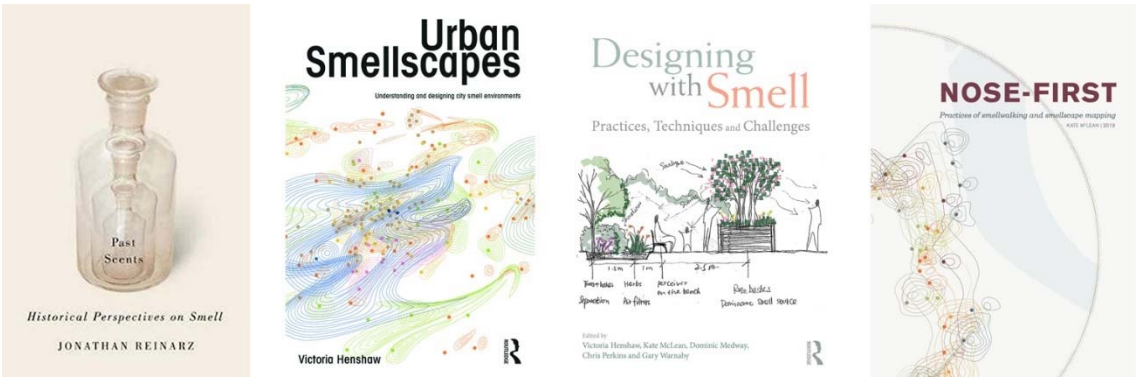


Figure 2.4 Publications in the field of scent urbanism 2010-present. Left: Past Scent, Jonathan Reinarz; centre left: Urban Smellscapes, Victoria Henshaw; centre right: Designing with Smell, Victoria Henshaw et al; right: Nose-first: Practices of smell walking and smellscape mapping, Kate McLean (Image source: author based on book cover)

Post-2010 to the present, research on odor urbanism has begun to emerge, with odor officially entering the research field of architects and scholars since the buzz generated by the opening of DS+R's exhibition at the San Francisco Museum of

Contemporary Art in 2010. Representative work includes Kate McLean's Smell City Map, which continues to this day, Jonathan Reinarz's compendium of odor research in the historical field, and the urban odorscape studies pioneered by scholar Victoria Henshaw, who died young.

From her 2011 PhD thesis, The role of smell in urban design, Victoria Henshaw has continued to plunge deep into the field of scent urban design, doing pioneering work, and her PhD student Xiao Jieying has conducted similar research until the 2014 publication of Urban Smellscapes (Urban Smellscapes) was published. However, Henshaw's sudden death in '14 stunted the development of the field of odorous urban design, and no research beyond hers emerged for a long time to follow. 2014 saw Paul Emmons' research on the odorous design of the Corbusier Salvation Army headquarters find early examples of modern architecture for odorous urbanism. 2015 began with Larry Shiner (Larry Shiner) and other scholars in the field of art began to give scent art its proper name, arguing for the viability of scent as an art material and attempting to divorce it from experimentation in the field of perfumery. Since about 2017, a number of research articles on scent urbanism in the field of heritage and tourism have emerged.

At the same time, due to the highly participatory character of odor, odor-related exhibitions have become an important communication tool and research summary for this nascent field. Scent exhibition-related practice started with DS+R's wine-themed exhibition in 2010, and has since organized many similar exhibitions in Europe, the US and Australia. One of the main characteristics of scent exhibitions is their highly interdisciplinary nature. The curators and participants of the exhibitions include perfumers, chemists, artists and architects, and their presentation methods vary widely, but the interaction between scent and visitors is always an integral part. On the macro level, these exhibitions have, on the one hand, greatly increased public awareness and curiosity about urban smells, and on the other hand, have complemented some of the examples and made up for the lack of exploration of scent-related projects.

2.3 Research Issues in Odorous Urbanism under Flexible Urban Boundaries

From a spatial perspective, the interdisciplinary study of odor urbanism, despite its vast content, can still sort out a number of spatially relevant topics due to the very strong spatial character of the odor experience itself. The overlap between urban odor

landscapes and visual urban spaces inevitably leads to a sense of place in urban spaces that derives from at least odor and vision. Continuous odorscapes may give a consistent impression of fragmented urban spaces, while distinctive odorscapes may divide urban spaces into different zones.

The concept of flexible urban boundaries was introduced by Danish scholar Jan Gehl, who used the term "flexible boundaries" to represent the transition area between public and private spaces in the city . From a spatial perspective, Jan Gehl argues that the increase of flexible boundaries in the city helps to connect urban spaces as a whole, to interpenetrate spaces inside and outside buildings and to enrich the content of urban street spaces. Its components include physical and spiritual elements, the latter referring to historical, cultural and physical aspects related to urban life. The flexible urban boundary opposes the segregation and division of urban space by a complete and continuous hard interface, and the borderless and unstable nature of odor itself confirms the blurring and "flexibility" of the boundary between odors, from this perspective, the urban odor landscape can also be included in the study of flexible urban boundary.

Based on the existing research of urban flexible boundary theory, the author extends the definition of urban flexible boundary in four aspects: environment, experience, behavior and culture, and further corresponds to odor urbanism, proposing four topics: "integration and penetration of odor environment", "spatial creation of odor experience", "memory perception of odor behavior", and "historical information of odor culture". ", "memory perception of odor behavior", and "historical information of odor culture", which correspond to the four topics of odor urbanism: odor city map, odor public landscape, odor commercial marketing, and odor cultural heritage, respectively. The four topics of "Scent City Map", "Scent Public Landscape", "Scent Business Marketing" and "Scent Cultural Heritage" correspond to the four topics of Scent Urbanism. In this way, the research framework of odor urbanism is constructed from the perspective of urban space as a starting point.

Chapter 3 Mapping the distribution patterns of urban odour landscapes

Odor city mapping is an odor urbanism research method that tries to reveal the

connection between urban space and odor distribution by cartographing existing urban odors. Due to the ephemeral and variable characteristics of odors, how to accurately represent urban odor distributions has always been an important area in academia. Odor urban maps can be divided into three categories: spatial, temporal, and sense of place, which address the three characteristics of odor diffusion, transience, and memory, respectively. Each category discusses slightly different topics and mapped representations.

Odor maps can characterize the integration and permeation of odors in the environment. By examining the three aspects of space, time and sense of place, the purpose of odor maps is not to define the boundaries and extent of the distribution of each odor; rather, odor maps represent the characteristics of urban odor spaces that are intermingled, interpenetrating, and temporally and spatially unstable. In contrast to the physical urban space - even the most flexible physical space still has a fixed form - the urban odor map reveals an odor space full of possibilities, confirming that odor is also an urban flexible boundary.

The most specific department and the richest research in the field of odor mapping is led by British artist Kate McLean. As an artist and urban scholar in the field of mapping, McLean has continued to explore the various rules and challenges of odor mapping since 2009, such as the vehicle of the odor experience - the odor walk, the ways in which data on the odor experience is collected, and the cartographic laws of mapping presentation (which involves the medium, color, and diffusion patterns of odor mapping representation), her practice spans over 20 cities in Europe, Asia and the Americas, delving into the impact of time, space and sense of place on people's perception of the city's scent environment and the impact of mapping it. Having identified odour mapping as her research direction, in 2019 she was awarded a PhD in the field of odour mapping at the Royal Arts in London.

There has been considerable exploration in the field of odor map research, including student assignments and attempts at art projects by artists, philosophers, and others, and gradually, a series of scholars, led by McLean and others, have mapped out a viable, open-source approach to odor map research. Overall, based on a summary and generalization of existing odor mapping processes, the steps of an odor map can be roughly divided into four stages - the foundation stage, the preparation stage, the practice stage, and the finishing stage.

Of these, the foundational phase implies the extent to which the researcher has a theoretical understanding of urban smells themselves, including building an odor lexicon - how accurately respondents will find an objective locus of odors when they use words and phrases to describe what they smell; identifying odor color DNA - -more odor experience during the data collection phase by visualizing colors that allow the experiencer to quickly capture a record of the instantaneous smell, and this mapping relationship between color and odor is defined by both psychological experience and odor color DNA; diffusion models of odor - related to research in the field of aerodynamics related, odors can be understood as fluids with information, and the diffusion of fluids through air of similar density follows certain formulas and laws. The model used by McLean is relatively simplified compared to theoretical studies, but quite intuitive, assuming that in the absence of external perturbations, the diffusion of odors is uniformly distributed in all directions in a concentric circle pattern; the greater the number of concentric circles, the longer the practice of odor persistence, and by considering wind speed and direction to calculate the variation of concentric circles, a clear map of urban odors can eventually be concisely presented.

The preparation stage mainly includes the route survey of the odor walk, the design of the odor cards and the recruitment of volunteers, among which, the route survey mainly requires the researcher to know the general distribution of the odor in the city in advance, and to find a suitable odor route under a certain research topic, for example, when the research is about the specific odor of a certain area of the city, the researcher needs to map out a route where this odor is stronger, in order to avoid the practice results In McLean's practice, watercolor is a more accurate and easy-to-understand way (colors, general pattern of diffusion, intensity, range, and the way they overlap each other can be recorded quickly); recruiting volunteers is mainly related to the topic, and often the volunteers recruited are Volunteers are often recruited from all walks of life in the city, but when the topic explores the urban odor experience of special people such as the visually impaired, volunteers need to find a specific group of people.

The practical phase included scent walking and immediate recording. Generally speaking the researcher leads the volunteers to experience the odours encountered on the path at an agreed time and place, in some cases different groups of volunteers can be scheduled at different times to explore the temporal nature of the odours. Experiencers should be allowed to make occasional stops in the trails to record in detail the particular

odors found. For example, in 2017, the mapping of odors in the Plaza neighborhood in New York explored differences in odor maps of the same urban space at different times. By scheduling two odor walks under a two-month time difference and obtaining two odor maps overlaid, it was possible to see patterns in the distribution of odors and transient odors that generally persist over long periods of time.

The final collation stage was mainly carried out by the researcher to create an odour map, a process that involved synthesizing the odour data recorded by the volunteers and presenting it on top of the graph, choosing the appropriate presentation.

Figure 3.1 Standard process reference diagram for odour mapping analysed on the basis of the Kate McLean study (Image source: author's own drawing)

The purpose of the sensory walk is not sensory deprivation, but rather the desire to obtain a record of a particular everyday urban environment by using external conditions to emphasize people's experience of the scent environment. The creator of the scent walk was Michael Southworth, who, by leading volunteers through a set route through Boston's sensory environment after subjecting them to sensory deprivation, found that the sounds and smells of the city were the two most obvious sensory aspects of people's perception of the urban environment under non-visual centrism. Later, the concept of odorscapes proposed by Porterley also specifically refers to the construction of experimental strategies for exploring the urban odor environment centered on odor

walks, questionnaires and interviews.

Kate McLean's research methodology i.e. basically follows the above flowchart to completion. In order to popularize the practice of scent mapping, she has also open-sourced a toolkit (Smellfile) of materials needed for scent walking (unfortunately, the author was not able to download the toolkit from her personal website due to a broken link) for educational and research purposes.

The need to develop this odour mapping methodology lies in the difficulty of visualizing odours themselves. In contrast to the "what you see is what you get" urban visual landscape, urban odors, which cannot be accurately described in terms of their distribution and origin, have therefore gone unnoticed for a long time, and to some extent this has led to a rather late interest in the urban odor landscape. On the one hand, although tools that can accurately describe odours have emerged, such as instruments that can collect odour molecules to analyse their chemical composition and other similar scale-based tools.

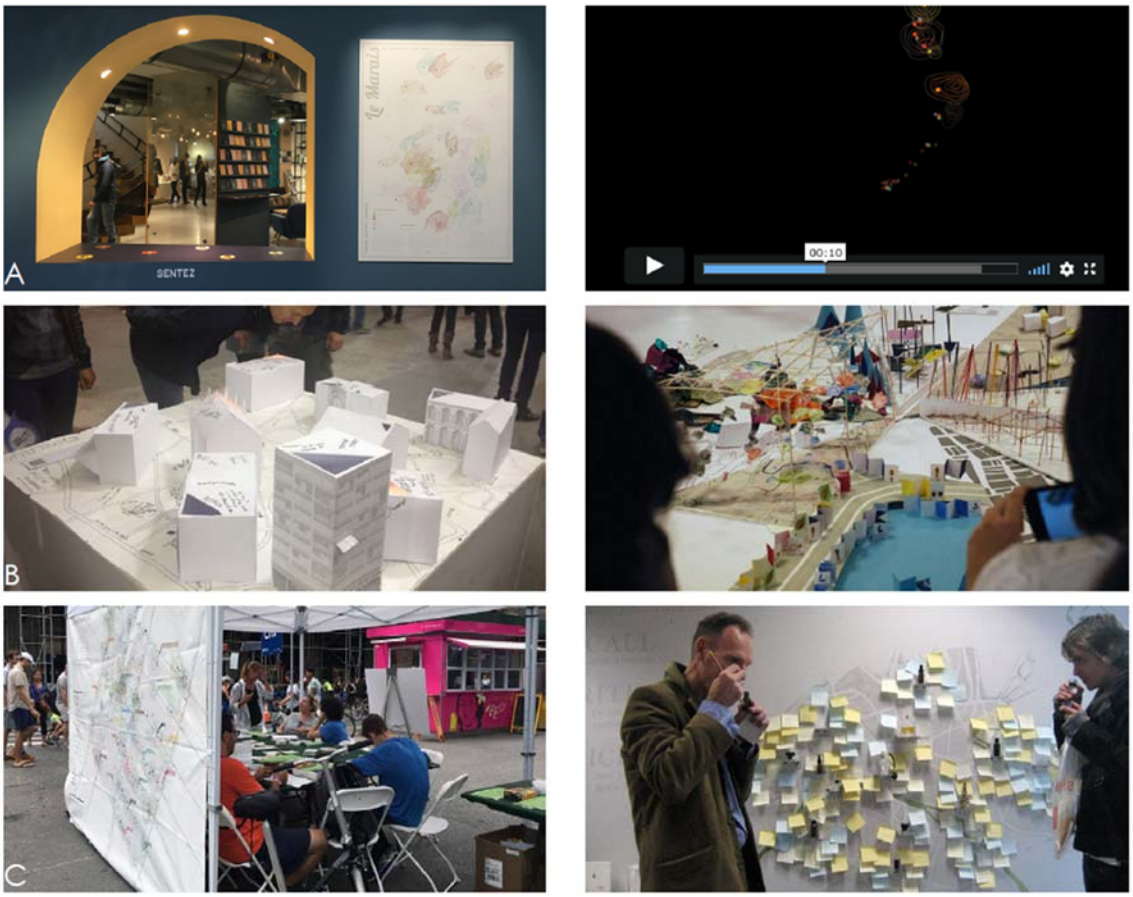


Figure 3.2 A few of the more frequently used mediums for representing scent maps (Image source:

www.sensorymaps.com)

In the form of representation, i.e. the final part of odor mapping, the finishing stage, there is considerable experimentation in the form of exhibitions, animations, models, drawings and interactive installations, all of which aim to enhance the visualization of odors for artistic expression. Scent maps exploring the distribution patterns of urban scent landscapes can be characterized by large-scale overlays of urban maps, and in this regard, interactive installations are of extraordinary use, allowing exhibition visitors or community residents to participate in the mapping, an approach that differs markedly from the aforementioned scent mapping, which is often defined as a sense-of-place scent map due to the inaccuracy of memory, and the fact that is true, and more relevant attempts to focus on the spaces that people associate with an odor when they smell it, or the odor they associate with a space when they see it, albeit less accurate, can likewise yield cognitive odor maps in terms of memory. In addition, the big data approach to odor mapping explored by Aiello et al. integrates urban science, big data, and GIS, and has the advantage of superiority in terms of the total amount of data, which allows for easier access to the overall distribution patterns about the odor landscape of a given city and can also contain information about individuals, compared to the slower attempts to explore one street or one block at a time in ordinary odor maps. The disadvantage is that it does not have the active nature of the study, as people perceive odors in a relatively passive way, and the information recorded instantly on social platforms is characterized by a sudden increase in intensity and a large proportion of negative odors, while ordinary odor walks actively awaken the volunteers' odor perception organs (to understand that just because people do not actively perceive odors , does not mean that they are not affected by them, and relevant psychological studies reveal that the interrelationship between people and odors does not only occur on occasions when people suddenly perceive a strong odor).

Figure 3.3 A breakdown of McClain's publicly available scent map items to date (Image source: author's own drawing)

By categorizing the list of McLean's publicly available projects since he has been working on the Scent Map, it is possible to group them under two broad categories, spatial and temporal (less than three of these projects explore other aspects of the scent environment, such as historical archaeology, which are not singled out due to their small number and their continued spatial and temporal character), and since 2010, McLean has maintained a total of two to three The total number of Scent Map projects has been maintained since 2010, exploring a variety of topics in a site-specific manner.

3.1 Scent and spatial independence

The spatial mapping of odor maps studies the distribution characteristics of odors at a specific scale at a specific moment in time. According to the distinction of scales, existing odor mapping studies can be roughly divided into city scale, neighborhood scale and street scale, which study the odor of a specific place or detail in the city scale, different neighborhoods and streets respectively.

3.1.1 Regional characteristics at the urban scale

Scent maps are used on urban spaces to reveal regional characteristics in terms of scent landscapes at the urban scale. Unlike urban visual landscapes, characteristic urban regional odorscapes full of features may not be perceived visually, for example,

photographs, videos and other media cannot contain a unique urban odorscape, however, when experienced in an urban space, a particular odor or group of distinctive odors can leave a lasting impression, creating a hard-to-forget recall between memory and place. Such smells are often associated with urban spaces or functions, and sources include large-scale water features, plant landscapes, factories or industrial clusters that produce a particular type of smelling product, and special cultural groups and social events. It is often this particular regional odor that people also recall when they reminisce about the overall odor environment of the city; for example, there was a very large MSG factory on the outskirts of the author's hometown, and an odor from the MSG production process permeated a large area nearby; after visiting that area as a young child, the author still remembers the experience and the odor associated with it. Similarly, Victoria Henshaw in her book Urban Scentscapes refers to the Hindu festival smells of the Indian neighborhoods of Paris and the smells of a huge garbage collection site and its attached neighborhood in a suburb of Egypt.

City-scale odour maps often require the accumulation and analysis of large amounts of data, and it is difficult to do this by relying on a single odour walk. By organizing nearly two dozen scent walks in Singapore (16 of which were completed in 2015), McLean conducted a systematic mapping of Singapore's multicultural social space and created an urban scent map of Singapore. As can be seen from the map, McLean did not deliberately represent the different information recorded by each volunteer, but focused on mapping the distribution of specific smells, such as strange smells - the smell of dinosaurs, the smell of a hard life, the smell of deep, dark secrets; ephemeral smells - the -curry smells, hookah smells, herbal/mint/bitter/dry smells, salt bar/sea water/salty air smells, etc.; and background smells - spicy/smoky/hot smells, humid smells. She also marked the location of some iconic spaces in the city, such as the "little india" neighborhood in Singapore where jasmine, rough wood, perfume and curry odors are distributed.

Urban odor maps can reveal both human and odor landscapes in terms of urban odor perception. Especially when the visual landscape of a city is not particularly distinctive for various reasons, special scent landscapes can instead showcase hidden aspects of the city. For example, the 2019 odour map of the town of Wednesbury reveals the history of an industrial town in the North West of England, where a strong stench - the smell of a soap factory - pervades the seemingly ordinary town, and by

collecting descriptions of the place's smells and the locations described by people from different eras, McLean hopes to present a picture of the town's specific industrial influences on the urban odor landscape and how people's descriptions of places have changed, and to develop a related corpus. Whereas the big data odor map of Arrow et al. presents different odor characteristics of the city at different scales, in a large scale odor map perspective, people's descriptions of urban odors focus between the negative odors of roads and the positive odors of parks, such that the odor map clearly shows the positive or negative effects of the main sources of odors in the city on people's perception of urban space and psychological feelings.

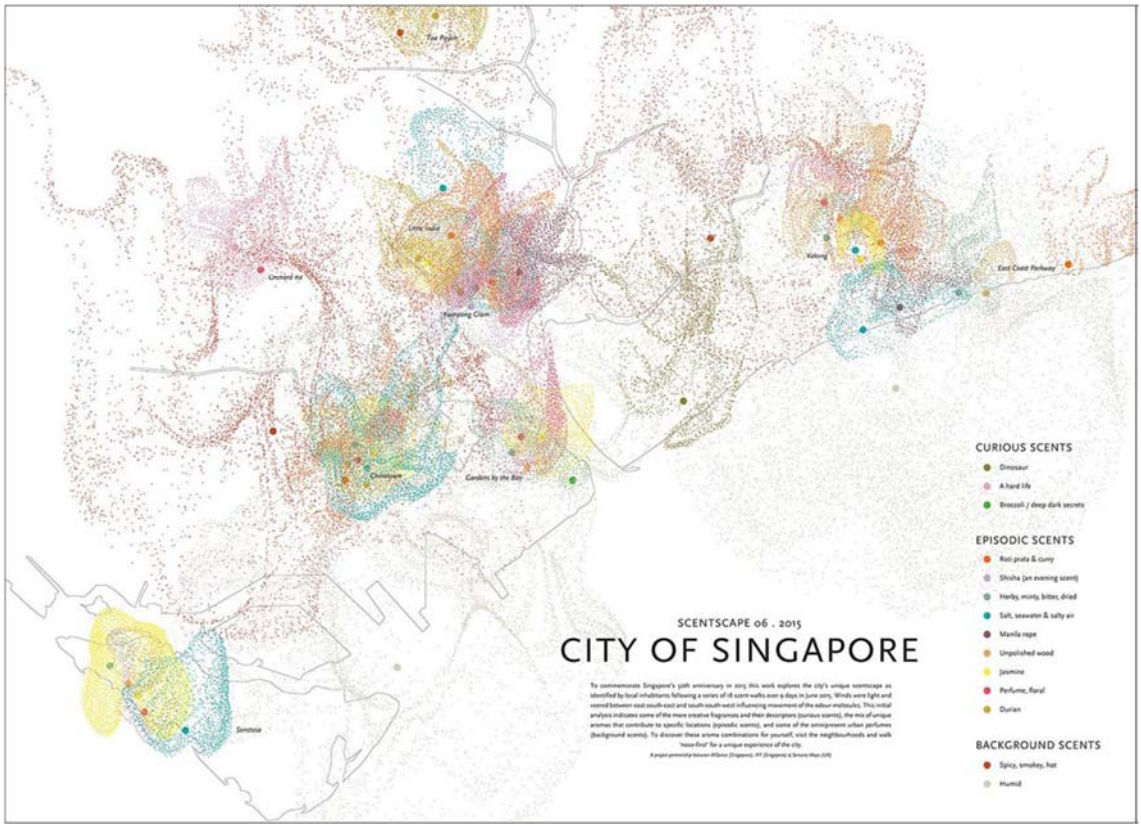


Figure 3.4 Singapore City Scent Map June 2015 (Image source: www.sensorymaps.com)

Furthermore, city-scale scent maps can reveal an unnoticed image of the city that contradicts stereotypes. For example, in the 2013 Amsterdam Scent Walk, McLean and volunteers found a hidden city that was different from the perceived image of Amsterdam's scent, and in pre-walk interviews, the volunteers thought that the scent walk would find primarily the city's marijuana scent - which is consistent with the

public policy and social image of Amsterdam to Contrary to expectations, however, the volunteers found more lived-in everyday smells, such as the smell of waffles, oriental spices from Asia and Suriname, the smell of old books, the smell of laundry, and even the smell of pickled herring - a traditional industry in Amsterdam.

3.1.2 Complex mapping of neighborhood scales

Smaller-scale odor maps focus on odor capture and odor landscapes at the street scale in cities. In contrast to city-scale odor maps, at the neighborhood scale, volunteers' attention tends to be actively or passively focused on more subtle odors, although the larger urban odor landscape remains. In neighborhood-scale odor maps, volunteers may also come from their own neighborhoods and directly record odors that are important in the impressionable neighborhood space.

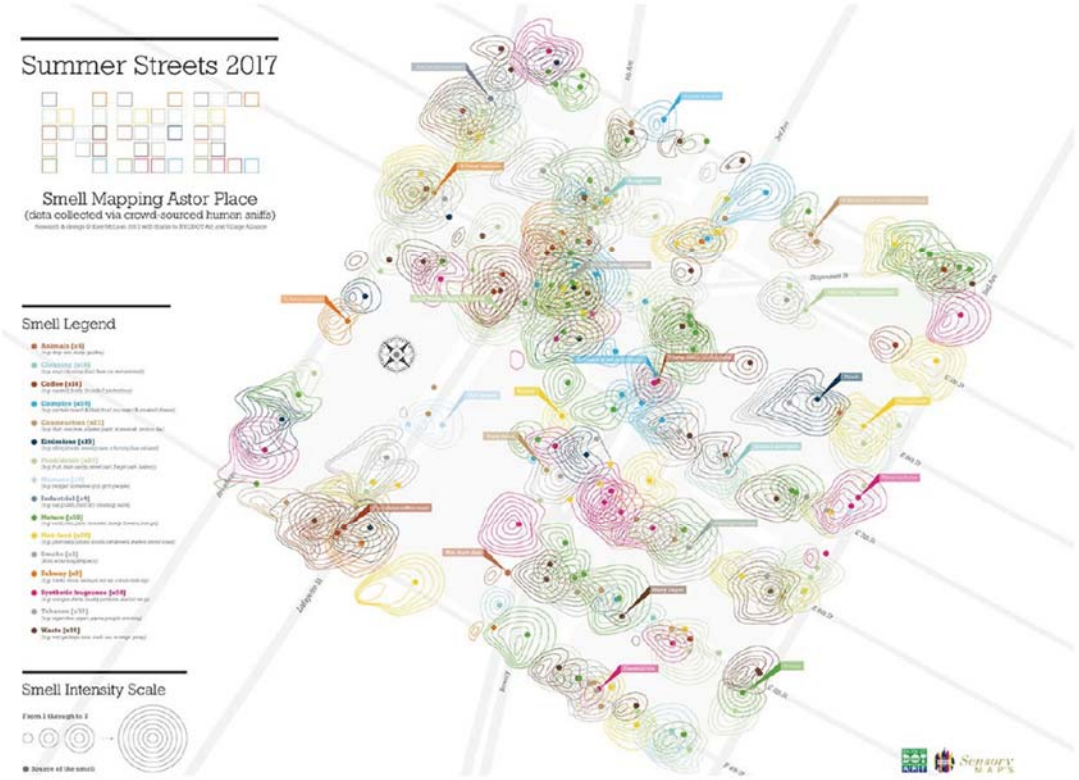


Figure 3.5 Scent distribution patterns revealed by a scent map of Astor Place, New York (Image source: www.sensorymaps.com)

One could argue that most single odor walks can create a neighborhood-scale odor

map. Of course, this statement is not accurate, but what it reveals is the concern that neighborhood-scale odor maps have for the experience itself-that such odor walks often do not wish to merely discover the obvious odors that permeate the space, but rather that the experiencer describe, and capture, particular odors in the space that are difficult to detect but do exist, including in the particular neighborhood's smells of everyday life. Neighborhood-scale odor maps are quite good at revealing the complexity of urban odor spaces. For example, during one of the New York odor mapping sessions, McLean found that the smells of Astor Place showed a distinct directionality - in the gridded urban road network, fragrant, pleasant smells were more distributed on both sides of the north-south path, while negative odors from waste filled the east-west streets.

On the other hand, neighborhood scales can reveal the maximum amount of complexity in the mapping between odor and space in a specific urban space. Odors, due to their transient and unstable nature, change their distribution in urban space instantaneously, so odor maps should in fact be very complex, and city-scale odor maps tend to focus more on the static side of the urban odor landscape - that is, the more stable and better characterized side. Different locations, spaces, times of day, differences between the different backgrounds and physical qualities of volunteers may all lead to different odour collections.

3.1.3 Street-scale forms of place

Spatially, the last type of odor map is concerned with street-scale forms of place, i.e., the effects of different spatial forms on odor production. This type of odour map can be divided into two categories in terms of the relationship between the objects on which they act - those that map specific spaces to the odours within them, and those that associate memories about a particular place or spatial form through odours. The former of these is a study of actual urban spaces and landscapes, while the latter relates to place-making and how odors are intricately associated with spaces in the light of knowledge from psychology and the biological sciences.

The first type of "place-odor" map practice is usually similar in operation to neighborhood-scale odor maps, however, in terms of the object of study, neighborhood-scale odor maps focus on the distribution of odors in space, while "place-odor" maps focus on the interaction between odors and space. The interaction between odor and

space, and in this case, more about the effect of spatial form on the pattern and intensity of odor dispersion. For example, in 2020 McLean's odour map documented odours in the corridors of a UK public hospital. By capturing relevant impressions of odours from patients, staff and visitors, McLean explored the patterns of presence of highly concentrated, diffuse and potentially harmful odours, by classifying odours by source as coming from waiting areas, sterilised materials, mixed odours, people, operating rooms, wards and dining rooms, demonstrating that public The diffusion of indoor odors in spaces is strongly correlated with the intensity, irritation, and location of the plane of the odor itself. The odor walks organized in Pamplona found relatively higher odor concentrations on street corners in the city, due to the interaction between denser human activity, buildings and wind on street corners, which also assumed a higher density of odors in this part of the city.

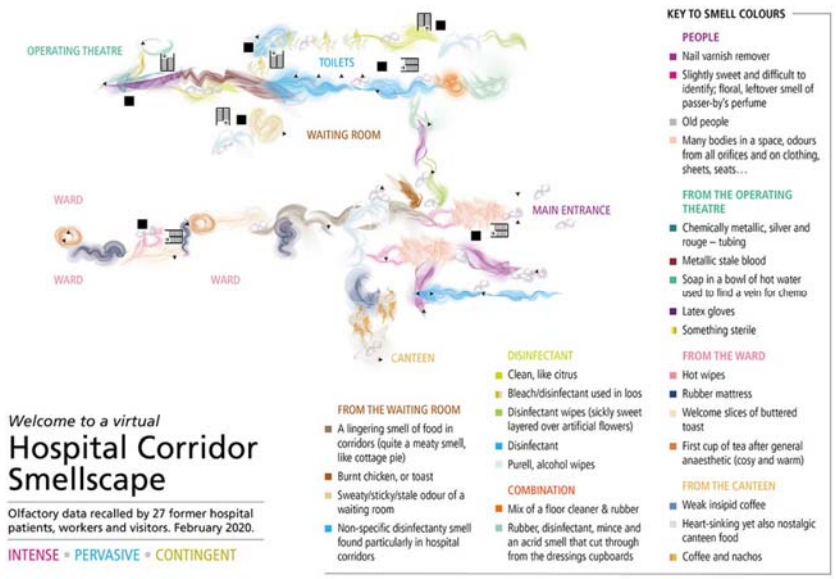


Figure 3.6 The association between odour and human activity as revealed by an odour landscape in an indoor corridor of a UK hospital (Image source: www.sensorymaps.com)

The second type of "scent-place" map is usually very interactive and is found in the exhibitions of art museums. By borrowing images, words or even certain smells themselves, visitors are able to imagine and recall them, and record the results on a map. In the field of sensory urbanism, the city under perception is a very important object and topic of expression, for example, Parasma's Skin Eyes is a poetic text that illustrates the non-visual centrism, where the ontology of space itself is a less precise, but very

moving and ambiguous impression. In a rather interesting exploration in 2013, McLean transformed Paris into a kind of scent playground, following the existing narrative of the city's scent landscape to constitute a random path of scent experience. A series of collected scent memories and locations are presented online in a micro-narrative to generate a particular olfactory experience of the smells and aromas of Paris.

3.2 Odor and time instability

Over time, odors exhibit unstable characteristics. Odor can be understood as a fluid with information, and fluids reveal that odors constantly change in intensity and range in the air in an aerodynamic manner - even the slightest act of our sniffing triggers a large change in odor, and the change in information - in fact, the stimulus that the odor, at the molecular level, carries as a base in our nervous system is transformed into an odor signal, which together with the fluid shapes the three-dimensional city. The change in information - in fact, the molecular level of the odor, the base of the stimulus it carries in our nervous system is transformed into an odor signal, which together with the fluid shapes the three-dimensional urban odor landscape. Normally, odor maps that focus on spatial features would default to all data being independent of changes in time, and ignoring such variables would not cause much of a problem; after all, the experimenter would still be able to control for the relative proximity of the time at which the odor walks as samples were located. In contrast, studying the similarities and differences in spatial odor distribution patterns in the same city at different times requires a deeper understanding of the temporal nature of odor maps and the possibility of superposition.

3.2.1 Long-term climate differences

The first type of odor map that shows the effect of time on odor focuses on climatic differences over long periods of time and is often an overlay of odor maps under different seasons in the same location. Long-term factors influence urban odors primarily from wind direction, climate, and industry. Cities generally have different wind directions throughout the year, and changes in wind direction lead to differences in overall airflow patterns in cities and the odors they carry, resulting in significantly different odor perceptions in cities in different seasons. For example, McLean's winter odour map of Edinburgh describes the mix of particular odours and the unique odour

landscape of Edinburgh as coming from the prevailing south-westerly winds, with the city's breeze allowing the spread of odours towards the south-west, carrying the smell of the sea towards the city. In contrast, the odour map of Kiev, Ukraine, drawn in December 2016, has a pattern of odours but conversely relatively clustered in the winter westerly winds that may be related to the morphology of urban space.

3.2.2 Dynamic shifting of short duration

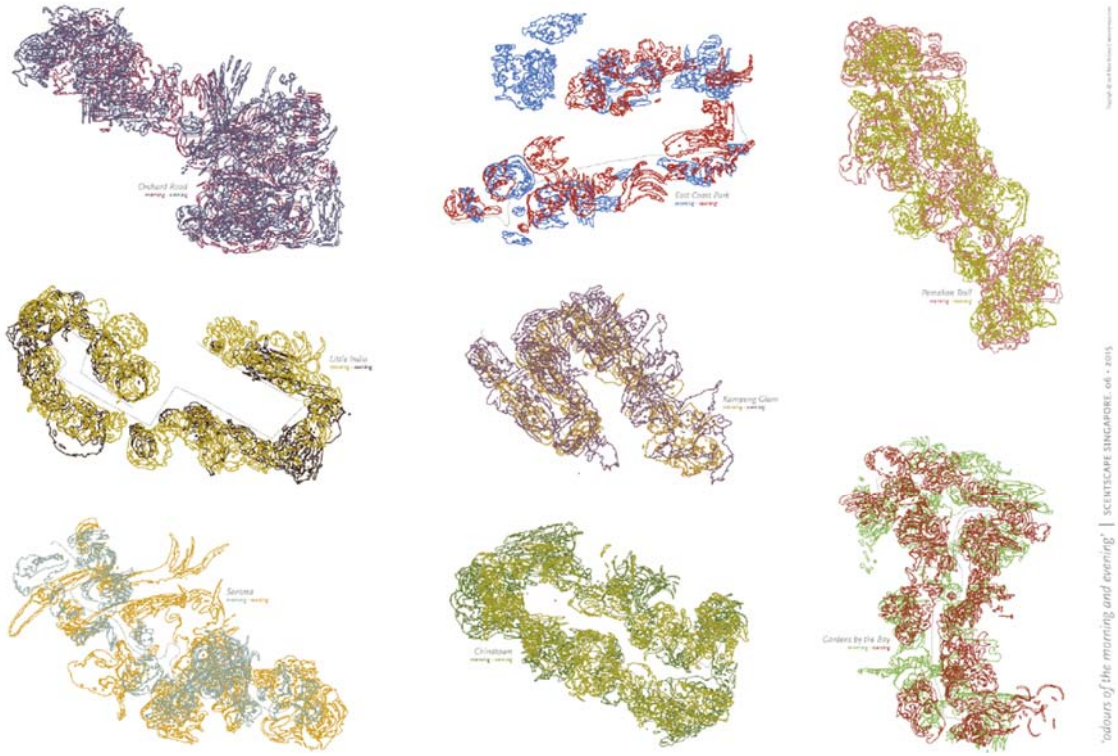


Figure 3.7 A map of Singapore scents in the morning and evening after two scent walks stacked on top of each other (Image source: www.sensorymaps.com)

Another type of odor map that represents the temporal nature of odors focuses on the dynamic movement of the odor landscape over a short period of time, which may span as little as one day, and at such time scales, changes in odors are related to changes in the source of urban odors and the dispersion of odors as fluids. Relevant influences include the molecular weight of the odor itself, its concentration, and changes in the humidity and temperature of the air. The overlay of different odour walking data in the

morning and evening in McLean's later odour map of Singapore reveals differences in the distribution of odour landscapes in different neighbourhoods in the morning and evening. For example, Chinatown, Little India, Garden Street and several parks were not analysed in detail by McLean in terms of the patterns of odour distribution in these locations in the morning and evening; indeed, this investigation still seems to reflect only randomness, but some patterns do exist, for example, odours tend to be distributed somewhat more widely at night than in the morning.

The transient nature of the urban scent landscape revealed by the short-time scent map is very different from the stable urban visual landscape, and is highly dependent on the acuity of the recorder's own senses. Because short duration odor maps usually record smells in considerable detail, such as the perfume of a passing pedestrian or the odor emanating from a window, the experiencer can easily come up empty if he or she appropriates the experience of the urban visual landscape. McLean makes a dynamic and interesting attempt to do this with a scent map of Kiev, Ukraine, where she animates the scent recordings of seven volunteers by making them show the differences between the volunteers' recordings of scents along the same path, at roughly similar times.

3.3 Relevance of odor and place

On the other hand, the recorded object of a mnemonic odor map is no longer just the physical space; it explores whether odor maps can express the odor-memory-place association. By translating odors into the vocabulary of memory, of emotion, researchers can investigate the relationship between the interactions of odors and cities at an abstract level; for example, instead of recording a restaurant street as a variety of specific food odors and their distributed forms, place-sense-mapping odor maps record the street as delicious, beloved, or reminiscent of a particular street in one's hometown. After Kate McLean pioneered the systematic study of the spatial and temporal nature of odor maps, many scholars have conducted exploratory research on this new aspect.

3.3.1 Scent impressions and memory spaces

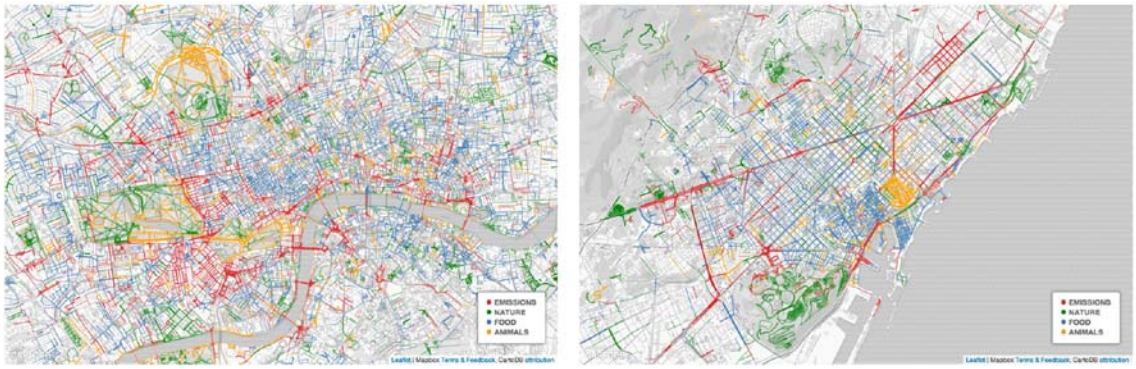


Figure 3.8 A map of London and Barcelona odours under a big data collection sample produced by Luca Maria Aiello et al. (Image source: Ref. [14])

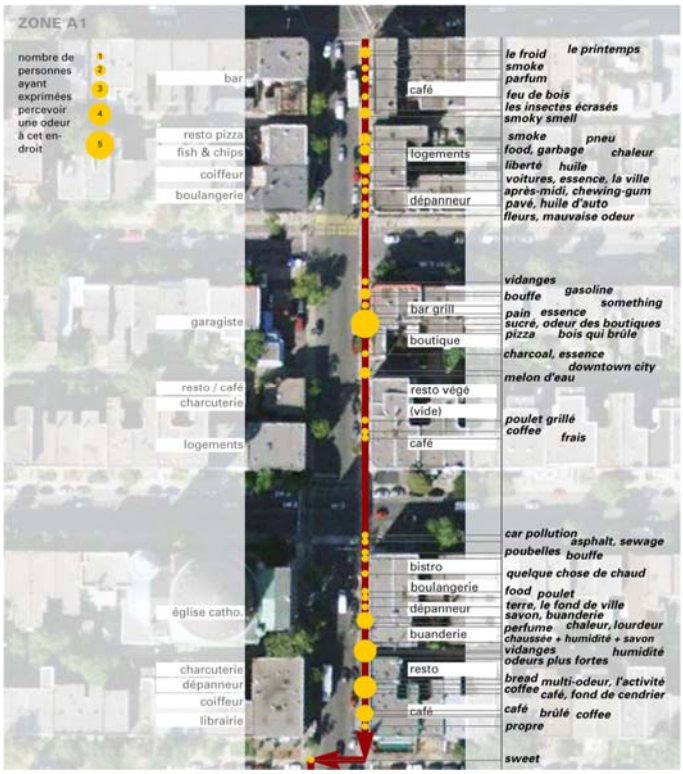


Figure 3.9 Mapping of odour distribution and odour events on the street in an odour walk organised by Natalie Bouchard (Image source: Natalie Bouchard, 2013)

The Italian scholar Aello et al. used a quantitative big data approach to extract information from social networks on locations evaluating street odors in London and Barcelona and present them on a map. The obtained interactive maps present the odor characteristics of different areas of the city, with the source of negative odors and the

distribution range of characteristic odors at a glance. The study uncovered features of the urban odor landscape that change over time and space, and the emotions that odors bring to people. Most interestingly, they conducted a comparative analysis of the images at the same time, trying to find the association between odour and colour. Nathalie Bouchard of the University of Montreal designed a Montreal scent walk through the city's multicultural district, shopping streets, residential areas and parks, and her work aims to reveal the temporal distribution patterns of scent and how the memory of scent affects the city's spatio-temporal tube associations. Scent City Design researcher Victoria Henshaw organizes scent walks in Doncaster, UK, and she describes in detail the process of route planning, experimental methods, and data recording. 2009 saw the emergence of an online website (http://www.nioibu.com/) in Japan that allows users to record scents from around the world, which unfortunately is now inaccessible. A rather interesting project on scent walking is the Tastduftwien (Taste-Smell-Vienna) project in Vienna, led by philosopher Madeleine Diaconu, who explored the experience of scent in Viennese parks and gardens, public transport, cafes, popular public spaces, antique shops and playgrounds, investigating the different meanings of scent and memories associated with scent in the eyes of local residents. The project also investigated the link between odors and potential allergic reactions.In 2017, a team led by Ying Long of Tsinghua University used a big data approach to study odor maps in the old city of Beijing, claiming to be an early attempt by Chinese scholars in the field of odor mapping.

3.3.2 Interactive maps and public participation

Figure 3.10 Brian Goertzenloet's Sillage exhibits photos of the live scent experience, where experiencers record their feelings by smelling the scent. (Image source: https://scentartnet.tumblr.com/）

Interactive installations of scent maps are more often found in exhibitions, and by engaging the public, such scent maps often explore the association of scent with an abstract sense of place, and act as an influence on a social level. For example, both McLean and Henshaw have experimented with designing exhibition installations or community events in which the public can actively participate, presenting scent impressions mapping physical spaces.In addition to this, there are many similar practices in the arts. In 2014, Sillage, a work by artist Brian Goeltzenleuchter, was exhibited at the Santa Monica Museum of Art. The artist designed eleven scents associated with the Los Angeles community, and participants freely combined scents of their interest to spray on their wrists and ultimately create a scent map of the collective memory of Los Angeles. According to the artist, "Ephemeral presences like Sillage, non-physical 'anti-monuments' provoke discussion because of the memories they can inspire. As a socially engaged art form, the ephemeral nature of scent forces a dialogue with the public that must be generated because scent quickly becomes memory."[1]

[1] https://www.bgprojects.com/home/2017/9/5/sillage-los-angeles

3.3.3 Urban history and spatial flux

In terms of place, odour maps can be used more abstractly to record urban history. The advantage is that it can represent the odor information collected in the history of the city by archaeology, written records, etc. in the existing urban space by mapping. In a way, this can also be used to reveal the evolution of urban spaces and scent landscapes, which in turn can help scholars to study the changing history of cities. A study of the odour map of Védernes, for example, shows the influence of the soap industry on the town over two centuries, and in terms of the odour landscape, the soap factory has undoubtedly played an irreplaceable role in shaping the odour narrative of Védernes.

Odor maps continue to be a progressively evolving field, with teams and individuals led by researchers such as McLean exploring and practicing the idea of odor maps, with the aim of adding new dimensions and information to our understanding and design of urban spaces. When odour maps are transformed into 3D models, the distribution of odours becomes more clearly linked to urban space, as the workshop organised by McLean in 2015 revealed to us, with quite interesting and rich results from 12 groups of students mapping the odours of a market in Marseille, France and translating the information gathered into easily understandable models based on the aspects of their group's concerns. experimental results.In 2016, McLean summarized the odor mapping projects and methodologies he had conducted, summarizing the characteristics of his own practical projects, the countries and his own takeaways, with considerable reference.

Chapter 4 Formal Design Strategies for Urban Scentscapes

Odorscape is a term coined by Douglas Portley in 1990 to describe the scent aspect of an area's landscape; his odorscape includes both non-spontaneous background odors and episodic odors, with an emphasis on the holistic nature of the odorscape. However, a 1994 article by Paul Rodaway refutes the idea of odor landscape wholeness by arguing that the urban odor environment is not as continuous, visible, or clear as the acoustic, tactile, or visual environments, and therefore it is impossible for humans to accurately obtain the overall odor landscape of an area at any one point in time, let alone prove the existence of odor landscape wholeness .

Experience is an important aspect of scent public landscapes, and because scent itself requires that it be experienced, scent public landscapes also place considerable emphasis on how to maximize the experience of those who experience it. Therefore, in addition to the careful consideration of odor itself, spatial creation is also an important aspect of odor public landscapes. Just as we cannot actually discuss just one sense, the experience of a scent public landscape includes at least two themes, visual and olfactory, and a good space can enhance the scent experience while giving new creativity to scent design.

4.1 Odorscape optimization of urban buildings

4.1.1 The modernist idea of smell

When we talk about architecture, cities and smell, form, material and structure are the primary starting point. Indeed, this starting point runs the risk of visual centrism, and we must bear in mind the ubiquity of the object of study, smell. In a way, the vast difference between scent and vision allows us to discuss scent urbanism from a spatial ontological perspective such as form, and all we get is a container and contents separate from it. Of course, an article on scent architecture by scent design consultancy BFNY argues that from a phenomenological perspective, the physical form of a space affects the metaphysical, emotional and experiential parts of the space within it. Architecture and scent therefore share narrative characteristics, and the experience of space is also an experience of narrative, which in turn aims to help us make sense of our presence in space.

Researchers in the fields of architecture and the city have paid little attention to smell over a long period of time. As mentioned earlier, the absolute modernist push for the visual comes from the arrogance of mankind in the face of nature since the industrial revolution. "Many of the architectural projects that have been pushed by architectural publishers during the last twenty years (written in 2012) express nothing more than narcissism and nothingness." [3] Apparently, "only a distant and detached vision can contribute to such a view of nothingness; for example, the tactile sense of nothingness does not exist because of its inevitable intimacy, closeness, authenticity and individuality."

Victoria Henshaw draws from an experience of a scent walk with an architect the

reasons why scent is overlooked in the design process. In their conversation with the architect, they talk about how scent interacts with space in the city, how enclosed spaces heighten the intensity of scent, how long straight roads promote the flow of wind and circulate scent through the city; how the scent of the waterfront enhances the relaxing quality of the space, and how the faint scent emanating from the stone and mossy walls of the historic cathedral adds weight to this serene atmosphere. However, in contrast to this enlightening dialogue, scent is unconsciously ignored when architects are working on architectural designs. In their 2006 book, Hervé Ellena, Anna Barbara and Anthony Perliss of the Italian architectural firm Ellena Mehl Architects write that smell belongs to the dark side of architecture and is often left out of design practice. Scent is neglected because people underestimate the function of the senses and the principles by which we understand the world. People breathe more than 20,000 times a day, and to avoid being constantly distracted by smells, the brain's filtering mechanism allows us to notice only strong and unfamiliar smells.

In contrast to the modernist period, in the ancient architectural design process, vision, although also an important tool, was just as important as the other sensory aspects. The earliest writings on odorous urbanism date back even to John Evelyn's Fumifugium in 1661, where it was believed in the 17th century that odors entered the brain directly through the nose and were therefore important in relation to health.In his book, Evelyn proposed to plant a belt of plants filled with trees and shrubs in an area close to London, and The initiative to burn the wood built down from these plants, and the fact that the word Fumufugium itself may refer to fumigation, clearly shows the difference between him and the modernist idea of odour removal and anti-pollution.Evelyn points out that odours make pleasant air and act directly on the human soul and spirit. Evelyn differs from Corbusier in that he is more concerned with the positive effects of smell on the city and believes in the importance of the senses in urban space, even implying the possibility of the existence of scented architecture.

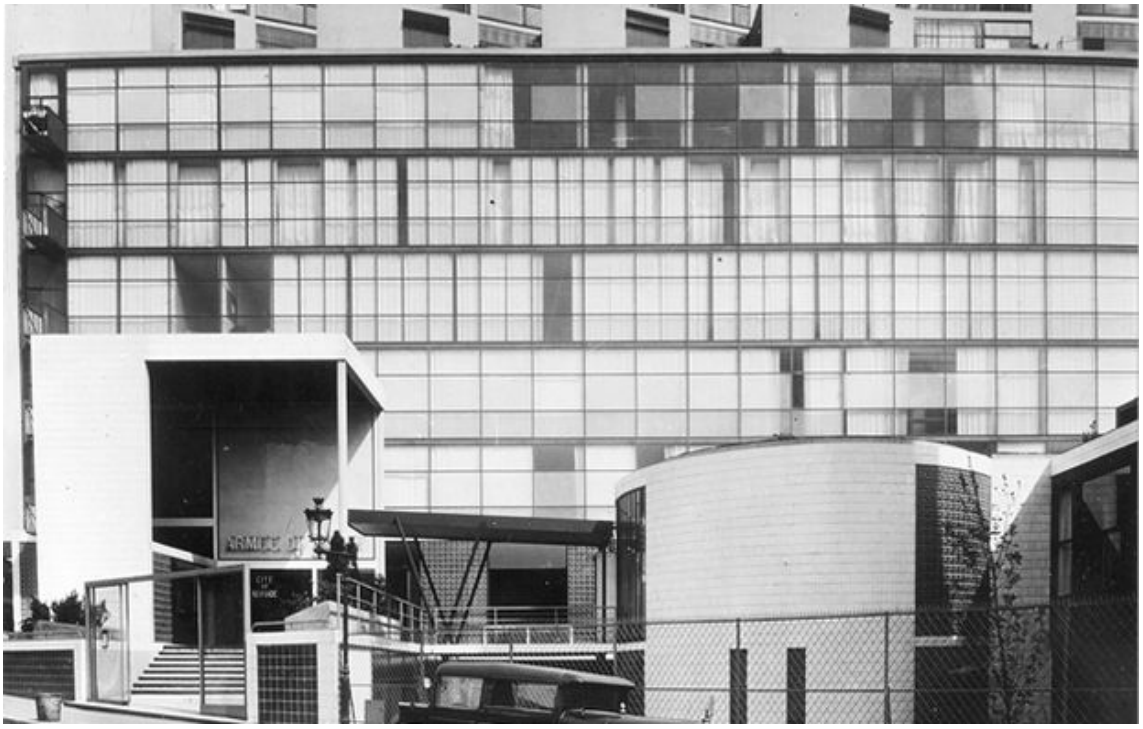


Figure 4.1 The idea of clean air endorsed by the enclosed façade in Corbusier's Parisian City of Asylum, 1929-1933 (Image source: FLC/ADAGP)

However, when we look again at the beginnings of modernism through the lens of the senses, we can still find some cases that are relevant to the senses. Using the example of Corbusier's Cité de Refuge in Paris, Paul Emmons examines the innovations in smell, air and space of this famous classic example of modernist architecture and the airy urbanism it ushered in. In an era before mechanical ventilation, the Cité de Refuge's move to isolate the indoor air environment from the outside world challenged the perception of the relationship between the air inside and outside the building. He explains, "The glass curtain wall is sealed because warm, clean air is fully circulated through the interior by means of heaters and ventilators." While this view is fraught with lingering cultural and ethical attitudes towards odor, it cannot be denied that this was a concise and precise design decision by this modern architectural titan in terms of the spatialization of air theory.

Yet surprisingly Corbusier himself hardly ever mentioned smell directly in his writing or discourse. The key word he uses is mostly air. He also seems to be implicitly aware of the potential of smell at the end of his essay "Cities of the World".

So I only wish to be one of those who wish to perceive "structural" paths to prepare for "tomorrow"; to be one of those who empathically notice the good things, the demons of composure; and above all, to be one of those who allow themselves to pass through the nose --God has put in our face to help us use the cape of intuition (as a "gift" from fate to the individual, and as an uncountable sum of self-consciousness or unconsciousness in the hands of an astute soul) to guide us to useful ends. -the one who guides to useful ends.

As sociologist Georges Zimmer put it, "The social problem is not only a moral problem, it is also a problem of smell." Corbusier seems to have had the same view of smell as he did of decoration, that smell is something that should be eliminated, that pure air is odorless. Hidden in the modern definition of air as smell is the ideology of odorlessness.

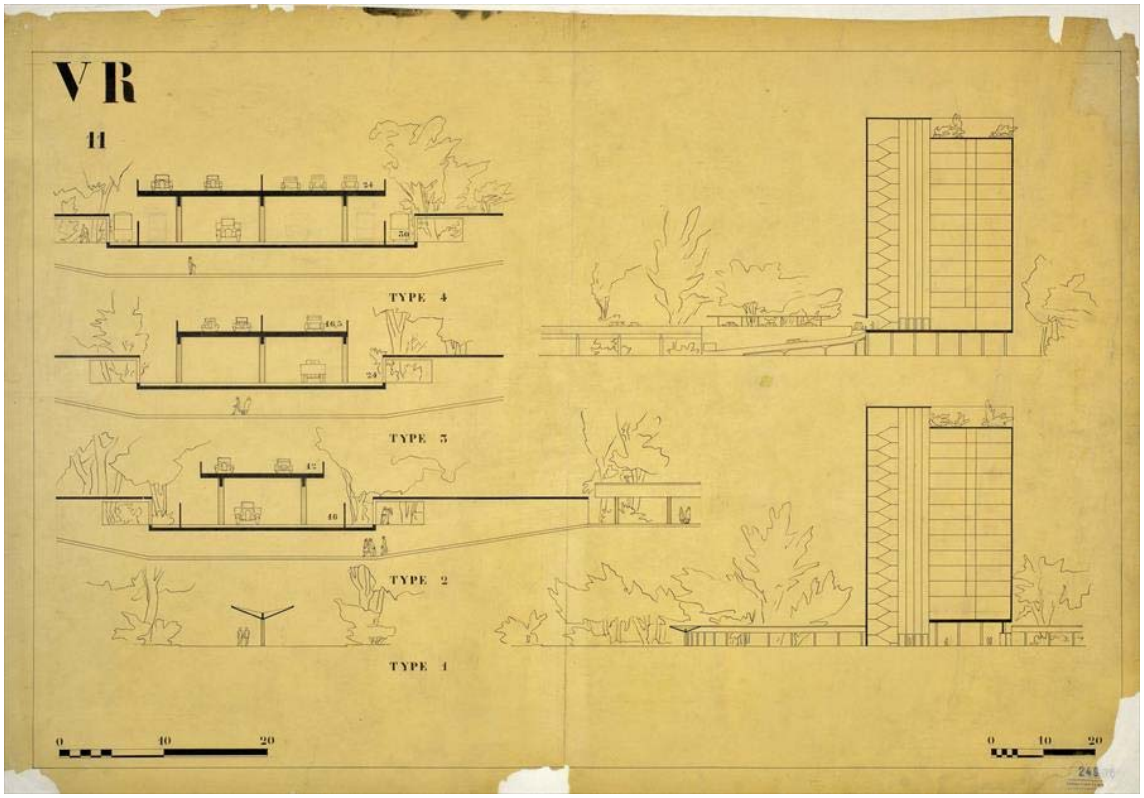


Figure 4.2 Glowing urban design profile showing the relationship of space to the natural environment, 1930. (Image source: FLC/ADAGP)

Corbusier also applied his theories on urban smells to the design of the City of

Light, when the toxic waste from cars in Paris was causing "a fatal disease in the heart and lungs of the city", calling the air in the sheltered city "exact air He called the air in the sheltered city "exact air" and "exact respiration" was called by Corbusier a cornerstone towards the urbanization of the contemporary city. In the design of the City of Light, Corbusier reflected his understanding of smell in many aspects of the design. Mechanical ventilation helped the idea of the vertical city come to fruition, park lawns and urban green spaces provided oxygen to the city and absorbed noise, and the air from the upper floors of the towers was, in the conception of the time, considered to be healthy air from the mountains and the sea. And the upper floors would likewise avoid possible gas wars and gas weapons. In this light, the early modernist obsession with utopian high-rise towers may have found its answer in smell, when the urban public health movement had only reached sanitation, and people still worried about the possible connection between the medieval urban smell environment and viruses, and getting as far away from the ground as possible - designing high-rise towers - became a logical choice.

4.1.2 Identification and theory of scent design

Designing for odors first requires clarification of how odors are classified and identified, a problem that in fact exists under various topics and none of which has found a definitive answer. Most of the odor classification systems that have been proposed by scientists for a long time are based on the source of the odor for classification, not on the nature of the odor itself. The earliest recorded Aristotelian classification classifies odors into seven categories: aromatic, scented, odorous (garlic), divine (musk), goat-like, repulsive, and disgusting . In contrast, the Kapsiki of Cameroon classify odors into fourteen categories, including mèdèke (odor of animals), rhwazhake (odor of urine), 'urduk'duk (odor of milk) and ndaleke (odor of rotting flesh or corpses), and it is clear that such a classification of odours is closely related to the culture and belief system.

Biological studies have shown that the olfactory organ is more directly connected neurologically to the brain, which means that smell is closer to instinct than the other senses, and perhaps it is because of this feature that in almost all cultures there is a

considerable paucity of words related to smell compared to the other senses. Another consequence of the brain's emotional center processing odors is that we have difficulty accurately identifying and naming odors because we have already judged them emotionally before they are accurately identified.

BFNY has a very interesting point which points out that one way of classifying scents, the odor pyramid, itself has a literal chemical character that also happens to correspond to the structure of the building; the odor pyramid is a way of classifying fragrances according to the molecular weight of their aromatic compounds, and the base notes of perfumes -wood, musk or resin- scent happens to have a heavy molecular weight and can be present for a long time. It is the very cornerstone of a blend of scents, like the foundation of a building. At the top of the pyramid, the top notes of the perfume, the lighter molecules, correspond to the signifiers in the architectural space that make the first impression, from heavy to light, from base to signifier, perhaps suggesting a similarity in the structure of scent theory and architectural theory.

Figure 4.3 Scent description wheel mapped by Curren (2013) et al. (Image source: Urban Smellscape)

Classifying descriptive words for odors and forming an odor vocabulary wheel is a work of interest to many scholars. UCLA scholars Irwin Suffet and Paul Rosenfeld developed odor description wheels for drinking water, wastewater, and compost in 2007, including the words people use to describe odors and their chemical names. In 2013 their research was extended to include an odor description wheel for urban odors.

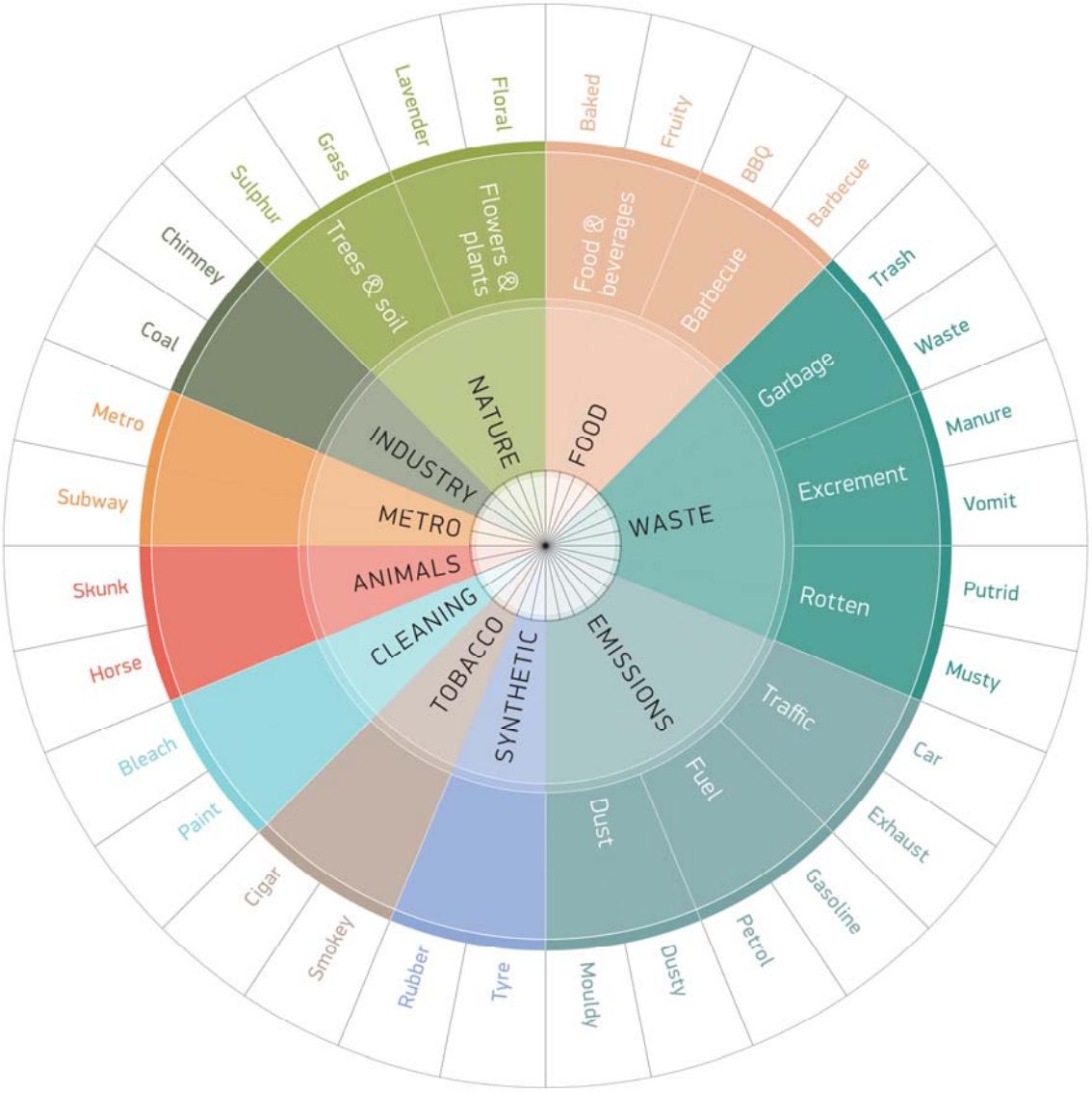


Figure 4.4 The urban odor classification wheel proposed by Luca et al. The first level is ten "word clusters", the second level is a part of the subdivision categories, and the examples of words are in the outermost ring. (Image source: Ref. [14])

Luca et al. used big data methods to extract and catalog odor-related postings from social networks to obtain a large wheel of urban odor categories. Much of this data was not shown for spatial reasons, and they found ten "word clusters" (like the inner ring in the figure) that could be expanded as a first-level catalog. Based on this research, they completed the aforementioned big data odor map.

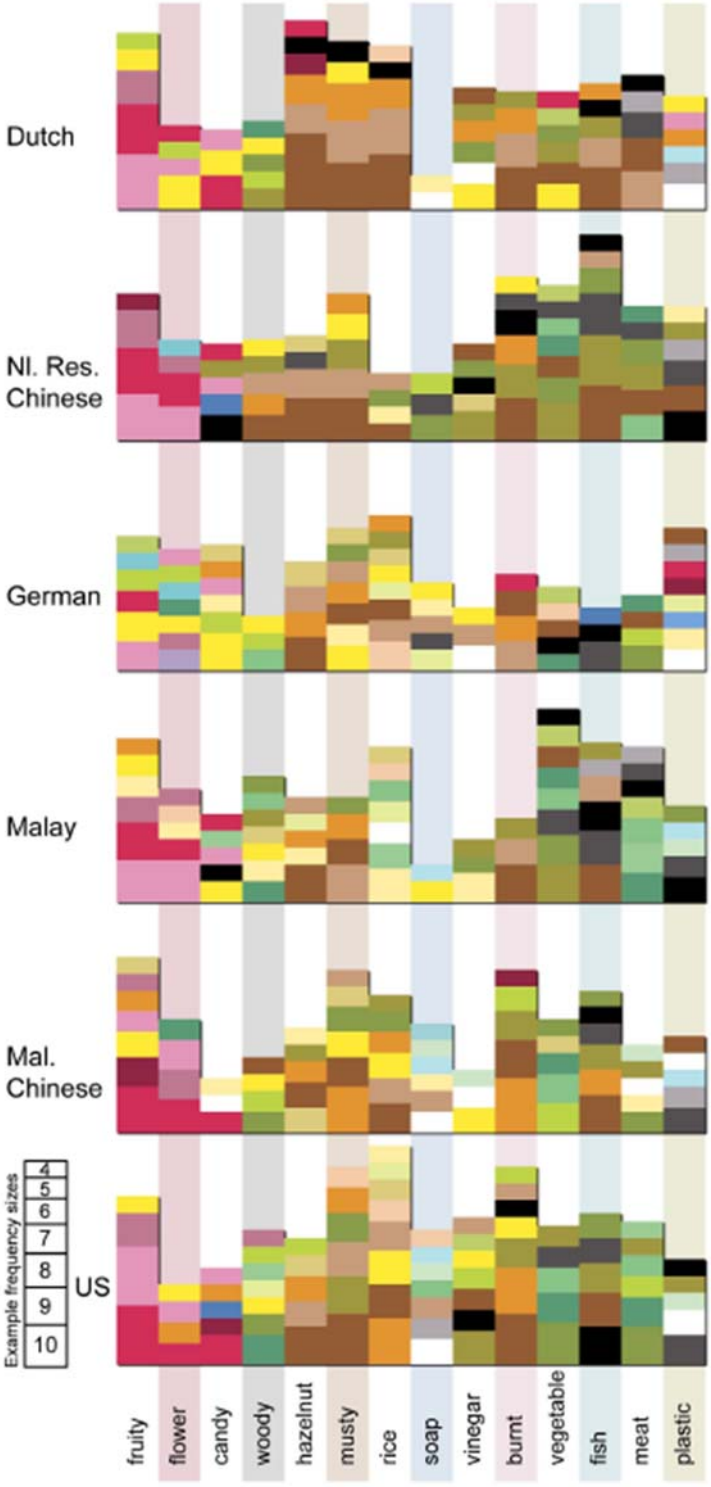


Figure 4.5 Plot of statistical odor-color associations for subjects from different cultural groups. (Image source: Levitan et al., 2014)

To add insult to injury, people with different cultural and social life backgrounds

also have very distinct differences in their perception of the same odor. In a 2014 study published in PLOS One, 122 subjects from six different cultural backgrounds were asked to correspond colors for odors, and the researchers aimed to map color associations across cultures to understand the similarities and differences in odor perception across groups. The findings found that consumer products, marketing, and life experiences largely shape our patterns of odor-color associations, and that people's patterns of color-odor relationships affect the way people interpret odors.

The measurement of the odorous environment relies on people and instruments.In 1988 Povl Ole Fanger of the Danish University of Science and Technology proposed a set of units for measuring indoor air pollution, "olf" refers to the emission rate of air pollutants (pollutants emitted by the human body) for a standard person, where Here, the standard person is a sedentary white-collar worker with a skin surface area of 1.8 m2 and 0.7 showers per day; "decipol" refers to the emissions of pollutants from a standard person (1 olf) in 10 liters of unpolluted ventilation air. Later, Fager further extended the work to quantify other sources of odour.

The human nose is still one of the most effective instruments for capturing and judging odors. Just think of the reliance on the human nose in the wine and perfume industries. However, relying on humans rather than machines for odor assessment may affect the decision-making process due to its subjective instability. As technology advanced, a number of odor measuring instruments began to appear, however, these methods continue to have considerable errors to date.

4.1.3 Scent design objects and methods

As the gaze of architects and urban designers begins to shift towards the senses, more and more research is beginning to experiment with incorporating more sensory approaches in the field of design, including smell. Zardini advocates for analyzing urban phenomena in terms of the senses and designing with that in mind. Joy Monice Malnar and Frank Vodvarka (2004) further deepen the theory of the role of the senses in architecture by arguing that odors are interstitial, ambient, and episodic in nature, and that different odors correspond to different perceptual qualities of the environment. In her unpublished PhD thesis, French architect Suzel Balez (2002) explored the role of scent from an architectural design perspective. Her study collected 32 different odor effects by conducting an odor walk in an indoor shopping center in Grenoble, France.

Portelli proposes that human perception of the odorous environment is inevitably influenced by the other senses, and therefore the design of the olfactory landscape is impossible to separate from the other senses, especially vision. Moncrieff summarized four basic principles for enhancing urban odorscapes: separation, deodorization, masking, and dilution. Subsequently, Victoria Henshaw further developed these principles into design principles: separating odors through planned activities or alternatives; removing negative odors from the city; masking the remaining negative odors with positive ones; and introducing special odors to create new features for the space. A number of environmental aspects are also important in odorscape design, including air flow and microclimate, intensity of activity, and materials, and topography. She proposed three scales of odorscapes: micro-level - based on site-specific scales; meso-level - neighborhoods; and macro-level - urban areas.

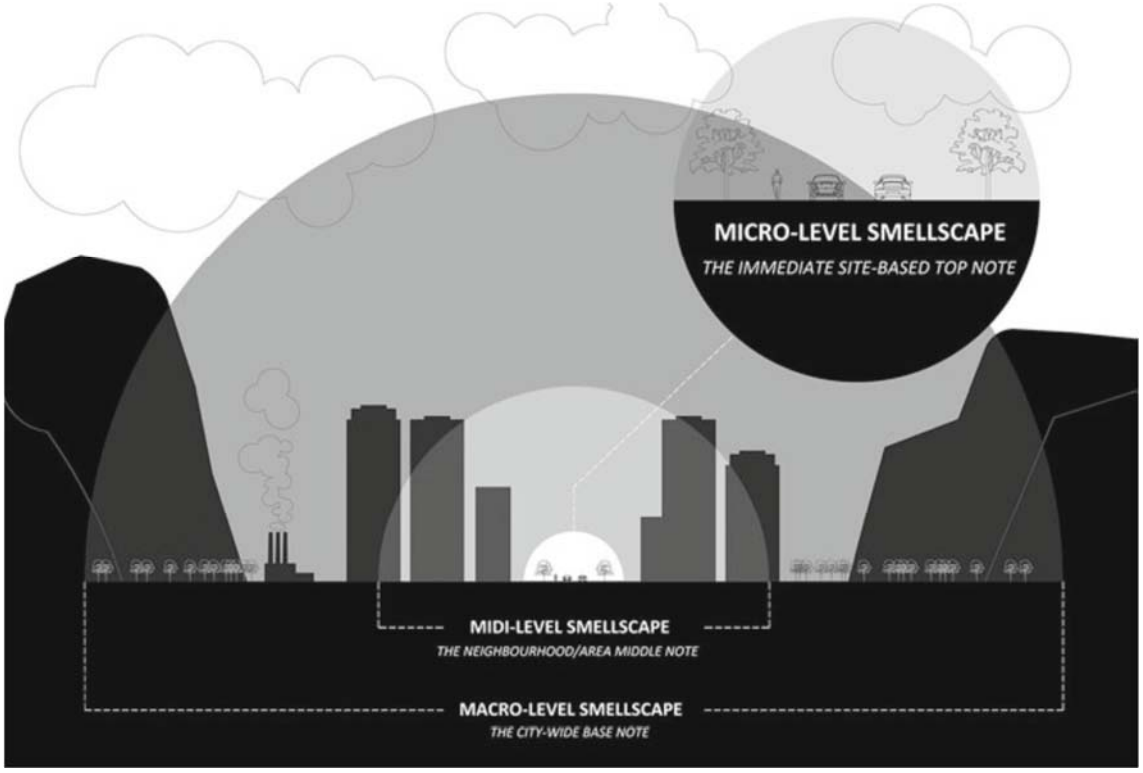


Figure 4.6 The range of studies of smellscapes at different scales. (Image source: Urban Smellscapes, Victoria Henshaw)

Victoria Henshaw presents the first set of design methods for odorscapes. The sources of urban scentscapes have three scales: the natural environment, the built environment and human activity, corresponding to the three scales of topography, city

and street. Referring to the perfume industry's concept of top, middle and bottom tones, she argues that the natural environment provides the bottom tone of the urban scentscape experience, and people passively receive this large range of scents; some scents from urban activities in urban neighborhoods correspond to the middle tone; and some high-intensity, short-lived scents at the street scale correspond to the top tone. A high quality urban odorscape experience should coordinate these three aspects of the odorscape. She proposed four tools for odor design including air and microenvironmental airflow, activity intensity, materials, and topography.

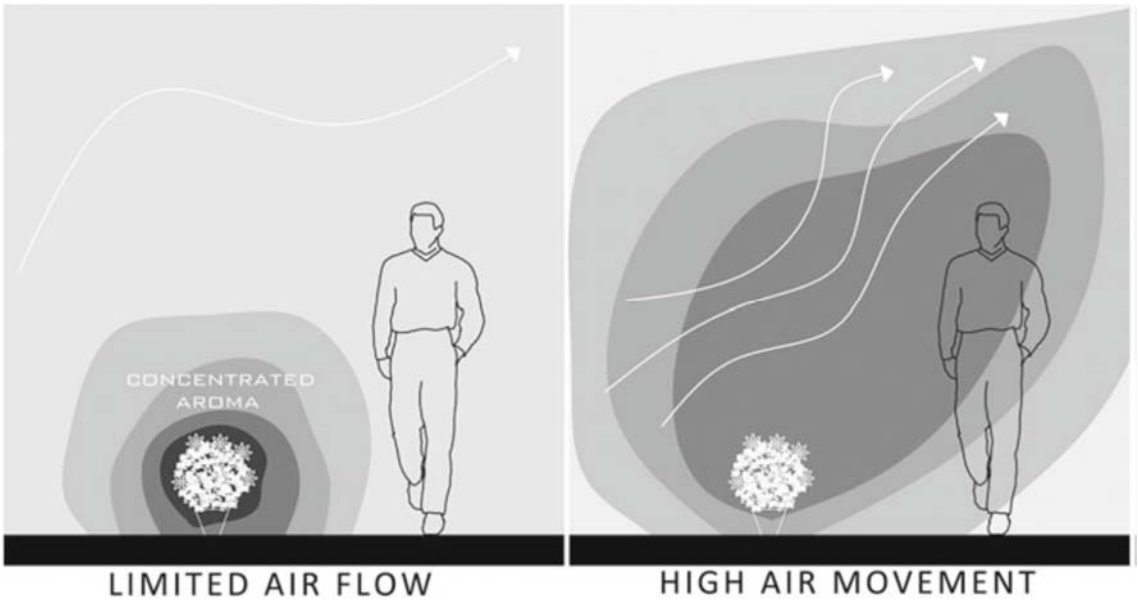


Figure 4.7 The effect of urban smells on odor aggregation. (Image source: Urban Smellscapes, Victoria Henshaw)

Urban airflow affects the temperature and pedestrian experience of the city, and as odours are molecules floating in the air, the movement of airflow can in fact affect the diffusion of odours. Victoria Henshaw proposes enclosure as a means of influencing airflow in odour landscape design, by directing and controlling wind direction and flow rate to design different airflows in different areas of the city, for example, a faster air flow rate can be refreshing in areas where car exhaust is strong. In addition, plants have some effect in masking negative odours.

There is a direct link between the intensity of activity in some urban spaces and the popularity of the odorscape. Postmodernist urbanists argue that urban spaces should be functionally mixed, however, in terms of odour, the clustering of a single function in

some cases instead contributes to the quality of the urban odourscape. For example, Victoria Henshaw interviewees, referring to markets, argued that the more crowded and complex the smells in a market, the more popular it is, and similarly, night markets and certain areas where spatial clustering occurs because of race, etc., are impressed by the sudden increase in intensity of characteristic smells here.

The use of materials in the street space also has an impact on the odorscape of the street. For example, materials of natural origin, such as wood or stone, release odorscapes that are not readily perceptible, yet generally leave a positive impression. In other cases, odours have similar reflective and absorptive properties to light, for example brick absorbs and releases odours better than materials such as tiles due to its abundance of voids.

Different topography can also affect the odor of the city. For example, Doncaster on the plains has frequent negative odours from drainage systems in the city due to the topography. In mountainous areas, roads are prone to the accumulation of traffic emissions in climbing areas.

4.2 Formal design features of space installations

In 1827, the concept of gesamtkunstwerk, or total artwork, emerged as a central principle of immersive art exhibitions. In the past decade, museums have seen the emergence of what might be called "gesamtkunst-show" exhibitions, a significant number of which have involved scent. 1984 saw perhaps the first relevant attempts to exhibit the scent of an ancient Viking village at the Jorvik Viking Centre in the UK, and in 1999 the Warehouse City Museum in Hamburg, Germany, had an exhibition on food using ceiling pipes. In 1999, a food exhibition at the Warehouse City Museum in Hamburg, Germany, used pipes in the ceiling to transport the scent of sugar, beer and wine. 2009 saw the publication of Dennis D. Waskul, Phillip Vannini, Janelle Wilson's important research on scent and nostalgia. After the publication of important studies, designers and curators began to take seriously the potential of the artistic aspects of scent. The Art of Scent, 1889-2012, curated by renowned perfume critic Chandler Burr at MOMA in New York, was the first exhibition to acknowledge scent as an art form and not just an interactive tool, designed by Diller Scofidio + Renfro.

Scent landscapes can be divided into diffuse, filled and associated according to the relationship between scent and space. Among them, the space of the first two refers to

the concrete, scent-located space, while the space of the latter is the abstract place space associated with the feeling of a certain place.

Figure 4.8 Zero member Bernard Aubertin's Large Fire Book, created in 1961, has a match in each hole in the aluminum panel, and the artist at the exhibition lights the match to create the visual and olfactory effect of burning. (Image source: Guggenheim Museum, New York)

The exploration of scent in art began with the pioneering art groups of the mid-20th century, represented by the European group Zero, founded in Düsseldorf, and the Japanese group Gutai, who aimed to create an art that encompassed all of the senses, believing that light was an illusion of second nature and that only immediate acts, such as striking, cutting, burning or detonating, were real. In contrast, Gutai and Zero have similar claims, but are more performative. These pioneering groups in the arts first questioned the previous status quo of visual dominance in art and went on to choose the senses as a breakthrough, however, this quest for the real, at least at the time, produced few artworks based exclusively on smell.

A long-standing controversy in the field of art with regard to scent is whether or not scent counts as a category of art. Monroe Beardsley argues that scent lacks the balance, crescendo, evolution, and pattern needed to construct aesthetic objects, and Roger Scruton similarly claims that scent does not accurately provoke a variety of emotional feedback, and in mixing also loses the individuality of each part.The 2013

New York exhibition The Art of Scent : 1889-2012, argued that perfume is a part of art, and the exhibition's curators focused solely on the scent itself, including its maker, the name, and other essential elements of the artwork, and were no longer satisfied with the artwork in which the perfume was used. Larry Shiner discusses this issue in detail, first arguing that scent has the capacity for artistic expression and denying the artistry of the perfume industry, and finally, proposing "art scent" as a direction for pure art, an aspect of scent that is perhaps most advantageous compared to other art is its prominent temporality.

As a central theme of urban design, the goal of placemaking is to discover, enhance, protect, and create meaning that is intimately connected to place and space. In 1959, Steen Eiler Rasmussen discussed the importance of touch and hearing in architecture and urban design, and although he did not mention smell, he began to critique the monopoly of vision in design. status. Parasma's famous theoretical book The Eye of the Skin traces the history of visual centrality in architectural theory and practice and makes the body a central element in the design of architectural spaces. In a nostalgic tone, he recalls his childhood memories of his grandfather's farmhouse, writing: "Every dwelling has its own peculiar taste of home."

Some artists have been aware of the potential of scent for a long time. The famous modern artist Andy Warhol, who had an unusual "permanent scent collection", believed that of the five senses, scent was the closest to the past, with the benefit that memories ended immediately the moment they stopped smelling. He sees the collection and use of scent as an art form, with the intention of taking control of scent and total control of memories. Scent was also a source for his creations, such as Blue Cat and Perfume Bottle, created in the 1950s

4.2.2 Open scent experience installation

Open scent experience installations are usually in public spaces in the city, but they do not interact much with the space and focus more on the combination of the installation itself and the scent. Diffuse odorscapes are characterized by the free diffusion of odors in an open environment. Due to the influence of the outside air, diffuse odorscapes require a certain intensity and persistence in a variable and unstable environment. Diffuse odorscapes are often found in open urban spaces, integrated with urban elements to enhance the spatial quality of the city. The practice of diffuse

odorscapes started earlier and more often than not, the design is not aimed at odor, but coincidentally, odor naturally has a certain importance in the space. This is perhaps another way of illustrating the importance of scent in high quality urban spaces.

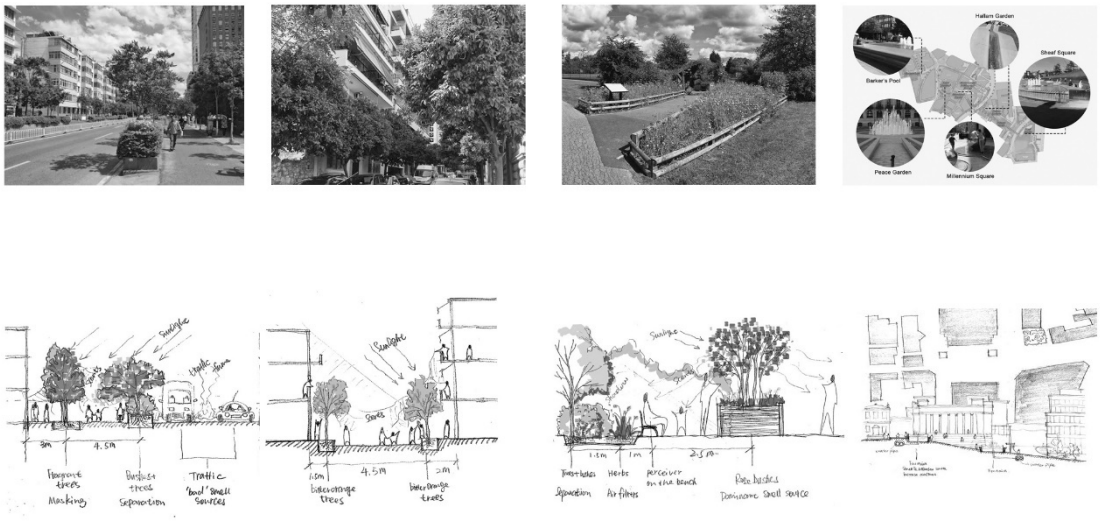


Figure 4.9 The four case studies studied by Xiao Jieling et al. are, from left to right, a lady's mantle and gardenia on Spring Road in Kunming, China; a bitter orange tree on the streets of Athens, Greece; the Five Senses Garden at Millhouses, Sheffield, UK; and a water feature on the Golden Mile in Sheffield city centre. (Image source: Design with Smell)

Xiao Jieling, Malcolm Tait, and Kang Jian examine odorscapes in urban public spaces from the perspective of aromatic plants and water features. Design guidelines for the use of aromatic plants and water features are also derived. In open urban spaces, odors are dispersed with the air flow, so temporality and instability are more pronounced, and the intensity of odors can only be detected and perceived by pedestrians if they are above a recognizable threshold. On the other hand, directional plants and water features can act as boundaries for other odors, blocking the spread of negative odors in the city. The perfume fountain in the perfume town of Grasse, a French World Heritage site, is located in the central square of the town, and the fountain is mixed with perfume made from lavender, so that visitors can smell the distinctive aroma when standing near the fountain. The diffused scent of the public space also interacts with those who experience it. Artists Monika Studer and Christoph van den Berg have designed interactive scent installations in the Brüglingen Botanical Gardens

that are activated whenever a pedestrian passes by, releasing scents into the surrounding open space.

Figure 4.10 Wine scent installation in Spain (Image source: https://www.dpa.com.sg/projects/cadacubahueieaivinotiene/)

Figure 4.11 The first version of the Growroom designed by SPACE10 in the CHART architecture competition (Image source: https://space10.com/space10-open-sources-the-growroom/)

Figure 4.12 Olafur Eliasson's Dufttunnel (Image source: https://olafureliasson.net/archive/artwork/WEK100824/dufttunnel)

Open scent experience installations often attempt to provide a wrap-around immersive experience. The scent wraps around the visitor, creating a different environment. Cada Cuba Huele al Vino que Tiene, designed by architecture firm DP Architects in 2017, won an architectural installation competition in Logroño, Spain, as a space dedicated to Rioja wine, and the installation uses nine deconstructed red wine barrels as containers, which are permeated with the rich scent of wine. Growroom by SPACE10, on the other hand, is an open source installation open to all, encouraging people to grow food through a 2.8 x 2.5m spherical garden, and when filled with aromatic plants and herbs, the interior of the ball creates a scent-rich environment that creates a human-nature connection in the city. A similar concept is the design of Olafur Eliasson's Dufttunnel, a slowly rotating tube planted with carefully selected aromatic plants, Dufttunnel offers a complete sensory experience: from the dynamics of vision to the richness of smell.

Figure 4.13 Mitchell Heinrich's "SMELL GRAFFITI" (2009) (Image source: https://www.fastcompany.com/90183122/smell-this-tag-) olfactory-street-art)

There are also some quite creative urban open scent experience installations. Scented street artist Mitchell Heinrich has invented a form of street art that uses canned scents as a vehicle in an attempt to subvert the perception of street art. Heinrich sprays natural scents he finds, such as earth or freshly cut grass, in public places in Vienna. The aim of the project was to realise the potential of scent as art and to free graffiti from the constraints of the visual.

Figure 4.14 - Monica Studer and Christoph Vandenberg's "Revier (Stomping Ground)" (2003) (Image source: https://iart.ch/en/work/revier)

Figure 4.15 A public space surrounded by plants at the entrance to Barclays Center in Brooklyn, New York (Image source: https://sponzilli.com/commercial-portfolio/barclays-center/)

The introduction of high quality scentscapes in urban public spaces can connect urban spaces and buildings that share similarities in scentscapes. Charles Spence, based on the PAD model of emotional states in environmental psychology - Pleasure, Arousal, Dominance - with the core idea that the physical environment affects people through emotions, proposes a medical urban Becket and SHoP designed the Barclays Center in Brooklyn, New York, which has a "signature smell" similar to the smell of citrus, thanks to a company called ScentAir, which designed a special smell for the A company called ScentAir designed a special smell for the stadium. In addition, landscape consultant Sponzilli helped to implement the aromatic plant design outside the arena, enhancing the scent experience of the surroundings.

Diffuse iconic scentscapes can enhance the recognizability of a street or river, for example, in a city. This is due to the strong association that iconic smells create with memory; a street that may not be visually precisely identifiable may have a very clear character in terms of its smellscape, a phenomenon that is seen repeatedly in some cultural neighbourhoods of the city. An example is the smell of curry and Chinese food in Indian ghettos and Chinatown, recorded by Kate McLean during a scent walk in Singapore.

Another source of diffuse odorscapes is the diffusion of odors from indoor spaces into public spaces. This type of scentscape is mostly used in marketing to attract pedestrians or to use scent for health purposes, and retailers such as Abercrombie & Fitch, Nike and Sony have long used scent to enhance brand identity, as explained in more detail in Chapter 5 of this paper.

4.2.3 Clustered scent experience installations

Clustered scent experience installations refer to a number of enclosed or semi-enclosed spaces in the city dedicated to scent experiences. Many exhibitions can be included.

Clustered odorscapes refer to odorscapes within enclosed spaces. Here it does not necessarily mean a completely enclosed indoor environment; a more accurate definition would be that the indoor gas environment is basically stable and the rate of internal and external air exchange is much lower than the rate of natural ventilation. Since the air in the interior and exterior spaces is largely isolated, the more widely distributed odors

tend to develop a certain intensity indoors, and the odors form a strong connection with the space, helping to establish the character of the space.

Figure 4.16 The completed experimental section of the Lowline Lab in New York. (Image source: Bloomberg)

Using the abandoned underground trolley terminus at New York's Low Line Park, HR&A Advisors and Arup transformed the derelict space into a pro bono plant garden, reflecting sunlight onto plants underground through a sophisticated and complex skylight system.In 2015, Lowline Lab transformed less than 5% of the site as an experiment and opened it to the public to experience Lowline's completed space experience, where 60 plants such as pineapples, mint, thyme and strawberries are grown. It is conceivable that when Lowline is completed, it will also smell different from other parks as an underground park, and the stronger plant scents will greatly enhance the sense of place and spatial quality of this underground abandoned space.

Figure 4.17 Site of the Basel Architecture Scents exhibition. (Image source: https://blaserarchitekten.ch/wsp/de/schauraum-b/schauraum/dufte/)

Furthermore, the selection of specific scents contributes to the expression of architectural spatial ambience.The 2016 exhibition Architectural Scents in Basel, Switzerland, Dufte! Der Geruch der Architektur explores the sameness of architectural space and scent on an abstract level. Curator Andreas Wilhelm, a perfumer, sought to investigate the effect of scent on people's spatial perception when they are in an architectural space, and the possible applications of scent in everyday public spaces. There have been some quite interesting attempts at commercialisation, similar to the Viking Museum mentioned in Chapter 6, the UK's Thorpe theme park sprayed the smell of urine in its Saw 4 scenes to enhance the immersion of horror. And it is becoming increasingly common for theatrical productions to use odours, these require more sophisticated diffusion and ventilation systems to control the flow and concentration of odours.

Figure 4.18 Installation designed by Kengo Kuma (Image source: designboom)

In 2014, for the London exhibition Sensing Spaces: Architecture Reimagined, Japanese architect Kengo Kuma designed a scent installation in two darkened rooms where Kuma made pyramid-shaped sculptures out of bent bamboo's wicker, illuminated by small spotlights on the floor. The first, larger installation is impregnated with the scent of Japanese hinoki wood, traditionally used to build temples, while the second room smells reminiscent of the new tatami mats. In a small, enclosed space, these everyday smells get built up to an intensity that makes people aware of the presence of everyday smells once they exceed a threshold that a person can recognize. For Kuma, with this installation, he also expresses the importance of odors in architecture, which are selected in relation to his memories of the same years.

The author happened to walk into a perfume shop in Beijing Place during one of his trips, and 90% of the space was used as a museum-style display space. The exhibition aims to reveal the relationship between scent and touch; the experiencer touches a certain material with one hand and sniffs a perfume designed specifically for this material, and in turn, the experience of smell and touch creates some kind of mysterious connection.

4.2.4 Interactive scent experience device

The interactive odor experience device is a highly formalized odor experience

device. Due to the temporal and unstable nature of odors, the space associated with the odor is supposed to change accordingly while the odor changes.

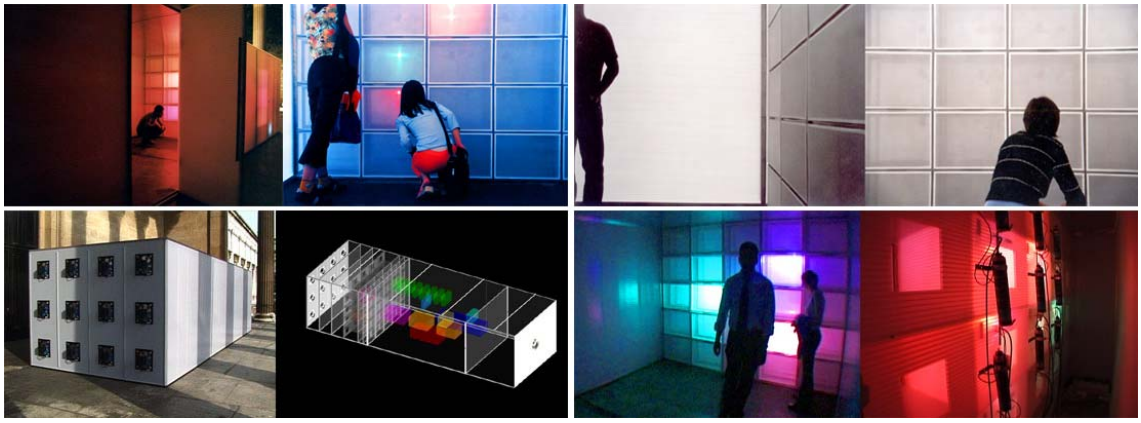


Figure 4.19 Scents of Space-HAQUE (Image source: https://www.haque.co.uk/scentsofspace.php)

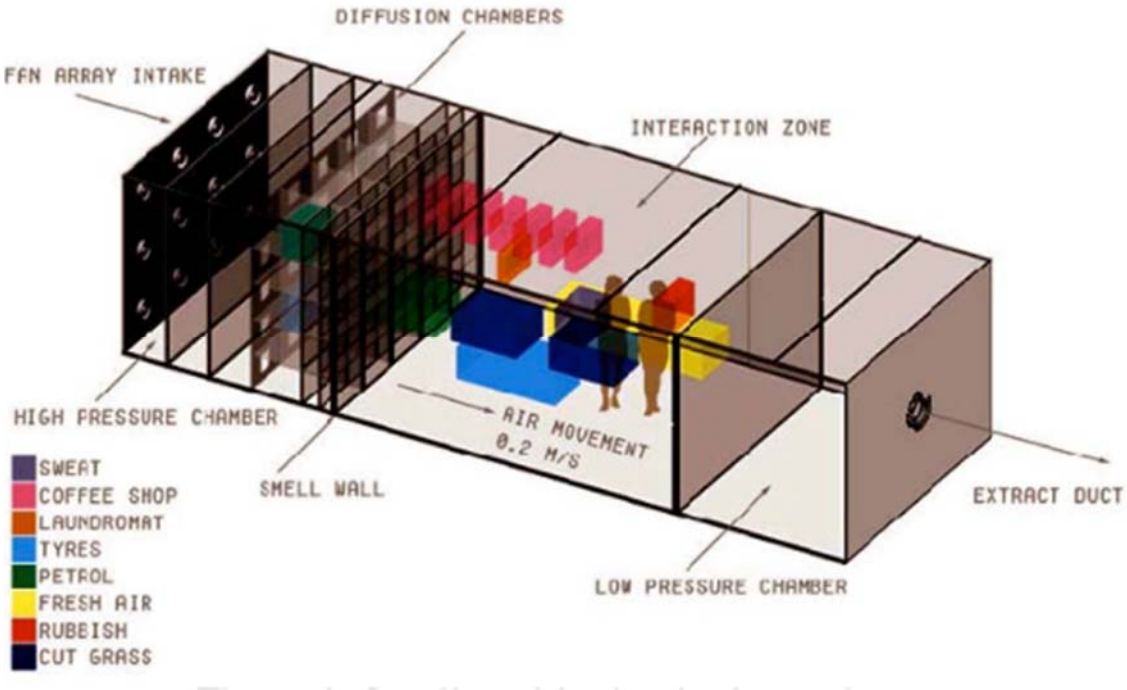


Figure 4.20 The principle of the Scents of Space installation (Image source: choreo of sensations)

Figure 4.21 Miriam Songster, "THE GREEN SCENT OF PINK" (2005) (Image source: https://scentartnet.tumblr.com)

The Scents of Space installation by HAQUE is an outstanding exploration of this. The airflow in the installation comes from a matrix of fans, which is transformed into a smooth and continuous seven-six by a diffusion device. The computer-controlled scent emitter together with the airflow control device allows for the selective diffusion of scent in the space. In her work "The Green Scent Of Pink", artist Miriam Songster challenges cultural stereotypes of color and scent by dispersing the scent of grass in a pink room, attempting to interrupt the subconscious association between scent and color through this combination. Through this combination, she seeks to interrupt the subconscious associations between scent and color and explore more possibilities.

Associative scentscapes refer to the use of scent primarily to evoke a memory associated with a space, a process that does not involve physically real places, but is generally associated with a connection between scent and a sense of place. The commercial sector was similarly the first to experiment with combining architecture with associative scentscapes. Scent branding company 12.29, founded by scent expert Dawn Goldworm, was asked to design a fragrance for Zaha Hadid's One Thousand Museum in Miami that is directly related to the activities and narratives of the different spaces. Goldworm combined the curves of Zaha's design with the owner's South

American roots to create specific scents for the five spaces. The scent of the aquatic center is reminiscent of a European beach vacation, the scent of the fitness center evokes the fresh nature where earth, wood and citrus are located, and the scent of the lobby is reminiscent of the beach, with the goal of quickly switching from a working state to a vacation feeling.

Figure 4.22 Hilda Kozari "Air - Urban Olfactory Installation" (2003) (Image source: https://scentartnet.tumblr.com)

Figure 4.23 The way scent interacts with painting in the exhibition Smell the Art: Fleeting Scents in Color in The Hague. (Image source: https://jingculturecommerce.com/mauritshuis-scents-in-

color-immersive-smells)

Other associative scentscapes are associated with cities. Cities have their own specific style, and the right scentscape can bring to mind these strongly styled cities. Artist Hilda Kozári and perfumer Bertrand Duchaufour designed three different scent bubbles corresponding to three cities - Helsinki, Budapest and Paris. The scent bubbles contain Kozari's personal memories and experiences of the three cities in both olfactory and visual form. The scent landscapes bring back different memories, not only of certain places, such as the sea, parks, and architecture, but also of emotions related to people, life, and memories. In the chapter on scent marketing, I mentioned that there are perfumers who design fragrances inspired by cities such as Marrakech. 2021's exhibition Smell the Art: Fleeting Scents in Color in The Hague showcases the works of 17th century Dutch painters alongside the scents of the era in which the paintings were made. It's not some pleasant smell, the museum is showing the smell of the Amsterdam canals 400 years ago ..... excrement, waste and all sorts of dirt being dumped in the water , in a way that curator Ariane van Suchtelen hopes will allow visitors to really establish a connection with connection to the life and art of that era, building a resonance between a community across time through smell and art.

Figure 4.24 - Tania. -Bruggera, Untitled (Havana), 2000 (Image source: https://scentartnet.tumblr.com)

Figure 4.25 Carsten Holler, "Solandra Greenhouse" (2004) (Image source: https://scentartnet.tumblr.com)

At times, the powerful connection between smell and emotion is bridged through space, quickly placing the experiencer in a double whirlwind of emotion and space. Cuban artist Tania Bruguera's installation Untitled (2000) chose to lay a layer of rotting sugar cane husks in the dark, tunnel-like space of Cuba's former military prison, Fort San Carlos. Visitors struggle to navigate the pungent smelling floor, which the artist hopes will allow the experience to quickly create an emotional connection to Cuban history. Carsten Hölle r's artwork Solandra Greenhouse is filled with golden cup vines, a plant whose pheromones induce sentimentality, and with strobe lights that dazzle visitors, the installation hopes to recreate the dizzying effect of falling in love.

4.3 The health healing properties of natural scents

The fast pace of life in modern cities and the high density of urban spaces require more and more spaces with healing value in cities, and research has confirmed the

healing function of scent landscapes. In the field of spiritual healing of scent landscapes, more attention has been paid to the association between scent and health. On the one hand, it is from a health perspective that the public health movement, which began in the 17th century, has designed urban odorscapes (see Chapter 6).

4.3.1 Design suggestions for scented gardens

Xiao Jieling proposes a design approach for plants and water features in the city. Aromatic plants such as roses, jasmine and lavender, in addition to visually shaping spaces and providing shade, can also olfactively mask negative smells and provide relaxing and deeply affecting health scents. Aromatic plants occupy an important place in Japanese and Chinese garden art, and Buchbauer (1928) argues that in some clinical practices of aromatherapy, the scents of aromatic plants are thought to have therapeutic properties, such as lavender's ability to reduce stress and calm people. Many studies, such as Classen's, have found that plant scents can have a positive effect on human physiological, psychological and social behaviour. The clean and fresh smell of water in cities can also have a positive impact on people's experience in urban spaces, and water features can also purify the air and change the microclimate by increasing humidity, lowering temperature and changing wind speed. 1989, Booth (Booth) argued that while European cities have historically used fountains extensively as urban landscape landmarks, the main purpose of water features in modern cities is recreation, irrigation and masking traffic noise. In the case of Sheffield's Golden Mile, the water features along the route provide a continuous scentscape, "sometimes you can smell the chlorine in it ..... to be fair, it's a clean smell." Part of the water feature attracts people close enough to interact with the water, and people touching the water body directly and smelling the water feature distracts from the bad smells in the environment, thus indirectly improving people's perception of the city.

Healing scent landscapes should likewise consider the local social and environmental context. The selection and location of aromatic plants and water features should take into account local cultural activities, as well as temperature, climate and seasonal variations. xiao Jieying argues that this poses a challenge for designing scentscapes for cities in different regions with different climates. In some countries, healthy odorscapes can be socially acceptable, but in countries such as the United States, for example, there is widespread opposition to the presence of large-scale

aromatic odors in urban spaces.

Xiao Jieying offered some suggestions for designing aromatic plants and water features. The first is to choose the appropriate type of aromatic plants and water features, the designer needs to know the local plant species, growing conditions, scents and flowering periods, the second is to design at a human scale, focusing on the distance + intensity + boundary principles, i.e.: the distance between the experiencer and the scent source, the intensity of the scent, and the space where the scent is distributed. This last item will determine the possible interaction between the experiencer and the odor source. For pedestrians, a recognizable dominant odor can mask other negative odors while also serving as a characteristic odor marker to create an impression. Different types of boundaries can limit the spatial distribution of odors. The integration of aromatic plants and water features with people and spaces in complex urban environments requires consideration of the human scale and the form of the space. Human behaviour and the experience of other senses should also be taken into account. As described in Portelli's view, design activities cannot be limited to scent; other senses such as sight, sound and touch also determine the quality of these landscapes.

In the case of Millhouses Five Senses Garden in Sheffield, communality and health are the two main features. The park's entrance information board states the plant species planted, including mint, oregano, basil, lemon balm, parsley, rosemary, thyme, sage, chamomile and lavender. Henshaw suggests that it is often easy for people to overlook the scent environment during their scent experience, so such an information board is quite useful in reminding people of the presence of their surroundings. The core of the garden is a semi-open space surrounded by shrubs and trees, with roses and herbs surrounding the park's inhabitants of all ages and backgrounds. There are no physical boundaries to the garden and the plants on the periphery are no taller than a person's height, giving it a more open feel.

4.3.2 The formal elements of healing scents

Urban streets and other spaces are often designed for the movement of pedestrians rather than for the body, mind, and place to establish a more easily established relationship. Roger S. Ulrich (1983) and Rachel Kaplan (1989) studied the healing experience of rural landscapes and attempted to use them as a reference for the design

of urban healing spaces, which are increasingly important in life due to the highly stressful nature of modern life. Healing landscapes have been proven by psychologists to have effects such as relieving stress and promoting concentration. Kaplan further proposed four elements of urban healing landscapes: being away - giving the impression of being away from the city, fascination - the ability of the landscape to attract attention, and extent - the ability to provide a large enough area to provide a healing experience. extent - the space large enough to provide an immersive experience, and compatibility - the matching of the environment with human needs and expectations.

Much of the early research on healing landscapes focused on the visual aspects and neglected the involvement of the other senses. Payne (2008) raises questions about the visual-dominated design approach through her study of the healing capacity of Sheffield's urban parks, and she argues that the perceived level of soundscape has a significant impact on the healing capacity of urban spaces. However, research on odour has been slow to progress. Victoria Henshaw argues that this does not mean that scent is of little significance in healing landscapes, rather she investigated perceptions and expectations of urban scent and demonstrated that cities tend to leave a negative impression of scent, but that the scents people expect are mostly associated with the natural smells of the countryside.

Plants and gardens

Plants in cities have a unique and important aspect in terms of air quality, heat island effect, visual colour and spatial form. Urban scent landscapes associated with plant scents include two scales, the first being small-scale scent landscapes, the source of which is often small-scale plant landscapes such as street trees and plant baskets. The second is urban-scale parkland that provides an immersive and healing experience. The first scent experience is often unexpected, with short-lived increases in scent intensity drawing attention and creating a positive impression of the place.

The vehicle for most healing scent landscapes is a garden of plants and water features, with healthy plants used as elements of scent design embodied in spaces of all scales and types. In many countries, botanical farms and theme parks attract visitors during the flowering season, such as the flower fields of Furano, Japan and Grasse, France. In more cases, aromatic plants are planted in private gardens and indoors and do not have an urban public character. Many cities in China are beginning to use aromatic plants as a way to improve the urban air environment, an initiative that enhances

people's quality of life. Aromatic plants can create spaces that people want to visit and stay in..

Figure 4.26 Left: Rehab Park in Cleveland, Ohio; Right: Rehab Park in Chicago (Image source: Therapeutic Landscape)

Plants with special fragrances can be planted in gardens designed for young people to help them interact with nature, both actively and passively. In a rehab garden in Cleveland, Ohio, large plantings of lavender entice children to interact with the plants and be in the presence of pleasant aromas. When designing a scent landscape for a wheelchair patient, consideration should be given to the height at which the patient's hands and nose are located, and the relationship of the body to the landscape. For example, the planting device designed by architect Geoffrey Rausch in the Buehler Enabling Garden in Glencoe, Illinois, allows wheelchair users to get their legs underneath the trays and get closer to the plant trays more easily.

city waterway

Victoria Henshaw's interview similarly refers to the healing value of water features such as rivers in cities in general in terms of scent landscapes. Urban water features are likewise divided into two scales, small-scale urban installations that provide fresh scent on a small scale, and major bodies of water such as rivers or canals that improve the overall scent environment of the city on a large scale.

Unnatural odor

In organising her scent walks, Victoria Henshaw has found that some unnatural environments in the city can provide equally high quality healing experiences. One

Londoner has mentioned in interviews how the smell of ancient buildings has had a psychological detoxifying effect on him. Markets in the city continue to be loved for their smells, despite the complexity of their smells, including vegetables, fruit, fish and cooked food, and even the smell of public toilets. The smell of cafes is also relaxing

4.3.3 Design thinking challenges for healing scents

However, differences in individual perceptions of scent also present some challenges. When designing a healing scent landscape, scents that create a negative impression on some patients may instead serve a similar purpose to healing. Healing gardens designed for cancer patients should avoid overly scented flowers and plants, as people undergoing chemotherapy can be unusually sensitive to strong aromas, but this is not an absolute rule; for example, in the rooftop garden of a cancer treatment facility in Seattle, the introduction of odors instead enhanced the healing effect of the garden, due to the selection of scented plants that could only be smelled strongly when very close. Some city dwellers surveyed by Victoria Henshaw felt that flower scents in the city could trigger allergic reactions, or be distasteful to some people. This may be due to the 'false sense' that the scent of flowers in the city is not the scentscape that it is perceived to be, and Elliot (2003) argues that the scent of flowers in the city is caused by deliberate design and manipulation in the commercial sector, similar to the smell of bread in supermarkets, which is perceived by some as an unnatural environmental alienation.

However, as urban population densities increase and the demands on urban spaces become more complex, the existing healing scented landscapes in cities will become more crowded and of lower quality as a result. Aside from plants and water features, there are not many healthy scent options that can be used in design. Since healing landscapes are often designed for people who are more mentally and physically vulnerable, the use of scent needs to be used with even greater care. In contrast to innovative design, healing scentscapes are widely available in society, especially in nursing homes, hospitals, retirement homes and public spaces in cities, where the healthy scent that scent can provide largely enhances the quality of urban spaces. The author believes that healing scent landscapes can have great scope in the field of mental health, and in fact, many cases of scent landscapes have healing properties.

Chapter 5 Behavioral Memory Marketing in Urban Scentscapes

Scented place marketing uses scent as a tool to create impressive places with the aim of increasing the awareness of the place and promoting consumer behaviour. 2007 research by L. Mossberg highlights the importance of the physical environment in the consumer experience of tourism and focuses on the stimulation of users by the five senses. 2015, Dominic Medway (Dominic Medway) explored the relationship between scent and place marketing in a cursory manner. Dora Agapito (2015) touched on the importance of sensory ratings in the tourism experience through interviews with tourists, where sight, hearing and smell were ranked as the three most important senses.

The bodies and behaviours of people in cities determine how people interact with space and scent, and therefore the form of scent and space determines the relationship between the body and it. The field of commercial marketing is quite concerned with the impact of marketing tools on behavior for explicit communication purposes. On the other hand, behavior is also part of human memory, and therefore, odor-triggered behavior can also produce memory and cognitive differences in psychological terms. Urban flexible boundaries must also take behavior into account, otherwise changes in spatial form do not necessarily lead to flexible boundaries. The topic of odor commercial marketing focuses on odor behavior and its relationship to deep memory perception.

Placemaking

Over the last half century, placemaking has become a strategy for many cities in terms of spatial environment optimization. The creation of urban landscapes that make a lasting impression is then the expectation of city administrations, architects and citizens for urban spaces. Until the beginning of the 21st century, interdisciplinary academic exchanges between neuroscience, psychology, and marketing research contributed to the rapid development of scent marketing. When evaluating a travel experience,

consumers are most concerned not with the product or service itself, but with the way it is consumed. The tourism and leisure industries are focused on enhancing the consumer experience scenario, where a comprehensive focus on the human senses is an important research direction to keep the industry competitive.

An asset (asset) is a resource that someone owns. Assets can generate positive economic value. For example, a brand is an intangible asset. In the field of sociology, Pierre Bourdieu introduced the concept of capital to deal with the sum of shared and communal resources. Social capital, on the other hand, comes from the resources generated by a cluster phenomenon associated with a particular community, such as a place, or symbolic capital.

Social capital and symbolic capital are translatable to each other, and the symbols used by symbols help people organize and talk about their experiences and enhance behavior. Symbolic capital as an understanding of social capital is a powerful tool for place branding strategies.

Scent Marketing

In 1973, Philip Kotler studied odor as a marketing tool in service environments, playing the role of a stimulus element in the SOR model that can respond to how environmental stimuli affect behavior . However, most of the research in the 1990s focused on the passive presence of scent in places, and scent was not treated as a true design element during this time. In contrast, in the field of practice, experiments and investigations of scent in retail and service industries have been steadily conducted, and in the service landscape, researchers have continued to study the role scent plays in it.Thomaselli in 2006 listed scent marketing as one of the top ten trends for the future, and research into the mechanisms of how scent enhances the customer experience process will help the future of business.

Service Landscape

Service landscape is a concept developed by Bernard H. Booms and Mary J. Bitner in 1981 and refers to "the environment in which services occur and in which buyers and sellers interact, and which has physical goods that enable the performance and communication of services" It is also the non-human element of the environment in which the service act takes place, and aims to explain people's behavior in the service

environment in order to enhance the quality of the service.

Experiences are considered to occupy a central place in social development, second only to goods, goods and services, and the Swedish scholar Thomas O'dell proposed in 2005 the use of experience landscapes to extend the concept of service landscapes already present in tourism, aiming to emphasize that tourists undertake trips with the aim of experiencing the environment rather than using services and production. Scent marketing, as a branch of experiential marketing, provides consumers with emotional, cognitive, behavioral, and value attachments.

In the 21st century, scholars such as Graham M. S. Dann, Thomas Odell, Mossberg, Tim Edensor and others have studied the connection between scent and placemaking from a tourism perspective. Luxury brands and perfume brands invite designers to design scent installations and brand stores to create scent personalities, trying to leave a unique "fingerprint" on consumers' minds through unique scents. Urban design scholar Victoria Henshaw explores how scent contributes to the construction of urban identity, based on the strong connection between scent, signal processing in the limbic system of the brain and emotion.

Based on the different types of scents used in the scent marketing process, Kevin Bradford and Debra Desrochers (2009) classify scents into three categories: marketing scents, product scents and environmental scents. This chapter builds on this categorisation by combining odours with their associated main topics, exploring what perspective the researcher is starting from within the idea of space, to save how odours are involved in the creation of cities and places, and how they interrelate with human psychology and memory to create otherworldly experiences.

5.1 Public participation in service landscapes

Marketing scent refers to scent that is used as an explicit promotional tool, such as the scent in a new car, or the baking scent in a resale home. Marketing scent is designed to attract the attention of potential consumers; it is not the product's own scent. Marketing scent as a marketing tool usually tries to find some connection between the product and the scent, for example by deliberately emitting the scent of the product itself on the device, or by establishing some connection between the brand and the scent.

Research in the field of marketing scent focuses on the association between service

landscapes and scent. For marketing scent design, the selection of scents focuses on narratives, either the scent evokes certain emotions and memories that are thus associated with the marketing object, or the scent is derived from the scent of the product being marketed, manipulating potential consumers' desire to buy by releasing a synthetic, similar scent in an advertising-worthy space. The practice of marketing scent is mostly initiated by commercial companies, and the venues are usually public transport stations and commercial spaces.

The release and storage of marketing odors must be done with the help of devices, and for marketing purposes, the diffusion of marketing odors is concentrated in public spaces; therefore, the form and spatial location of public devices as carriers and storage containers for marketing odors are issues that designers must consider. Henshaw proposes that motivation is one of the three interrelated factors in odor production, and that deliberately created odors are usually used to attract the attention of potential consumers, and that such odors usually diffuse locally around a source. Sony, Nike and the cosmetics chain LUSH use product-related scents to create a shopping atmosphere and attract customers to the store. In the field of advertising, JCDecaux has also conducted a number of outdoor scent advertising experiments in recent years.

Marketing scent devices in public spaces are divided into point-like and face-like devices depending on how the scent is diffused. Spot devices require users to interact with the device, which releases the stored gas at a certain location, while surface devices release the odor indiscriminately to passers-by in a small open space, the difference being that in the former scenario the user actively acquires the odor, while in the latter the user passively absorbs the odor.

5.1.1 Spot odor marketing device

Figure 5.1 Dotted scent marketing installation. Left: Trisenx's scent dome (Image source: https://reedpacificmedia.com/product/scented-domes/); Middle: property ad in a commercial area in Shanghai (Image source: https://www.jcdecaux.com/blog/ smells-ooh-power-scent-advertising); top right: faux baked potato ad for McCain in the UK (Image source: Bloomberg); bottom right: McDonald's chocolate cake ad in Brisbane (Image source: https://www.jcdecaux.com/blog/smells-ooh- (power-scent-advertising)

Spot scent marketing devices include creative billboards and a selection of commercial space marketing devices. SpaceScent has the proven technology to manufacture small scent diffusion devices. The unified nature of bus stop advertising space, its presence throughout the city and the large number of people moving through it make it a prime candidate for scent marketing practice. UK food processing company McCain spent £1.4 million on a series of scent ads, enlisting ad agencies PHD and JCDecaux to perfect them, encouraging potential customers to buy the product by using a giant artificial baked potato at a bus stop as an advertisement that emits the scent of baked potatoes when someone passes by. Similar examples include the McDonald's chocolate cake ad on the streets of Brisbane, the Scenic Scent Experience House for the Shanghai Wanxiang City property ad. and the invention of a scent dome by Trisenx in Georgia, USA, which provided a continuous scent inside a glass enclosure under which users could experience the scent of an online product simply by standing under it. in 2006, advertisements for milk companies at bus stops in San Francisco, USA, used scented substances that smelled close to biscuits, and these lasted only 36 hours before the city forced them to be removed. Among the groups that protested were people worried about obesity and diabetes, people who thought they could cause allergic

reactions, and advocates for the homeless who feared the imaginary cookies would leave the poor hungry.

5.1.2 Faceted odor marketing devices

Figure 5.2 Faceted scent marketing installation, top left: scented toothpaste ad placed by Colgate in Hong Kong sprays the smell of fresh toothpaste on the street (Image source: https://www.jcdecaux.com/blog/smells-ooh-power-scent-advertising); bottom left: gin aisle at London's King's Cross station in The aisle is filled with the scent of cucumber limoncello (Image source: https://secretldn.com/hendricks-scented-tunnel/); right: a turf scent ad for a DIY brand in Vienna (Image source: https://www.jcdecaux.com/blog/smells-) ooh-power-scent-advertising)

Faceted scent marketing installations are located in access spaces and commercial shops, London's King's Cross Station Ground 100m Gin Scent Channel combines visual design and scent design to allow every passing passenger to smell the rose cucumber scent of the new gin.In 2018, Colgate made bus stop signs in Hong Kong emit the fresh scent of mint, with the gas continuously released through nozzles to the bus stop. Bus stop ads in Vienna that emit the scent of mowing and logging aim to sell the DIY brand's relationship with nature.ScentAndrea designed the smell of fresh coffee at gas stations and tripled coffee sales by doing so. Using scent can increase sales by at least

10%.

Austrian scholar Bernadette Emsenhuber discusses the relevance of scent communication, advertising and human-computer interaction on a subconscious level, starting from a psychological perspective. In 2009 she introduced the concept of Olfactory Interaction Zone (OIZ), which can be a few square meters in size or cover a scale of several square kilometers, where consumers can smell a certain odor and use it as a signpost to a space or place. By precisely defining the extent of the olfactory interaction zone in the future, the advertising industry may be able to respond to an individual's emotions and release the appropriate gas to achieve precise two-way communication of scent.

5.1.3 Conceptualized scent marketing device

Lindstrom's 2005 study found a strong relationship between emotion and scent, where consumers may be influenced by scent at a subconscious level and manifest it in their shopping behaviour, without consumers even having to be aware that they are responding to this environmental stimulus. He analyses how scent marketing has been used to build the brand identity of Singapore Airlines. The perfume used by flight attendants, the infused scent of hot towels distributed before take-off and a fragrance called Stefan Floridian Waters used in the airport combined to help the airline connect with its customers. Hulten (2011) suggests developing a multisensory brand experience concept that engages people through their senses to generate customer value, experience and brand image. Scent branding consultancies such as ScentAir, Air Aroma, 12.29 and Brandaroma create scent landscapes for service environments of retailers, hotel chains, gyms, airlines and banks.

In an urban context, marketing scents can be used to promote place scent identity, and in some guidebooks, deliberately designed scents are used to enhance the visitor experience of visiting urban spaces, often as visual adjuncts in this case, and therefore different from the place-making of environmental scents. For example, the guidebook for York, UK, refers to offering visitors "the smells of the city", horse hair, grass and fruit wine at racecourses, and tea and cakes for afternoon tea, as a way of enhancing the visitor experience.

5.2 Scent brand development integration

Product scent refers to goods where the scent itself is the product, such as perfume. Commercial companies associated with product scent tend to focus quite heavily on the shaping of the scent itself, and because of this, there is no shortage of grounded explorations and collaborations with art institutions for exhibitions or installation design in this field. The reason why architects and artists have so many opportunities in this field is that unlike marketing scents, which require efforts to create a narrative and memory link between the product and the marketing scent, the product scent itself represents the product, and any object that is tainted with the product scent has already naturally established a strong connection with the product itself, which certainly leaves plenty of room for designers to design.

Some brands rely on the creation of their own scented products and scented identities to enhance their brand positioning and make an impression on consumers. Shops and hotels use scents purposefully to create service environments, but at the same time, of course, these scents can spill over into urban spaces and "pollute" the surrounding urban environment.

5.2.1 Scent design development

Figure 5.3 Left: The scent installation on the exhibition site of The art of scent represents the presence of scent through balloons (Image source: www.frameweb.com) Right: The exhibition site of Dufte! Der Geruch der Architektur attempts to establish a connection between architectural space and scent. (Image source: blaserarchitekten.ch)

The scent marketing, installations, exhibitions, and new product development around the perfume industry have always been steadily and rapidly growing.Quynh Tran reported in 2016 that new opportunities for the perfume industry come from the modern inheritance of the incense burning tradition in European churches, which is

closely linked to the birth of perfume, and today, Berlin-based perfumer Marie Le Febvre has drawn inspiration from incense to develop the Urban Scent line. In addition, the most advanced thinking in the perfume industry sees perfume itself as art, thus sparking inspiration about perfume design and installation art. Some fragrances are deliberately reminiscent of certain urban landscapes, trying to find a marketing link between scent and memory of place; Ava & May's fragrance is named Marrakech, with scents reminiscent of scented candles, spice stalls in souks and lively music. Perfume companies are also happy to collaborate with artists and architects to explore the marriage and future of scent art and perfume. Dubai-based design studio Loci used eleven perfumes from Perfumery & Co. in an installation at the Dubai Mall to present the possibilities of combining perfume and art.In 2021, the exhibition The art of scent at the Museum of Arts and Design in New York brought together thirteen perfumers whose fragrances were used in six Glithero-designed installation rooms to express different trends in contemporary perfumery.From August to December 2016, the exhibition Dufte! Der Geruch der Architektur in Basel explored the connection between architectural space and scent from the perspective of perfumers. However, while the perfume industry has contributed many examples of scent landscapes, there is little in the field of theory, as its dependence on commerce is too strong, and on the one hand, each one works in its own way, making explorations that lack systematization and depth despite the large total, and on the other hand, the understanding of scent is stripped from the narratives of delightful perfumes, and there is a lack of perception and understanding of everyday scents.

5.2.2 Public space integration

City-related scented souvenirs are a means of product scent in an urban context, as the scent of this product is not motivated by a sales pitch, but can still be associated with city scent because consumers have an implicit association with the product's scent and the city in which it is located. For example, many souvenirs from the city of Parma, Italy, are scented with violets, such as the perfume Acqua di Parma, due to the abundance of violets grown there. However, this can also lead to certain scent stereotypes, which have parallels with superficial, top-down place marketing, where marketing agencies use stereotypes to view cities, and Kate McLean's scent walks in Amsterdam confirm the existence of rich scent messages hidden in cities under

stereotypes.

5.2.3 Sensory Experience Immersion

Dora Agapito discusses the importance of the senses in the travel experience from a marketing perspective; at some point, product scents are difficult to notice due to the suppression of the visual over a person's other senses. The Dark Restaurant in Brazil aims to deprive customers of sight and amplify the other senses, transforming the act of dining into a new sensory experience.

The scents of products on the street have a postmodern character - eclectic, random, individualized - and on Lexington Avenue in New York, which Robert Huey Wright has called a street of the senses, Blind Jerry captures the smell of pizza pies, knives and forks, hot dogs, the smell of newsstands, the heat of corner vendors pretzels, the touch and smell of flowers from a florist, the smell of beer from a Clancy's bar. The abundance of product scents that permeate the city give the visually impaired a different impression of scent.

Tim Addamso argues that the product scents of the city offer a more lasting immersion that fits right in with the backpacker's quest for unusual sensory experiences. While upscale tourist spaces offer familiar, predictable, and comfortable sensory environments, backpackers reap the rewards of experiential walks with adventurous meaning, product scents that are completely heterogeneous from their past lives, and markets that emanate scary and delicious smells and cluttered scent environments that help these young travelers accumulate cultural capital.

5.3 Placemaking for environmental odors

Ambient odours are not emitted from products, but are odours that occur naturally as a result of some form of technical intervention or as a result of some act or process in the service environment. Ambient odors exist as part of the retail environment, such as the smell of coffee in a coffee shop. A further classification of ambient odours requires us to place the consumer experience at the centre of the discussion, that is, whether the ambient odour itself contributes to a change in the consumer's subjective awareness, in one case as an objective background only, mostly imperceptible to the user, and usually including the odours of various manufacturing processes and by-products of the service process, and in the other case where the ambient odour is the result of deliberate design,

imperceptible to users but influencing their behaviour at a subconscious level. The latter is, to some extent, also the focus of controversy regarding the ethical issues related to human manipulation in the context of odour marketing.

5.3.1 Witnesses to urban events

The background knowledge of odor for urban marketing can be fully understood by studying the process of odor production, reception and consumption. There are three elements of odor production: motivation, range, and duration. Based on Engen's research that the brain receives odors that may be associated with past experiences and therefore evoke memories, psychological research has shown that we have long-term accuracy in odor-induced memories, with middle-aged adults in their fifties clearly recalling the smell of homemade soda from forty years ago when smelling a new soda drink. Melissa Knopper's research found that the association between odor and memory can be mapped to the city's past and present. In addition, olfactory reception and processing occurs in the area of the brain that governs emotion, meaning that smell is more emotionally touching than other senses. From time to time, people translate city smells from different sources into location-specific memories, such as MSG plants, cookie factories, and soap factories.

When places can be considered as service products or service systems, the concept of service landscapes can therefore be extended to urban areas. However, since urban spaces have no physical boundaries, temperature, wind direction, microclimate and countless unpredictable events are likely to keep the urban scent environment in a chaotic, discontinuous state, and the different purposes and strategies of private and public spaces in terms of scent place-making will approach this incomplete state, which is, in fact, the dilemma of urban scentscape design. Unintentionally created environmental smells may be in all corners of the city, or they may become a tourist resource in certain towns. The former includes the smell of restaurant extracts or sterilised liquids, while the latter is associated with industry, where the smells of factories and other businesses may give urban spaces an odorous character, such as the rich chocolate smell of the Lyons factory in Brook Green, London.

5.3.2 Regional identity enhancers

Figure 5.4 Left: Perfume fountains in the Southern French perfume town of Grasse continuously emit the characteristic local scent of lavender perfume to their surroundings (Image source: https://www.flickr.com/photos/sandraherrmann/2775023693/); Right: the factory in Cheerios, Buffalo, USA, emits the city-wide The scent of Cheerios. (Image source: http://wikimapia.org/12904301/General-Mills-Buffalo)

Special odours associated with urban spaces may contribute to the urban narrative around smell, and a "city of smells" would give the city an unparalleled special identity. The associated scent must be recognized by citizens and exist on a wide enough scale and for a long enough period of time to become a 'scent brand asset' for a city or region, for example, the perfume town of Grasse in the south of France, home to many perfume brands, has been created as a scent landscape themed space and designed around this theme A city-wide scentscape was designed around this theme. Meanwhile, many believe that the breakfast cereal Cheerios has become a scent icon in Buffalo, USA, where it is produced, and there is a popular call to consider its potential as local marketing.

Graham Dann et al. examine some of the patterns in travel writing about the description of urban odorscapes from a tourism perspective, for example, urban odorscapes tend to be portrayed far more negatively than rural odorscapes. Only about 20% or so of odor compounds are considered pleasant by humans, and therefore most odors in cities are uninviting. However, for those who are regularly exposed to certain odours, even bad ones become progressively less noticeable and offensive, and discussions about whether certain odours associated with cities should be retained or eliminated are in fact debates about urban identity; for example, in 2009, a proposal to

install odour control towers on an Edinburgh distillery divided opinion among nearby residents, with some arguing that brewing and distillation smells are an important part of Edinburgh's odour identity, while others apparently find it pungent and unacceptable.

5.3.3 Environmental Experience Place Aesthetics

From a spatial perspective, there may be power boundaries in the creation of places for urban environmental odors and different effects of odors on individuals; the boundaries between urban public and private spaces are not clear in terms of odor environments, and the same odor may be positive for some people and unbearable for others. There are cultural differences in the perception of odors in different societies, which is more important in cities and neighborhoods with complex cultural backgrounds, and differences in odor impressions by age and gender, and in some cases, odors may even cause physiological reactions. Henshaw's solution to the ethical controversies that can arise from the creation of ambient odor places is to market and communicate ambient odors that are already present in urban spaces and are liked (or at least not negatively smelled), rather than deliberately creating an imposed, alien experience of smelly urban places, thereby avoiding technical and ethical challenges.

It is worth noting that, from an experiential urban marketing perspective, the scent map mentioned above and its means of collecting data, the scent walk, are ways to increase awareness of the scent of the urban spatial environment. Scent walks can be guided route walks, the pursuit of a visual feature, or imaginative thematic tours such as David Inglis and Mary Holmes' 2003 ghost tour. Patrick Devlieger's 2011 research led him to design alternative guidebooks and walking routes for people with sensory impairments in Leuven, Belgium, as a means of enhancing their urban experience. This unexpectedly demonstrated the potential of scent for people with sensory impairments (especially the visually impaired) in terms of their experience of urban spaces.

Adriana Campelo draws on the sociological field of Bourdieu's research, using autobiographical ethnography and phenomenological methods, focusing on place perception, explaining the senses, sensory insight and experience in order to investigate the links between place and social capital, and proposes sensory capital, exploring sensory capital, place branding through a study of the Chatham Islands in New Zealand the link between. His research argues that place experience includes sensory capital, and that sensory capital when combined with symbolic capital will contribute more to the

expression of place aesthetics, in addition, this framework can help researchers understand how communities and people identify, value, interact with and experience place. Surveys of respondents leaving and returning to the Islands revealed that the majority of sensory images responded to people linking sensory experiences, emotions and place to form a shared aesthetic that sustains a sense of place. And sensory experiences, including smell, provide a way to connect people to the spirit of place.

Chapter 6 The cultural and historical heritage of the urban scentscape

While the culture, history, and social changes of a city are reflected in its elements, the idea of smell as a carrier of historical information about the city has not been proposed until the last half century. Culture, as the spiritual element of the flexible urban boundary, determines the meaning of the flexible boundary. Related to this, odors have been widely proven to have an important value in the formation of urban space, and studying odors in history can also help improve the understanding and experience of urban change.

The objects of research in the field theory of odour cultural heritage can be divided into three areas: urban history, social life and exhibition displays. The study of urban history is mainly related to the public health movement that changed the spatial pattern of the modern city, a movement that aimed, among other things, to change the odour properties of urban spaces that no longer adapted to the high concentration of population, the emergence of regionalised class odour spaces in towns and cities based on the decontamination of the infrastructure and, finally, the overkill of the movement and the occurrence of the urban public space odor stripping. Research in social life includes the cultural heritage of odours in the field of religion, social festivals and everyday life, divided into historical archaeological and analytical studies of extinct odours. Finally, there are advances in the field of heritage exhibitions and displays, which are based on the research results and research methods of the two previous fields, new demands and calls for research and identification of existing cultural heritage, as well as institutions and individuals researching methods of conservation of odor

heritage, and finally exhibitions related to odor heritage around the world to give the public a channel to understand and recognize odor heritage from a social level.

6.1 Public Health Campaign for Urban Odour

6.1.1 The Smell Fear of Urban Infrastructure

Alain Corbin and Patrick Süskind are important scholars of urban odour and the modern urban decontamination movement. From the Middle Ages to the pre-modern period, European cities were often described as "smelly places". Garbage, excrement, and waste products were disposed of in the streets or discharged into rivers after accumulation and fermentation, and the rivers of most early European cities were in fact very close to sewers. The seventeenth-century English Romantic poet Ben Jonson's The Famous Voyage describes a trip up the river by two companions who encountered a cascade of filth, even some deposited directly into the river from overhead toilets . As Europe's population exploded in the eighteenth century, the burden on cities increased and the most crowded urban centers became de facto "odor landmarks." London in the midst of the 1665 plague was filled with germ-laden air, and odor historian Reynolds suggests that the people of this period used fumigation to combat the threat of airborne germs while inadvertently filling the air with them. simultaneously inadvertently filled the air with aromatic odors that became associated with traumatic memories of the plague, and in the event of a similar urban stench in the future, odor memories were turned on, reminding people of the connection between clean smells and stench and this plague. Of course, this idea simultaneously taints the meaning of many pleasant scents.

Rivers and sewer facilities in cities are important infrastructure objects for historians studying the history of urban odors. This stench that spread throughout the city prompted the emergence of medical topography (medical topography). Medical geography originated from the political topography used by rulers during the mercantilist era to survey the resources of the territories they owned. Seventeenth-century scholars began to create medical topography to mark the relationship between odor, disease, and urban space. Environmentalists in the eighteenth century sought to demonstrate the environmental characteristics of disease occurrence by collecting a large number of measurements related to air purity. Driven by medical publishers, medical topographic maps recorded a wealth of detail related to urban conditions and

environmental changes of the time. This method continued to be used in medical research into the twentieth century (Figure6.1). Influenced by this, British disease historian Mary Dobson's Contours of Death and Disease in Early Modern England explores the spatial distribution of deaths triggered by stagnant bogs in southeast England (Figure6.2). The 'bad air' that pervaded the vicinity of the bogs and stagnant water and the ensuing malaria affected the health of the inhabitants, and Dobson uses extensive medical topography to represent the rich vocabulary of odours and the accompanying diseases that occurred. She describes her research as "a hodgepodge of dangerous odors, an archaeology of miasma, a traceability of excrement, a hierarchy of fishy secretions, a mud pile of oozing fluids, an all-day mix of poisons and deadly vapors. We are confronted with 'a thousand places' of disgusting air, stagnant water, rotting mud, rotting huts, filthy cities, sewage of rotting flesh, fetid streams, corrupt alleys, and filthy cacophonous corners." The smells that come with this passage can help the reader imagine the general appearance of historical smells and the changes that occurred.

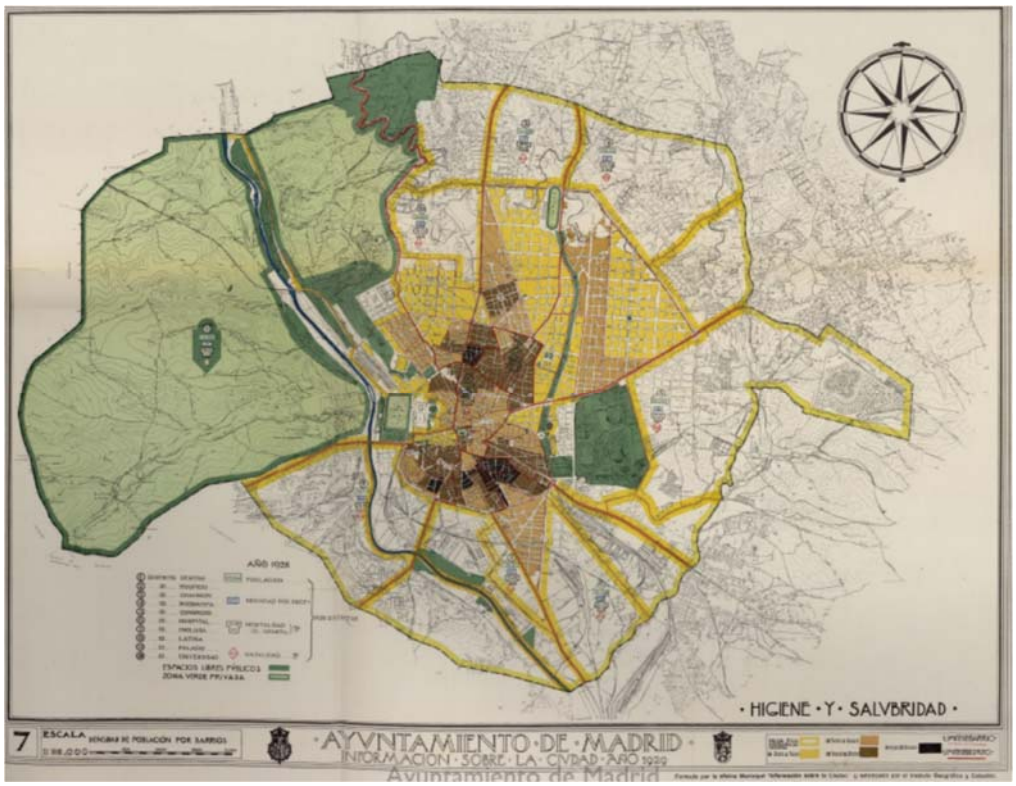


Figure 6.1 Urban health zoning in Madrid in 1929 based on the quality of urban odors (Image source: Internet)

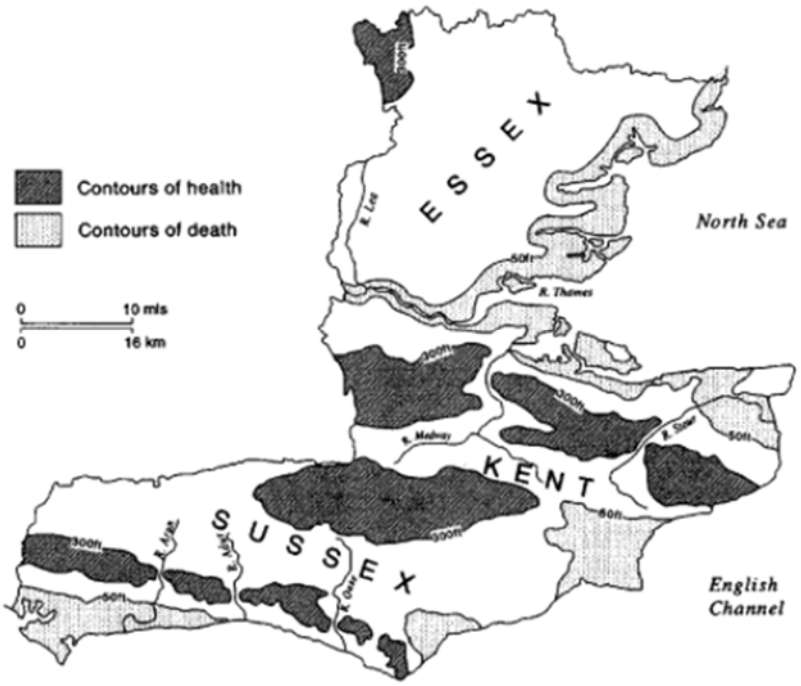


Figure 6.2 Dobson's mapping of the death and health divide in South East England. (Image source: Mary J. Dobson)

Prior to the modern era, sporadic urban odour decontamination occurred in Europe, often associated with political involvement. Roy Porter studied public health in eighteenth-century London and found the cyclical impact of the political environment's urban odour production. Some areas of the city that enjoy the emanation of good smells in the present may have stunk in the past. In the sixteenth century, Florence was known for its astonishingly transcendent cleanliness, and this may be attributed to the cleaning of the city's administrative areas by military service personnel. The English poet Samuel Taylor Coleridge referred to the fetid Rhine as "eau de Cologne" during his eighteenth-century travels in Cologne, yet half a century later, not only was Cologne free of the stench, but today cologne as a Chinese context of men's perfume is even more widely used. It is saddening to note that usually in history, after certain cities have undergone a shift in urban smells like Cologne, the description of the smell associated with the city tends to disappear altogether.

The modern urban decontamination movement began with what was perhaps the earliest recorded odor walk, conducted by Jean-Noël Hallé, the first president of the

French Public Health Association in Paris, on February 14, 1790. For about six months after the Revolution, Hallé encountered a series of stenches in the city. The recorded stench came from pollutants in the river. The meticulous documentation of this ten-kilometer odor walk marks the beginning of the European reformer's public health journey. Unlike subsequent odor reports that intentionally or unintentionally documented visual features, this report recorded only odors, deliberately omitting the visual impact of activities, and buildings. The perception at the time was that accumulated dirt in cities posed a health risk, and that sudden encounters with foul odors in cities often even caused a physical reaction. In the following nineteenth century, this cognitive bias and odorophobia associated with sanitary crises culminated in the European metropolis represented by London and Paris and became a public health strategy aimed at cleaning up and even rebuilding the city.

The first public health movement in history took place in early Victorian England. Sanitarians emphasized the relationship between filth and disease in order to facilitate the mobilization of the population. Fear of plague drove urban reform, and the early sanitarians believed that disease could be eliminated through a sound sewer system and healthy water. Thomas Southwood Smith, an English hygienist, believed that the miasma of corruption was the source of disease. Over the next century, these strategies for urban public sanitation were exported throughout Europe, North America, and the British colonies, sparking widespread changes in the urban environment. This public health movement set off a revolution that revolutionized cities, and the way future generations would perceive them.

These hygienists simultaneously promoted the extent of power's involvement in the urban odorscape. In many ways, sanitarians determined the level of social and living conditions of a given era. Chadwick discreetly exploited the conflict between perceived squalor and social order to prompt authorities to develop urban management policies through the de facto discriminatory practice of sanitary surveys.

Two cities - London and Paris - occupy a unique position in the history of urban odour purification.The cause of London's great stench, which lasted for two weeks in 1858, was the excrement of the city's inhabitants flowing directly into the Thames through the sewers, yet a prolonged drought caused the The Thames was extremely low and the filth emitted an unbearable stench during the heatwave. Historian David Barnes documents the authorities' swift announcement of an unprecedented public works

project to remove London's rubbish. Sir Joseph Bazalgette began construction of 83 miles of sewers to be enclosed in the Thames embankment and to drain the city's rubbish downstream at high tide. The project was completed in 1875 at a cost of £6.5 million. In contrast to London, the stench in Paris lasted for two months in 1880. Previously, the new sewerage system built by Baron Haussmann and Napoleon III in the mid-nineteenth century was an infrastructural boast for Parisians, starting with the 1867 Exposition, where guided tours of the sewers showed off the capital's highly developed, odourless sewage system, being routinely cleaned of excrement to suburban sewage treatment plants. So when the smell of Paris became unbearable after the sewage treatment plant in Nantes was temporarily shut down in May 1880 due to complaints from residents, Louis Pasteur favored the construction of a sealed pipe to carry the filth to the sea. The result, however, was that the city administration did nothing and the smell disappeared naturally, reappearing several times over the next two or three decades.

The establishment of the germ theory in the 1880s removed the association of odor with disease, and it in fact impeded the process of sanitary reform. several times after 1880 the stench of Paris ceased to inspire fear of disease, so the city's governing bodies did not take the opportunity to promote progress in the city's sanitation, but at the same time, odor and class were tightly bound together, and stench was at this time considered to be a sign of un a sign of civilization. The planning philosophy of Central Park in New York, USA, was also influenced by the urban public health movement. Central Park was designed because a group of sociologists and residents saw the need to design an open area to eliminate the smell of decay in the city.

6.1.2 The class space of urban regionalization

With the disappearance of the idea that odor itself was associated with disease, the threats it raised in society were transformed into social issues, and odor became a pretext for masking racism, exclusionary politics, and the stigmatization of others. David Arnold, a scholar of colonial history, writes, "Beneath the objective language of medicine and discussions about 'health science,' the position of European medicine was often highly subjective, reflecting the social and cultural biases of the era. " The

American colonization of the Philippines, which began in 1898, carried out the first public health program outside the West, and medical personnel of that time relied on descriptions of odors and squalid conditions to justify their discriminatory measures. and began to be emulated by other colonial powers in the 1920s. The urban public health program in the Philippines also determined the public health movement that later took place in American cities after the American medical personnel involved returned home.

The literature around the eighteenth century records a number of odorous landscapes of European cities. For the perceptive author, these smells were the perfect vehicle for expressing the environment and class in which the characters lived. The literature of Hugo, Balzac, Zola, and Dickens recorded many subtle smells, recording many of the details that appeared in the reports of the sanitary reformers of their time. Such smells lend a kind of "authenticity" to the works. Balzac, for example, writes at length in The High Old Man about the "stifling, musty, rotting" smell of Madame Vogel's dwelling, which seems to be not a home but a backstairs, a dishwashing room, a workroom. In this way the face of class society under the social Darwinism then in vogue is presented.

The colonial New World towns were expected by the colonizers, and it was thought that these new towns should have an odor advantage over the bloated and smelly European capitals of the same period. However, many colonial towns, in the course of their rapid development, also changed in smell to the urban slums of Europe that people left. Pamela Wood's study of odour in colonial Dunedin, New Zealand, shows that the city's gold rush, population growth and industrial development led step by step to a deterioration in the city's odour environment and public health qualities.

On the other hand, the odors of urban immigrant communities, because of their particular cultural attributes and origins, are equally suggestive of the division of urban spatial areas. Twentieth-century reformers, exploring immigrant communities, recorded impressions related to odors, and slums and working-class neighborhoods in various European countries were perceived as reeking of poverty and were the object of elimination for these reformers. Joseph Prichard of the Wigan Working Class Public Health Association drew on Chadwick's work and wrote about the grading of toilet quality in the Wigan slums in a report he submitted to Chadwick.

Scent scholar Jim Drobnick argues that the smells of particular cuisines can exist

as markers of difference, and that the new immigrant minorities who produce such smells offend the dominant sensibility by refusing to assimilate into the city's dominant group. The smells of ethnically charged cooking create a lived dilemma; on the one hand, these smells indicate one's self-consciousness of one's cultural identity and maintain cultural continuity, and on the other hand, these smells mark one's place and body as the Other, and opposition to and discrimination against the smells of the Other have become central to the politics of many urban communities in North America.

The formation of medieval cities was linked to the agglomeration effect of crafts and guilds, so they formed an olfactory landscape that corresponded to the city. Geographers Tracey Lauriault and Gitte Lindgaard proposed "odour cartography", meaning the spatial and geographical information contained in urban smells. Different regions, countries, urban and rural areas, neighbours and households, all have their own distinctive odours. Anthropological literature also mentions many non-Western examples, such as the odor culture of the Andaman Islands. Not to mention the odours of urban migrant communities and slums that have arisen since then.

By the early modern period, spatial distinctions made using odor shifted to the smelly city and the healthy countryside. As Klassen notes, "Generally, cultivated, controlled nature-fields, gardens, woods, and so on"-was considered to have a "pleasant, fresh odor." The odors of organic wastes encountered in rural areas are also more tolerable because they seem to be "a natural part of the cycle of life." "From the farmer's point of view," the odors of excrement were tolerable, even desirable, because they became the odor of the harvest. The twentieth-century perfume industry conceptualized the scent of the countryside, giving the perfumes it produced a suggestive introduction.

In their 1994 work on the cultural history of smell, Aroma, odor historians such as Klassen explored the "scent of the city", examining the perception of smell in the city, with a particular focus on the parts associated with the ancient world. The abundance of scent sites in the city actually creates a dynamic map of scent in the minds of people, allowing city dwellers to abstract the urban places of their daily lives through scent. There are distinct concentrations of scent around markets, food vendors, religious buildings, gardens and other green spaces. They also studied how certain areas of the city were distinguished from others by smells associated with activities, such as sports fields and barber shops. places associated with pleasant smells, such as bakeries, perfumeries, or gardens scented with flowers, began to be documented in the 17th

century. However, this study of urban smells can easily fall into a dichotomous perspective, that is, an excessive focus on odors and scents and a neglect of everyday smells in the city.

6.1.3 Odor stripping in urban public spaces

Since the eighteenth century, one of the purposes of urban planning has been to disinfect and clean up towns. The urban public health movement of the nineteenth century prompted modern cities to strategically isolate potential odorous pollutants. The modernist movement of the twentieth century used materials, design, and architecture itself to attempt to project a desirable odor-free appearance in the minds of city dwellers. The use of glass and glazed tiles on the surfaces of city streets and buildings was perceived to have a reflective surface suggesting their impermeability. Odorlessness is thus visually translated into architectural components and becomes a key to modernity. Anthropologist Martin Manalansan says: "Odorlessness, when the utopian myth of the modern city and the visual dimension of the skyline underlies it, obscures the more complex arrangement or logic of things."

With the completion of public health campaigns in most American and European cities, twentieth-century reformers turned their attention to industrial odors, of which smoky exhaust fumes received the most attention. The skies and streets of many cities were filled with toxic agriculture and people fled smoggy cities, prompting authorities to introduce policies regarding tobacco control campaigns. Throughout the twentieth century, serious air pollution events continued to occur, such as the deadly smog that descended on London in 1952, including the haze of mainland China in the twenty-first century.

In addition to industrial smells, the scent of the perfume industry has even suffered from the stripping of urban public spaces of their scents. Although the subway systems of Paris and New York were a source of inspiration for the perfume industry, the French Transport Authority even specifically commissioned a perfume called Madeleine to be mixed into the solution on the plot platforms. However, it is unlikely that a similar perfume movement will continue, as people soon began to tire of perfume out of the notion of odourless cities ingrained in their minds, and in some areas it even joined the list of pollutants. In addition to smoke-free zones in cities, some opinion leaders concerned with quality of life are now beginning to discuss the feasibility of fragrance-

free zones.

The scent stripping of modern cities has caused the disappearance of traditional scents in some cities with a long history. At the Jaipur Literature Festival in 2009, four Hindi writers bemoaned the loss of art, history and culture in cities like Jaipur and Kolkata under globalization and modernization, of which smell is a central component. Markets and bazaars in many parts of India have been replaced by malls and cinemas. Traditional Indian architecture and the smells (gandh) associated with it are giving way to a new order. They associate smells with history, and once India forgot its smells, culture disappeared with it.

Scent is absent from post-modern lifestyles, and the digital world brought about by television and the Internet has made it even less necessary for people to smell in their everyday environment. In fact, in industrialized modern China, renovating and erasing old markets and neighborhoods often means the disappearance of old areas and traditional ways of life, which certainly includes smell. It is possible to study ancient urban spaces and architecture according to old photographs and paintings, but it is difficult to leave us much first-hand information to reproduce or study when the smell is gone. Once a certain cut of history is gone, it will be forgotten forever.

6.2 Socio-cultural neighborhood ritual activities

6.2.1 Odor imagery in religious rituals

While visuals have dominated the glorious history of religion, the divinity of everyday life and the mystical atmosphere of prayer rely heavily on scent and space together to create it. Susan Harvey lifts the veil on Christian sensory imagery, where religious scents, whether incense, sacred oils, or aromatic antiquities, are a fundamental part of the daily lives of Christian believers, and where scent maintains an enduring religious ritual and connects the biblical world to their present and future lives.

Bodies, Behaviour and Space

In the religious world, odors effectively serve to distinguish between space, object, and act. The subjects associated with odors include bodies, actions, and spaces. The regulation of morality, the interpretation of mystical phenomena, and everyday prayer drive the need for religion to be powerfully eloquent on a spiritual level, and outside of

religious texts, architecture, ritual, and so on are important in this regard; an impressive religion must leave an indelible and special impression on the senses, and the senses have an important place in this process. Using the example of 6th century descriptions of Christian miracle stories, Reynolds argues that the sweet smell that appears at the time of the descent in the story suggests the authenticity of the miracle. Research by Klassen and others confirms that the presence or absence of odors largely shapes the experience of devotees and the meaning of religious practice, both at the individual and collective levels. Positive odors produce close associations with individual moral character, beliefs and ideas, and even the presence of God; conversely, negative odors can mean death, paganism, and destruction. Among different religious traditions, odors serve as an invisible part of ritual and ceremonial spaces to cleanse, purify, heal, or herald communion with the divine. Scent pervades religious practices and is an important aspect of interpreting the various meanings of religion.

Figure 6.3 The ceremony space at the University of Toronto Multi-Faith Centre allows for a quick change of air to accommodate different religious ceremonies (Image source: University of Toronto website)

Contemporary religious studies has also explored the use of scent in space. The University of Toronto Multi-Faith Centre, designed by Moriyama & Teshima Architects, was built in 2007 to provide a place for the University's diverse spiritual needs and interfaith dialogue and research. Within its de-decorated neutral spaces, different mystical atmospheres are created through the distinction of scents. "We realized that there are artifacts and elements of the liturgy that are very sensual, whether

it's flowers or incense burning," says project architect Carol Phillips, adding that different faith rituals involve the burning of different objects, with some religions using incense burning to create an atmosphere, and Native American traditions sage is burned. The architects designed a complex ventilation system that allows air to be retained for long periods of time during the ceremony and quickly cleared for use by other faith groups afterwards. The building's meditation rooms contain vertical gardens planted with lilies, jasmine, and other aromatic plants to provide an immersive environment for meditation. The building's mechanical ventilation system vents fresh air through the vertical garden, and natural scents fill the space in a subtle way. The architect admits, "We tend to be very focused on sight and touch and forget about hearing and smell, but sound, space and smell are part of what we do to create place."

Incense burning and ritual space

An important part of religious rituals is the widespread practice of sacrifice, and a key feature of sacrifice is the use of scent. Historian Lucienne Roubin has argued that odors were messengers of religious festivities, and that in the case of animal sacrifices in public spaces, the smell of blood and roasted meat, along with cooking smoke and ritual smoke, combined to contribute to an impressionistically brief mortal-to-heavenly transition. Archaeological research has found that in pre-colonial South America, perfumes were offered to the gods to protect cities and dynasties.

In earlier times, odors were not deeply involved in religious life and space. Prior to Constantine's concern with the use of scent in ancient Christianity, described in The Salvation of Scent, Susan Harvey argues that scent in religion was characterized by "sensual austerity" and that scent meant more pagan and eccentric rituals. In the centuries after Constantine scent became a necessary component of the liturgy and of every religious occasion, with aromatics enveloping every believer's home, shrine, tomb, and church II pilgrimage site, transforming these spaces into places of ritual.

Religious places are often strongly scented to ensure that the smell of the church leaves a lasting impression on the senses of the faithful as they enter the church. Scents such as liturgical plants and burning incense fill the ritual space and add mystery. For example, acacia trees as material for ritual offerings exude a sacred scent. In Roman tradition, wreaths and crowns surrounded fragrant offerings; balsam and myrrh were the primary spices in Jewish literature, early Christian elaborate bouquets added myrrh,

cinnamon, sugar cane, cinnamon, and olive oil, and materials for sacred incense included a variety of sweet spices.

Incense, as the quintessential sacrifice, even changed the definition of a place of worship, transforming a home into a temporary "sanctuary" when it was lit in a private home. Incense burning is considered a metamorphic process that transforms ordinary spaces into ritual spaces and prolongs the sacred moment. The aroma that permeated the space before and after religious rituals put people in a state of foresight and awe. The Egyptians offered incense to the sun three times a day, burning a mixture of resin, myrrh, and spices in the morning, noon, and evening. The recipe for the last mixture would even be carved into the walls of the temples as decoration. The scent even transcended the significance of space in this respect; when the faithful left the space where the church and rituals were held, the scent of incense remained clinging to their hair and clothing, a constant reminder of the religious act the faithful had completed. Archaeologist Béatrice Caseau describes the history of the use of incense burners in churches, from the large standing incense burners to the elaborate, movable ones, which moved from the church to the homes of ordinary people as a trust to avoid misfortune. They were also used in mosques in the early seventh century. And the best decorated incense burners are found in temples and royal residences in the major cities and towns of the Maya and Zapotec in pre-Great Voyage America.

In important religious spaces, the precision of the use of scent determines the success of the ritual. In spaces marked by "ritual purity", inappropriate offerings "risked arousing the wrath of God", according to research by Krashen, cited by Reynolds. The Jews in the Second Temple period stipulated that incense and burnt offerings could only be used in Jerusalem, the Holy Land, "the navel of the earth. Incense was used to mark the cleanliness and sanctity of the space, and the distinctive smell belonged to God and the priests.

Baptismal rituals are rich in olfactory significance, and Rhenazy's study of baptism offers ways of interpreting odors in the context of broader religious practices. The practice of applying spices before and after immersion in water for baptismal rites in some regions is influenced by ancient hygienic and medical practices. By applying baptismal oils or other solvents to the forehead, ears, and nostrils, usually olive oil was used before baptism and scented myrrh was used afterwards. The baptized person is endowed with new senses that are attuned to the divine. The scent of the baptismal oil

also marks membership in the Church and communicates the convert's new identity to the wider community. For the baptized, the scent of the rite represents heaven and the aroma of the Holy Spirit. A similar approach emphasizes the sensory side of the ritual, just as burning incense is both an olfactory and a visual phenomenon, and baptism, as a multisensory ritual, relies on the sense of touch, while smell provides a perceptible but invisible element to the ritual, the use of which somehow suggests an encounter with the higher intellect.

Decontamination and public space

As new religions occupied urban spaces, the rejection of previously pagan religions and the purification of their influence was often accomplished through ritual purification of odors in public spaces. Rhenazy argues that after the legalization of Christianity in 313 A.D., which occupied the major urban spaces, urban spaces once filled with pagan rituals now marked the purification and fumigation of public spaces through the cleansing of incense and ritual smells. Linked to the irreplaceable role of incense in Christian ritual, a similar practice could psychologically accelerate the transformation of faith in society.

Scent clues can express the presence of a deity or a holy mortal. The association of priests with scent, for example, is related to the incense used in churches and the smell of the rosary wreaths they wore during feast days. An important Christian legend demonstrating the association of scent with identity in public places is that of Bishop Polycarp, who was martyred around 155 AD for refusing to offer sacrifices to Caesar and the Roman gods. His body was pierced with a dagger and was to be burned in public; unlike his body, the stench of burning flesh did not permeate the air, but rather the scent of freshly baked bread. The particular olfactory experience attests to his martyrdom and spreads through the rituals of the city's public spaces.

Religionists believe that ritual odors help believers understand the meaning of religion, while at the same time, unpleasant odors are thought to come from pagans, and historical accounts often refer disparagingly to pagan incense. The disgust triggered by bad smells can drive a change in perception in public installations and can denigrate previously accepted religious practices. For example, in the Byzantine Empire's iconoclastic vandalism crisis, dissidents desecrated icons by wiping them with dung, grease, or other disgusting stenches to obliterate the pervasiveness of incense. Icon vandalism in the aftermath of the French Revolution also illustrates the revolution in

non-visual terms during a period of regime change.

Power relations in public space are implicit in the body and in behaviour. The class and status differences indicated by odour are reflected in the purification of bad smells, with the dominant groups in society, and in the Middle Ages, the nobility and monks, often assigning themselves pleasant or neutral odours in the olfactory classification system of workers. Thus, the study of odor is concerned with the relationship between odorlessness and odor. The unpleasant odor of a person in public space indicates on the one hand that he cannot afford expensive aromatic materials and on the other hand that he cannot afford the time to clean. Thus, the equality claimed by religion is also reflected in the control of smell in public space, by covering a wide range of scents in ritual places and masking the smell of different classes of believers, thereby achieving a social purpose.

6.2.2 The culture of smell in social festivals

The smells of specific activities during the development of society have survived to the present and have become an integral part of human activity. When a sudden stranger breaks in and smells such a smell, the sense of strangeness and discomfort makes one aware of the presence of another culture and community faster than the visual. Urban scholar Victoria Henshaw has documented her own chance intrusion into a Muslim neighborhood in Paris in 2012, "As soon as the car door opened, something strange happened," she writes: "A dry, dusty, powdery smell filled the air; people around me started coughing and sneezing ; my nose tickled, and I had a tingling, almost burning sensation in the back of my throat, similar to what you feel when you inhale pepper. As I fought the urge to gag along with my companions in a desperate attempt to expel whatever we had inhaled, I searched for other sensory information to inform me of the source of our discomfort, but I was unable to detect anything out of the ordinary. However, the source of our discomfort became more apparent as we descended from the light rail platform located at the height of the building towards the street ..... groups of men standing outside food shops, women and children gathered in front of sari-sari shops, stores with peeling paint selling halal meat and unfamiliar foods...were strong of the combined smell of food spices, dust and car exhaust." And in the Indian neighborhood near the Chapelle station in Paris, the streets during the annual Elephant

God Festival are filled with the smell of camphor, which is very different from the smell of coffee and tobacco that is often remembered in Paris. These smells have important implications for perceiving a city in constant flux and the rich differences between people. A study by Jamie Furniss of Oxford University on the smell of garbage in the Zabalin district of Cairo, Egypt (a neighborhood that has been the site of Cairo's garbage disposal since the 1970s) is reminiscent of the olfactory experience that negative smells bring to people and how it shapes the boundaries of urban space.

Figure 6.4 The site of the 2009 Elephant God Festival in the Chapel area of Paris. (Image source: Melody Buhr)

Figure 6.5 Piles of smelly garbage in the Zabalin district of Cairo. (Image source: Jamie Furniss)

In their study of aromatic plants in cities, Xiao Jieling et al. analyze the case of the bitter orange tree in the streets of Athens. Bitter orange trees are an evergreen species that bring a sweet and fresh scent to the streets of Athens from late spring to winter. Bitter orange trees and their scent have become an important urban feature in Athens, originally planted to decorate urban spaces but later used by locals for cooking and dessert making, so that the harvest of bitter oranges was historically an annual festival for the local community. However, the tradition has now died out, with only the impressive smell of bitter oranges in the city to remind the existence of this period of urban history.

Figure 6.6 Frescoes relating to scent-making rituals from the 18th Dynasty period surviving from the ancient city of Thebes. (Image source: Lise Manniche)

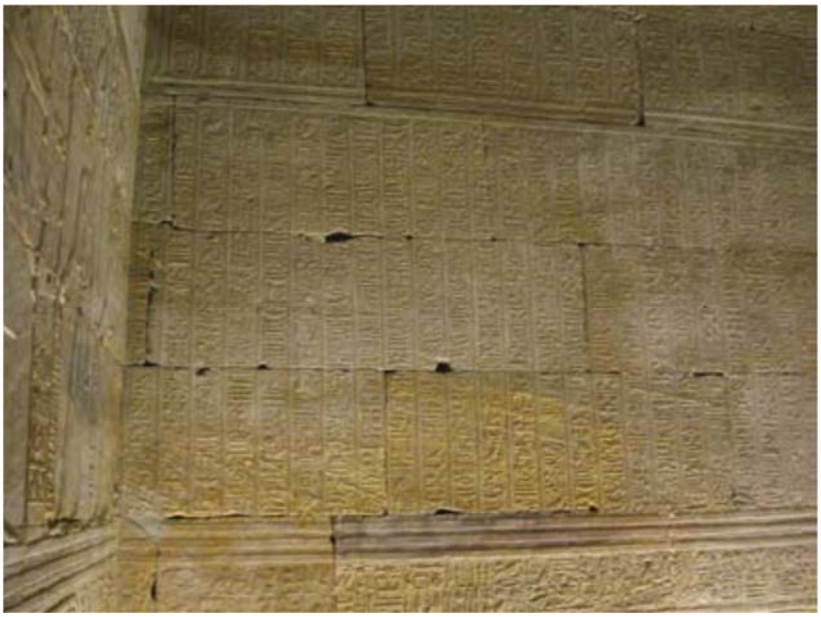


Figure 6.7 Recipe for spices recorded on the wall of a space featuring a preparation room at the Ptolemaic temple of Edfu. (Image source: Lise Manniche, 1988)

Lise Manniche's research on ancient Egypt confirms the importance of odor in social rituals in ancient Greek culture. By using painted representations on ancient temple walls, the remains of extant cultures, and archaeological excavations of containers as objects of study, Lise finds that ancient Egyptian rituals, activities related to embalming, and in the home, incense burning took place with the aim of purifying the air.

6.2.3 Scent memories of everyday life

Smell in the market

Figure 6.8 Edinburgh street vendors, 1825 from left: porter, fisherwoman, mutton vendor (Image source: Airy Nothings, M Egerton)

The relationship between cities, places and smells is more often than not reflected in aspects of everyday life. In his description of the urban experience, Menurut Landry places particular emphasis on the urban smells he documents, including "globalized" smells such as petrochemicals, fruits, vegetables and spices from markets, and smells from shops, restaurants and taverns. Anna Barbara and Anthony Perliss build a body of knowledge about time, space and smell, and interview perfumers, architects and people who work in the packing houses of New York's meat factories and the Hermès leather production centre in Paris about smell. Some mysterious, unknown-source odor events in the city's history can easily cause public panic. In the case of the city, New York has a curiously large number of accounts related to it. the October 2005 issue of the New York Times reported on the smell of molasses spreading from Lowertown to Uptown and nearby areas, and in January 2007 a similar event occurred in Manhattan and a large area of eastern New Jersey, this time spreading a strange, irritating, sulfurous-smelling gas that triggered an emergency response from the city's public transportation system and schools and office buildings Response.

The connection between cities and odors may not be as hidden as we think. As Klassen and others have written, cities in the past were smelly places, with large populations clustered in urban centers and dependent on the supply of food and goods and the removal of waste to keep them going. If you look at it by contemporary

standards, then the European towns of the pre-modern period were littered with excrement, mud, rotting vegetables and meat - perhaps the pigs foraging around in the streets mitigated the smell a little. The official World Heritage Site website details the history of Edinburgh's smell, and indeed the old name of Edinburgh, Auld Reekie, is closely related to the smell of the city, referring to the noxious smoke pollution caused by open fires in the city's flats. Edinburgh's High Street was once packed with a variety of stalls and workshops, including butchers, fishmongers, dyers, tanners, candle makers, soap boilers, weavers and bakers. Many trades were associated with foul smells, for example tanners and dyers treated leather and dyed cloth with urine, and candles were made from melted hard animal fat. On market days, fishmongers would gut fish in their stalls and butchers would cut meat on their slabs or hang carcasses on scales to bleed onto the road. The manure of the horses that brought the goods would add to the mix of smells. With no running water or flushing toilets, people dumped their poop pots in the street at 10pm every night. The city council hired scavengers to clean up the mess and take it out of the city. The unremoved waste was washed down by rainwater and down the enclosed steep slope into the former lake in Princes Street Gardens, the main source of water supply for many people in the city.

Changes in the distribution of odors in geography can reflect urban and social changes. Martyna S´liwa and Kathleen Riach look for social and memory information stored in odors by investigating changes in Poland regarding odor memory before and after the dramatic social changes of 1989. They adopt an ethnographic perspective on how odors are used to understand urban phenomena, collecting information through interviews and questionnaires with urban residents in Poland, reflecting the dramatic changes in everyday life in a post-socialist context in Central and Eastern Europe. Smells reflect changes in public-private space relations, and memories of living in socialist settlements in the former 1989 include the smell of neighbors' cooking wafting around, which is missing from single-family homes in Krakow, Poland, in the present day. Although the interviewees expressed happiness with this change, however it is not the smell of neighbors cooking that is offensive, but the inescapable influence of others' habits. The smell of sanitized water Lizol in public spaces is a memory shared among members of the community about the pre-1989 society, representing the power of the ubiquitous state. In contrast, Currara perfume, which emerged between 1989-1992 from the first foreign capital company in the city, was the hedonistic smell that many

interviewees recalled as pervading the entire city. Moreover, the source of the city's scent before 1989 was many small shopkeepers, with products and spaces emitting a rich, natural scent. Whereas the scents of capitalist society lost their diversity. Many people associated the smells that emerged after '89 with capitalism, for example, one respondent stated that the smell of a gas station was the smell of capitalism to him. There are also respondents who believe that today the smell of Warsaw, Krakow or any city is no longer unique. On the other hand, odours are also used to distinguish social classes, and the contemporary racial and class connotations of odours are reflected in space, resulting in the "ghettoisation" of a range of odours, such as poorly ventilated buses in the city.

There is a correlation between the increase in scent and urbanization and the reconstruction of social space. In post-socialist societies, memory is both a resource and a reference to identity, and among these, odour as a resource is closely linked to sensory experience. Emily Cockayne, researching the history of odour in 17th and 18th century England, and Micheal Meighan, researching historical odour walks in Glasgow, both argue that odour is an important tool for embodying changes in contemporary urban politics and social practices, and that odour can often express personal and social transformations.

The sources of odour suggest associated industrial and urban spatial changes. Victoria Henshaw classifies and sorts out the sources of odour in terms of air pollution, food, and urban policy; in the past, air pollution in Yorkshire, England, where Doncaster is located, explained its urban status as a transport hub, and today the sensory experience of the city has been greatly enhanced through the rerouting of transport routes as a result. And other sources of odour in Doncaster include the vanished coal mills - documenting the large coal mining area in which Doncaster was located during the Industrial Revolution; the sewage works built in 1873 - with the help of legislation and innovative technology, the intensity of odour has greatly reduced; and the meat-processing plant, which opened in 1926 - the smell of decay can even irritate the retina. Beyond that, candy factories and breweries can evoke positive memories for most city residents. Kate. -McLean's odor walk in Amsterdam unexpectedly changed the volunteers' stereotypes of Amsterdam, and the fishy smell of fish in the market reflected the very important fishing industry of Amsterdam in ancient times.

6.3 Exhibition display formats for scent heritage

Few smells have been preserved into the present over a long period of history, but odors in history reflect specific aspects of historical events or what life was like at a certain time, and at times its intimacy and association with the subconscious can help us imagine life in ancient times even more than the study of the visual. Beyond preserved smells, some of the odors that existed can be identified through archaeologists' study of materials such as implements, rituals, and documents. In terms of heritage organization and exhibition display, by adding odors to the exhibition process or by making the odors themselves the content of the exhibition, it can provide a different way of viewing the exhibition experience and add a sensory dimension to the experience; and the emphasis on odor heritage can, on the one hand, preserve odor remains that are important to modern and ancient life and, on the other hand, enhance the public's ability to perceive odors.

6.3.1 Scent Heritage Identification

As the discussion of odour in the heritage field has gradually increased, researchers have realised that the dynamic nature of odour itself does not fit the definition of intangible cultural heritage. In the work of museums, odours as collections bring a range of controversies and challenges because of this. What we should be aware of is that not every odor is worth preserving and not every odor is closely associated with place, and from an architect's perspective, classifying and identifying odor heritage in this context is the basis of all work.

Figure 6.9 Cecilia Benbibre, who is collecting endangered odors (Image source: H. Mahgoub)

Cecilia Bembibre, of the Institute for Sustainable Heritage at University College London, works on the preservation of odours by developing different techniques to recover odours that have disappeared. Her research focuses on how to define which smells can truly represent a region or culture and are therefore worth preserving.

Figure 6.10 Name and distribution of the projects selected by Kaori Odor One Hundred. (Image source: Ministry of the Environment of Japan official website)

Some crafts or industries during the development of society have changed the odor environment of the city and have become part of the social memory of the neighborhood. The nostalgia and conservation of surviving odour landscapes helps the public to become aware of the significance of urban odour landscapes. The selection and judgement of odour heritage will be an aspect of the heritage field that needs urgent refinement. In 2001, the Ministry of the Environment of Japan searched for cultural phenomena rooted in scent, hoping to take the opportunity to promote the development of areas with distinctive scents, and selected 100 out of 600 nominations submitted nationwide to be published as the Kaori Scent 100, which includes natural scent landscapes such as the Furano Lavender Landscape in Furano, Hokkaido. The Ministry of the Environment's Kaori Scent 100 official website announces the criteria for

selection: open to the public; regional historical value; continued social value; active community maintenance; and conservation contributing to the improvement of the local community. actively maintained by the community; conservation contributes to the improvement of the local environment; contributes to the creation of sensory spaces; and has conservation value. On the one hand, the identification and protection of scent heritage at the national level enhances the character of local places and people's perception of scent, and more importantly, in browsing reports on the subject, the author found that the nationwide initiative to declare has prompted many people to actively seek out scents they are familiar with in their neighborhoods or remember, so that the projects declared are so distinctive and rich in criteria that it is not just pleasant scents that are selected, and even when they are not The projects that are selected also raise local recognition of distinctive local scentscapes. This social, civilian experience of the urban senses is not found in books or research and is highly significant.

It is reassuring to note that there have been some innovative explorations of odour conservation in the field of urban heritage conservation. Lauren Davis and Lucienne Thys-Şenocak summarize various methods of odor research, including odor walks, cartography, oral history interviews, and artistic presentations, to examine the field of intangible heritage by substituting sensory research methods into the Eminönü spice market in Istanbul how odour heritage identification reflects urban and art history. They argue that the use of the senses in heritage research not only helps to connect people to the past and present in a unique way, but also contributes to a more comprehensive understanding of the heritage of places , which in turn changes the tastelessness of the contemporary city. Interestingly, the object of their research also includes an exhibition entitled "Smell and the City" at the Anatolian Civilization Research Center at Koç University in Istanbul in 2016, by which they refine the study of heritage itself.

Most of the research on the chemical nature of odors themselves and the methods of identification fall within the realm of chemistry, however, in the field of heritage odor identification, researchers have realized the importance of this rational approach to odor identification. Research by Cecilia Benbibre and Matija Strlič has shown that since most odours are composed of volatile organic compounds, methods of analysis of odours often involve headspace (solid-phase microextraction) techniques (HP-SPME) and gas chromatography-mass spectrometry (GC-MS) methods. On the subjective side, the terms used to describe heritage odors have not been standardized. Based on their

proposal, the objective aspect of odor chemical analysis and the refinement of the subjective aspect of the odor vocabulary wheel could greatly improve the documentation of odors and help us to go beyond the transient nature of odors to identify, document, and interpret them.

6.3.2 Odour Heritage Conservation

In the context of heritage conservation, unfortunately, there are only very few documents that refer to odours or senses.The 1979 Bula Charter, proposed by ICOMOS Australia, adds to the Venice Charter public recognition of places in which odour is considered to be an aspect of cultural significance, one of the measures of the value of a particular place to the public, and odour is considered to be a tangible heritage non-material aspect that is closely linked to the heritage itself. There are a number of criteria that may fit some of the characteristics of odour, for example, in the assessment criteria for Historic Scotland, cultural significance is defined as "significance in the national consciousness, or significance to the people who use or have used the monument, or to their descendants", and the monument's association with "people or events associated with history, tradition or art". In this context, the source of odour can be understood as an important element associated with public memory or the collective imagination. In addition, guidance issued by Historic England (the UK Government's statutory advisor on the historic environment, sponsored by the DCMS) considers a place to be a valuable odour when it influences people's experience of the place. For this reason, odour should be taken into account when determining the character of a place. With the growth of global tourism, the authenticity of the experience has become much more than visual images, technology and ideas have developed to help us recreate places in off-site locations, and for visitors interested in this approach, authenticity comes from the experience, not the original place, so recreating the smell of a historical site in an off-site location is, in a way, a new form of authentic experience.

Smell is most of the time not in the list of contemporary heritage identification. In fact, UNESCO's current nomination criteria for intangible cultural heritage do not include aspects such as the preservation and identification of scent heritage. The good news is that in 2018 UNESCO adopted the Grasse region of southern France in relation

to perfume-making as an intangible cultural heritage, which may be a precedent for scent heritage to enter the heritage field. Rosabelle Boswell, from the Department of Anthropology at Rhodes University in South Africa, has examined in detail the state of conservation of the islanders' odour culture after the inscription of the Stone Town of Zanzibar, Tanzania, as a World Heritage Site from a historical and ethnographic perspective, through extensive interviews with local people in Zanzibar, and she criticises the emphasis on the visual in the conservation process, the lack of heritage attention to other sensory aspects, and the classification, preservation, and monitoring of odour conservation and the lack of regulation of odour conservation. She argued that smell is an important expression of local identity, but because it lies between the tangible and the intangible, it goes unnoticed by heritage experts. And suggested that UNESCO should go beyond the current measures to protect physical structures such as artefacts and monuments, and in the case of odours, unite comprehensive research by anthropologists, chemists, historians and archaeologists to identify the rich and complex history of odour associations in African islands and protect them as heritage. Interestingly, from her research on Zanzibar, it is vaguely possible to see the long and very interesting history of odour in Africa and the complex historical interactions of politics, society and culture that are revealed behind it. This history of odour as an evolving history is closely linked to the emotional expression of religion and society, thus requiring conservation agencies to think of new ways to identify and protect living cultures.

The archiving and preservation of odour heritage is an important part of odour heritage conservation, and as the first part of future work, accurate archiving helps future conservation efforts. The concept and role of odor heritage is analyzed, and the practice of identifying odors that are significant to a site is developed. The validity of the archived odours was also analysed through experimental evaluation, leading to the establishment of a "significance assessment - chemical analysis - sensory analysis - archiving " framework of work.

6.3.3 Scent Heritage Exhibition Format

Today, visuals continue to dominate museums when it comes to exhibiting. Since the beginning of the century, there has been a gradual emergence of museums and

curatorial institutions that have attempted to use the senses to refine exhibition narratives. The inclusion of scent in a museum can attract more visitors, and in some cases, when the scent itself is an exhibit, there is also a need to design the space in which it is displayed.

Figure 6.11 A scene from the Reg Vardy Scent exhibition (Image source: https://ueda.nl/index.php?option=com_content&view=category&id=99&Itemid=786&lang=en)

In 2008 the Reg Vardy Gallery at the University of Sunderland mounted a unique exhibition of scents, in which 14 unlikely scents were exhibited, with the introduction of scents creating a more immersive atmosphere and allowing visitors to experience a more authentic and believable exhibition experience. Curator Robert Blackson said the scents were "inspired by an absence, their form relating to stories from history for which few material entities have survived." The hope is to provide a special immersive experience by synthesizing scents that have disappeared or are inaccessible, such as the scent of Cleopatra's hair, extinct flowers, the smell of the sun, the last meal of a condemned man and the smell of alchemical potions. The National Museum of Australia's exhibition showcasing history attempts to draw visitors into a connection with the world the curators are trying to represent by introducing combinations of smells and tools - the smell of dried sea cucumbers and the cooking tools of Aboriginal fishermen.

As the exhibition of smells gradually developed, some questions began to emerge. The question of how to ensure the authenticity of scent in a heritage context is at the forefront of the exhibition and the study of this aspect of the content. Dobnik argues that when there is no hunger to ensure the authenticity of scents, visitors risk thinking they are receiving manipulation. Part of these problems stem from the anonymity of scented exhibits, and when museums use scents that were not created specifically by particular artists, and the purpose of using scents is often only to aid visual or other sensory exhibition formats, museums tend to rely on commercial perfume suppliers to provide the scents. In such cases, the wrong scent may create a biased and unpredictable impression, which in turn weakens the effect of the exhibition.

John P. Aggleton and Louise Waskett studied the memories that scents leave with visitors to the Jorvik Museum exhibition in Yorkshire, England, through a questionnaire approach in 1999. The museum uses visual, auditory and olfactory design elements to recreate the 10th century city of York, enhancing the visitor experience through seven different scents. Kate McLean worked with the University of Reading in 2016 to complete the restoration of VR landscapes and scent and soundscapes of the archaeologically excavated Roman town of Silchester Insula IX.

Figure 6.12 The "Wall of Smells" in Diller Scofidio + Renfro's How Wine Became Modern exhibition in 2010. (Image source: DS+R website)

On the other hand, although architects and urban designers have rarely yet completed designs related to scent, this does not mean that scent is irrelevant to buildings and cities. In fact, the richness of the scent landscape can help architects understand the meaning of built spaces. The architects DS+R completed an exhibition on wine, smell and space in 2010, with the intention of showing how the architectural space and design industry has turned wine into a cultural phenomenon over the past thirty years, with smell as an integral part of the exhibition narrative. A "scent wall" allows the viewer to interact with the scent.

Practice and research have demonstrated that the use of scent in exhibitions at historic sites can greatly assist visitors in experiencing the content, whether the role of scent is a strategy to set the mood or an art form that helps to create a richer connection between the exhibit and the individual. Future research needs to focus on building a well-developed body of work that encompasses heritage identification, conservation, management, visitor experience design and heritage policy development.

Chapter 7 Design of Beijing Andingmen Scent Complex based on Scent Urbanism

According to the previous content combing, the main aspects of urban space and odor association include optimizing odor distribution, exploring odor space, and creating odor experience. The author chooses the design of Beijing Andingmen odor complex as an example to explore the design content and design language of urban odor space from the above aspects.

7.1 Scented Urbanism Goals

The design includes not only the solution of existing problems and spatial quality enhancement of the site, and the optimization of the infrastructure, but also the more important topic of planning and shaping the space of the scent landscape. There are

three goals for the realization of scent urbanism on the site: first, to activate the experience of scent-related places; second, to provide new possibilities for marketing in the commercial sector; and third, to provide a new type of scent-themed public space in conjunction with the scent cityscape context in which the site is located.

7.1.1 Scented Place Experience Activation

After the modernist odorless movement and the pursuit of visual centrism, the sensory thresholds and experiences of modern city dwellers can be considered quite inadequate. On the one hand, urban spaces are largely designed and constructed without regard to odor, and even areas that are characterized by odor are often accidental or even dominated by negative odors; on the other hand, the rich visual representation of cities inhibits the experience of odors in the surrounding environment, which is also related to the way the human brain operates; in environments where odors themselves are not prominent enough and do not change significantly, people will actively adapt to the odor and stop transmitting neural signals to the brain.

Therefore, the primary aim of the design is to activate the sensory acuity of the olfactory numbed city dwellers. Through the creation of a rich, varied and thematic scent environment, the information contained in the scent can stimulate the olfactory nerves of everyone who experiences it, whether outdoors or inside the building. The scent diffusion through the large outdoor umbrella installation, the elevated urban plaza and the linear park along the waterfront provide a distinctive and pleasant scent, and as the scent escapes at certain times, the plaza will be a scent park full of entertainment.

7.1.2 Commercial Sensory Marketing Block

In business, the practice of scent has been going on for decades, and if we consider the long history of the perfume industry, we can perhaps understand why business was the first area to notice the importance of the scent landscape. Marketing is an important part of brand communication. On the one hand, scent marketing helps build brand identity, which is a key factor influencing the impression of a brand in the minds of consumers, and thanks to the strong connection between scent and nerves, the use of scent to build brand identity has attracted the attention of many giant companies in the West; on the other hand, scent advertising can also be effective in promoting product sales and establishing a sensory connection between consumers and products.

Taking Beijing's unique brands as an example, restaurant brands such as Juboyuan and Quanjude, and alcohol brands such as Yanjing Beer and Niubangshan can set up scent research and development centers here and rent scent emitting facilities to spray scent into public spaces on specific dates; smaller specialty brands can build their brand image by setting up scent installations.

In addition, the restaurant complex designed for the west site emphasizes the scent experience by introducing food and snacks with scent characteristics, such as open cooking Western-style dining, creative cuisine and traditional snacks, setting up scent experimental and flagship stores to strengthen the marketing role of scent and create a rich and varied scent environment, while facilitating brand marketing.

7.1.3 A new type of urban public space

As the number of urban dwellers increases, the demand for public space becomes increasingly diverse, and it is at the same time the responsibility of the city administration to provide a wealth of public space. The scent space itself can attract people's attention and curiosity, and is suitable for the work of the city administration as a propaganda. The east side of the site functions mainly as a scent library and an exhibition space. The former serves as a public facility for the city, archiving, organizing and identifying odors, and can be considered a facility of a scientific research nature in conjunction with university research institutions; the latter provides a variety of exhibition spaces that can accommodate exhibitions of odor installations of various scales, and can attract architects and designers to organize targeted curatorial work. In turn, the odor complex will become the premier venue for odor exhibitions in Beijing and the world.

7.2 Site odor distribution patterns

According to the previous content combing, the main aspects of urban space and odor association include optimizing odor distribution, exploring odor space, and creating odor experience. The author chooses the design of Beijing Andingmen odor complex as an example to explore the design content and design language of urban odor space from the above aspects.

7.2.1 Basic information on the selected topic

On the one hand, urban odor is not a new product, it has been with the space since the birth of the city; on the other hand, in the modern context, after the public health movement and modernism, urban odor has undergone a change in the concept of odorlessness in the 20th century, until the last two decades, the pursuit and exploration of the characteristic odor of the city has gradually become a new type of urban design field. The search and exploration of the characteristic smell of the city has gradually become a new topic in the field of urban design. From the perspective of space, modernist spatial creation under visual centrism inhibits the rich sensory expression of places. When the visual quality of urban public space reaches a certain height, the enhancement of the quality of other sensory aspects becomes an unavoidable inevitable result. And an important aspect of sensory urbanism is the creation of urban scentscapes.

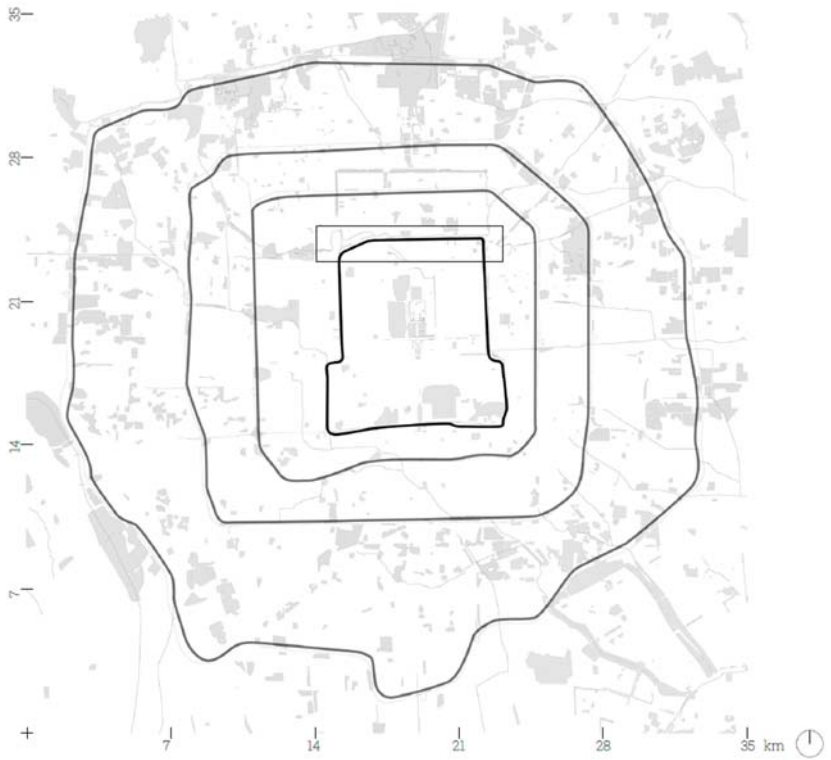


Figure 7.1 Analysis of vegetation, roads and rivers within Beijing's Fourth Ring Road and the extent to which the odour corridor is located (Image source: author's own drawing)

First of all, Beijing is rich in traditional smells within the old city. Under the

influence of thousands of years of city building and capital city history, Beijing's traditional smells encompass all aspects of food, religion, and politics, for example, the rich smell of burning incense in Yonghe Palace reflects the history of religion. Therefore, the author limits the site selection to the old city of Beijing to design a scent library that preserves and identifies traditional scents. Secondly, according to Kate McLean's research, the main sources of urban odor landscape include elements such as water features, plants and roads, among which traffic exhaust from roads is the main negative odor source of the city. Water features and plants, on the other hand, are largely the two traditional means of enhancing the urban odour landscape. The scope of the moat at the southern and northern ends within the old city of Beijing has both green areas, rivers (moats), and roads (the Second Ring) (Figure7.1), and because of the relative wealth of historical information about the northern city, the author selected the northern moat as the scope of urban analysis and the context for subsequent architectural and urban design.

Figure 7.2 Architectural and urban design redlines (Image source: author's own drawing)

Figure 7.3 1966 satellite image of the Andingmen Urn undergoing demolition (Image source: USGS Earth Explorer)

The bus station at Andingmen was chosen as the site scope for the architectural design (Figure7.2). Firstly, the North Second Ring Road is relatively densely built up and there are limited urban sites available for construction. Within the North Second Ring Road, the bus yard at Andingmen is one of the few sites with a larger area, fewer existing buildings, and relatively large space quality improvement space; secondly, the site is bordered by a moat to the north and a linear urban park along the moat to the south, which is both the basis for urban odor landscape and the negative odor remediation challenge.

Beijing's Second Ring Road was constructed in the 1960s and has undergone several additions and renovations since its construction, as well as the construction of interchange nodes at a number of former urn gates in accordance with local conditions (Figure7.3). Because of the huge space occupied by the interchange nodes and the dividing effect of the urban expressway on urban space, it is easy to form some unbuildable urban open spaces. Taking the overpass nodes of the North Second Ring Road as an example, on the one hand, they become an existence in the urban space that is difficult to traverse on foot, and on the other hand, they form a waste of space. In the near future, when Beijing is developing rapidly and buildable land in the urban area is becoming scarce, the development of these urban forgotten empty spaces may be a solution.

MIT's Center for Advanced Urbanism studies infrastructure urbanism as a process of renovating and repairing urban infrastructure to create new urban facilities that are both spatially and technologically compatible with the functions of urban space. This also applies to Beijing; the city's infrastructure predates most cities in China, and therefore has a legacy of problems from the early days of construction. In the case of the

Andingmen bus station, for example, many similar high-quality locations within Beijing's urban areas that are critical and accessible to the city were assigned to the city's infrastructure and administration at the time of construction. The concept of construction coincides with the "unit" of the last century. However, when we look at the value of construction within the walls, we find a spatial efficiency that is behind the times, with a low degree of internal planning expertise as the construction of such spaces is often the responsibility of the unit, and, on the contrary, the spatial needs of such facilities are very specific, which indirectly leads to the current chaotic and inefficient spatial organization within them and the division with the city.

Figure 7.4 Urban features and sources of odor in the vicinity of the site (Image source: based on author's self-drawing on Baidu Street View)

The triangular shape of the site is derived from the walled Andingmen urn, which was demolished between the 1960s and 1970s, leaving an open area between the Second Ring Road and the moat as the urn protruded beyond the linear city wall. The history of the site is difficult to ascertain, as it was used as a bus station for the Andingmen Gate by the 1980s at the latest. Currently, the bus station is responsible for the operation of Beijing Bus Group's routes 125, 119, 301, 407, 426 and 430. The bus yard is divided into two functionally similar sections on the left and right, with the east side including a gas station, a charging station for new energy vehicles (which is constantly expanding) and facilities for drivers to rest and park their cars. Also included on the east and west are two exits from the Andingmen Station of Metro Line 2. On the north side of the site, several kilometers of linear parks have been constructed on both sides of the moat, which has its own tourist value.

Based on the author's several experiences in the vicinity of the site, the major sources of odors affecting the site area include vehicle exhaust emanating from the heavily trafficked Second Ring Road, fresh water odors and plant odors from the parks along the river, and gasoline odors from the bus yards on the site (Figure7.4). Overall, the major sources of odor at the site include both the water features and plants, which are important positive sources of urban odor in Kate McLean's theory, and the negative urban odors that have been of great concern to city management in the last decade, represented by car exhaust representative.

7.2.2 Future potential of the site

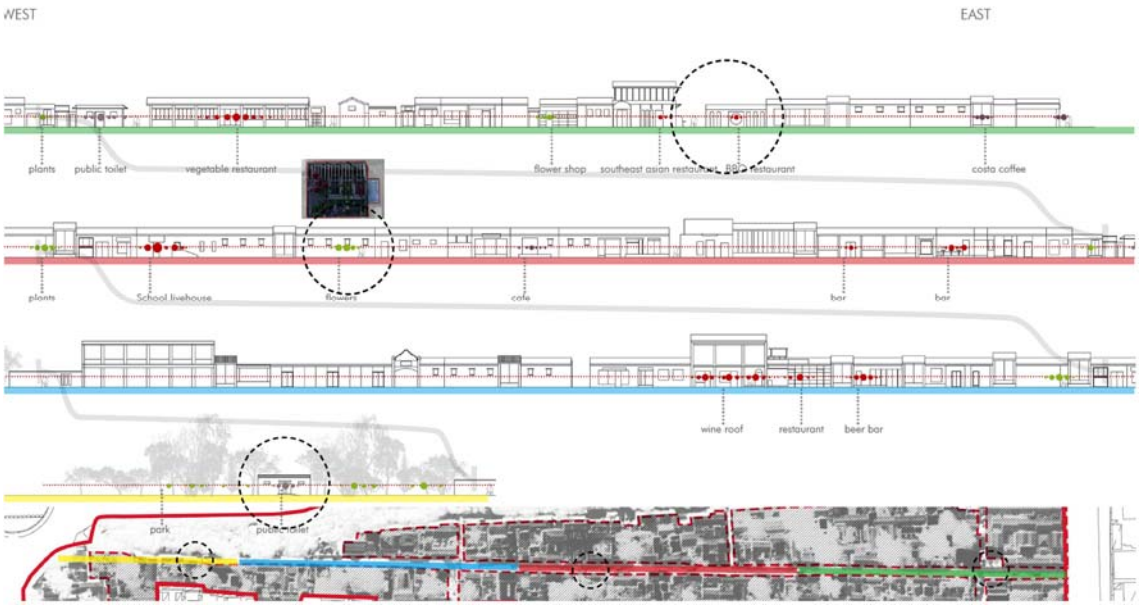


Figure 7.5 Wudaoying Hutong Smellmapping (Image source: author's own drawing)

From the perspective of the urban scent landscape, the northern side of the old city is an important area for the distribution of traditional scent landscapes, such as the ritual scents and botanical scents of Yonghegong, Confucius Temple and Guozijian in the southeast of Andingmen, the active restaurant and bar scents of Wudaoying Hutong in the south, and the rich restaurant and human scent landscapes of Zhonggu Lou and Shichahai in the west. The site of the Andingmen bus station is adjacent to the moat and Ditan Park on the north side, and across the Second Ring Road to the south are the Wudaoying Hutong and the scenic area of the Confucius Temple and Guozijian, extending to the linear park along the river on the east and west sides, making it an unparalleled open space in the old city. This site is likely to be rich in potential within the current Beijing Old Town.

In the map of sightseeing spots in Beijing, the vicinity of Andingmen is a dense area of attractions. Compared to traditional attractions such as the Forbidden City and Shichahai, the quiet atmosphere of Wudaoying and Guozhijian has a clear advantage over the major tourism trend that emphasizes experience offline. The international nature of dining and the openness of the space in Wudaoying Hutong makes it second to none among Beijing's commercialized hutongs (Figure7.5). On a larger scale, Nanluoguxiang, Zhonggu Lou and the east side attractions can be linked together through high quality venue spaces.

Figure 7.6 Nearby area focus information mapping (Image source: author's own drawing)

The mapping of some important information in the vicinity of the site can reveal the value and future potential of the site more clearly (Figure7.6). Based on the data provided by Mr. Long Ying's studio, mapping the restaurants in the vicinity of the site, we can find that the area in the old city south of the site, represented by Andingmennei Street and Wudaoying Hutong, gathers a lot of restaurants, among which, the restaurants in Andingmennei Street are mainly traditional restaurants, while Wudaoying Hutong, with its unique internationalization The area is characterized by a number of Western and Southeast Asian restaurants and bars. From this perspective, the site has the potential to integrate nearby food and beverage resources to create an excellent food and beverage exhibition space within Beijing. Secondly, the vicinity of the site is a densely distributed area of tourist attractions in Beijing, Yonghe Palace, Confucius Temple Guozijian, Ditan Park and Wudaoying Hutong, all of which are buildings and urban spaces with characteristic old Beijing style, and the predecessor of the site is even the Beijing City Wall and Andingmen Urn, which could have been a linear park of tens of kilometers in Mr. Liang Sicheng's plan, from this perspective, the site is very rich in historical value, and can be added to the tourist route. And it can be added to the tourist visit route as another contemporary attraction and function as a string of other spaces,

while there are also two exits of the Andingmen Station of Metro Line 2 within the site; Third, as the starting point of urban construction in new China, the urban spaces inside and outside the city walls show great differences in space and periodicity, and through the analysis of the building heights in the area where the site is located, it can be seen that the typical urban space - residential and office towers above ten stories - on the northern side of the site, and the well-preserved traditional city blocks on the southern side of the site. The treatment on the site can connect the urban fabric on both sides as a shared urban public space; fourth, the wind environment of the site has a specific patterning due to the spatial differences caused by the unique building heights and building density, in addition, the moat and the Second Ring Road serve as an urban spatial corridor to guide the wind direction.

7.2.3 Urban Scent Corridor

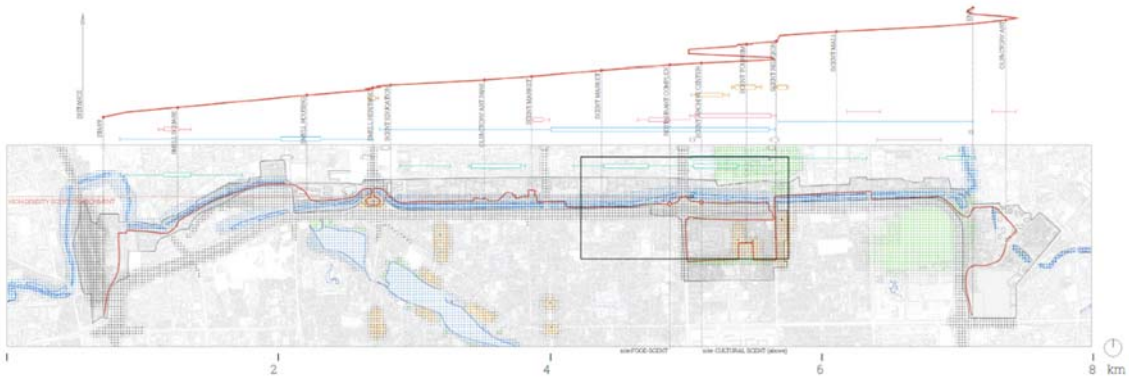


Figure 7.7 Urban Scent Corridor (Image source: author's own drawing)

From the perspective of Beijing city, the emphasis on urban character based on the Beijing Urban Master Plan (2016-2035) can be reflected in the creation of distinctive public spaces this provision encourages the design of an urban scent corridor connecting urban areas near the North Second Ring Road (Figure7.7). Based on the pedestrian flow lines of the existing transportation stations - Xizhimen, Deshengmen, Andingmen, and

Dongzhimen - the existing fragmented linear parks and tourist attractions are linked. From west to east, the design of Scent City Plaza, Scent Community, Scent Heritage, Campus Scent Science, Scent Installation Park, Food Market, Scent Branding Incubator, Scent Complex, Scent Tourism, Scent Technology and Scent Art correspond to existing urban facilities and cover most of the current theoretical issues related to Scent Urbanism. For example, to improve the odor quality of Xinhaiyuan neighborhood near Jishuitan, considering that the neighborhood is almost the only settlement with a moat crossing within the old city, the odor environment of the whole neighborhood can be well tied together through water features; Xinmin vegetable market near Gulou Street, as one of the few large vegetable markets within the Third Ring Road, is rich, complex and full of city scents, and only needs a simple sorting and integration to can create a vivid scent environment.

Through precise location, renovation and upgrading, a high-quality and at the same time odorous urban public infrastructure will be created around 2035. The future urban scent corridor from Xizhimen subway station to Dongzhimen subway station will become a high-quality urban space that attracts locals and tourists alike. On this path people do not have to worry about the negative odor interference from car exhaust, and in each area there are special and refreshing scent experiences and scent events waiting to be explored, while the Andingmen area where the site is located serves as an important and characteristic nodal space on the path. Its planned scent art museum and scent library and research center, on the one hand, allow scent-related spaces to be enhanced and integrated here, and on the other hand, serve as a science popularization for visitors.

7.3 Odor Information Gaseous Fluids

In the design of scent landscapes, the most challenging and distinctive aspect of the design is the choice of architectural language. To some extent, the slow development of scent landscapes compared to other sensory landscapes is also related to the language of abstracting scent.

Understanding odors allows us to disentangle them into information, which represents the different neuroelectrical signals produced by the different radicals carried by odor molecules upon the action of human receptors, i.e., the odors perceived by the

brain, and gaseous fluids, which allows us to know the distribution and diffusion patterns of odors in space, supported by knowledge of aerodynamics.

7.3.1 From gaseous fluids to form translation

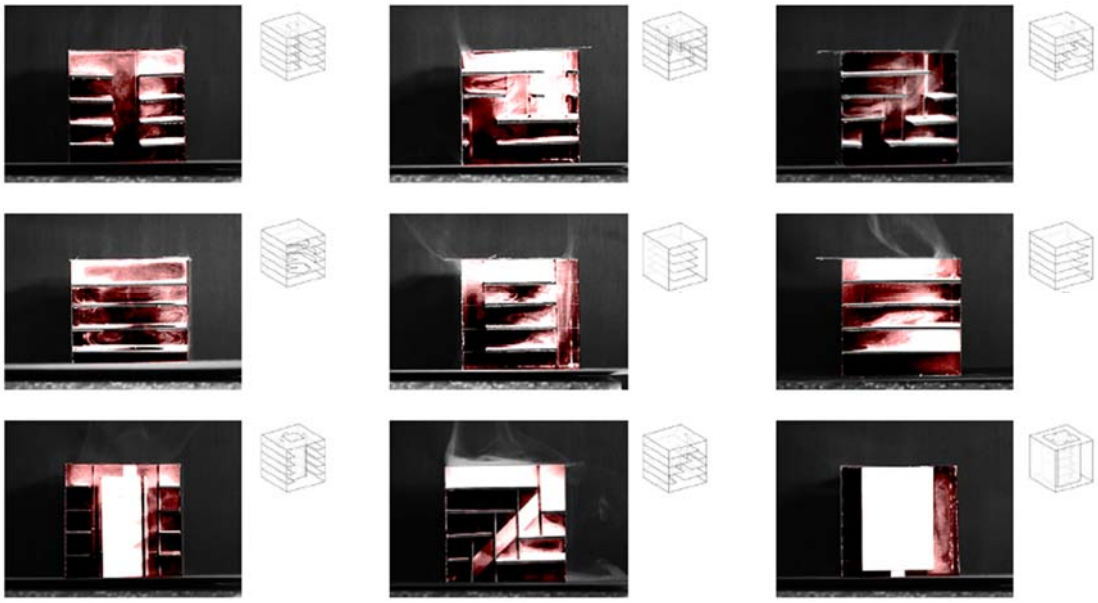


Figure 7.8 Odor module experiment (Image source: author's own drawing)

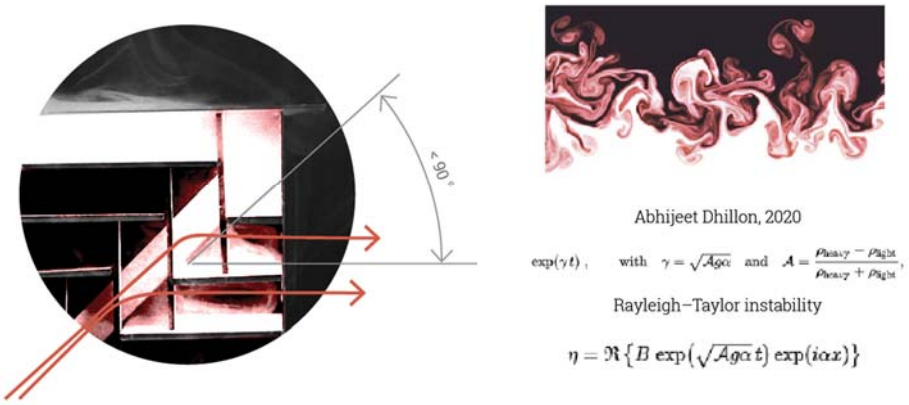


Figure 7.9 Experimentally presented odor diffusion direction and instability (Image source: author's own drawing, Abhijeet Dhillon)

In the preliminary stage of the study, the author needed to grasp certain patterns of odor diffusion patterns in the middle of space. Therefore, nine typical spatial modules of profiles were selected to make the model (Figure7.8), and sandalwood (with higher molecular weight) was used as the object of odor simulation. The experimental results show the different diffusion patterns of odors in the nine spatial profiles, proving that the diffusion of odors is closely related to space. Among them, in the experiment in the lower center (Figure7.9), the odor shows a relationship that diffuses in the acute direction and does not enter the obtuse space, which fits the study of instability in aerodynamics, where the diffusion pattern of gaseous fluids follows precisely similar principles according to RT instability and its related simulations. The experiment and study prepare the ground for the next step in understanding.

Of course, this ignores the differences in the density and thus the propagation-diffusion patterns presented by the molecular weight of the odor molecules. However the study of the nature of gaseous fluids has also helped the author to a great extent in understanding the principles of odor. The study of the relationship between odor and architecture can be started by studying the propagation of odor in the profile. This not-so-rigorous experiment at least demonstrates that the diffusion patterns of gaseous fluids can vary quite dramatically in different building profiles. There are three simple conclusions from the experiment: 1) gaseous fluids flow faster in areas of connected patios, resulting in lower concentrations; 2) gaseous fluids tend to accumulate in flat areas with greater depth of entry; and 3) the distribution of gaseous fluids follows the Tesla Valve, or reverse blocking principle, which ensures the direction of movement of gaseous fluids.

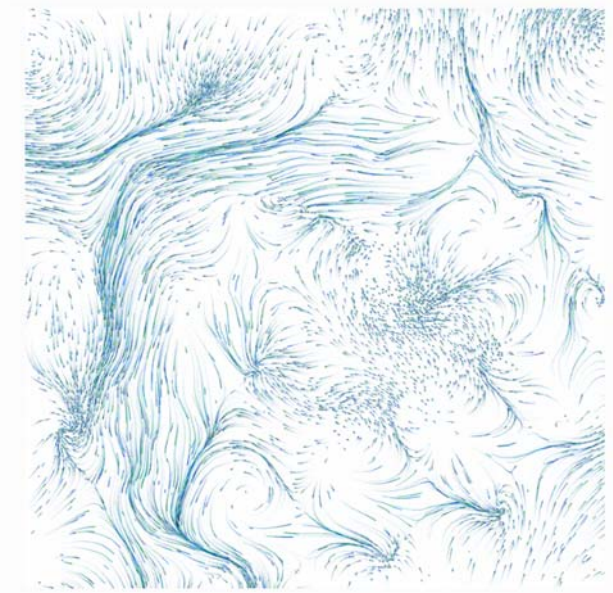


Figure 7.10 Fluid experiments simulated by Processing (Image source: author based on https://openprocessing.org/sketch/438044)

The simulation of the motion patterns of gaseous fluids follows the knowledge of aerodynamics, and the visual programming language represented by PROCESSING can simulate similar particle effects (Figure7.10), presenting the motion patterns of gaseous fluids in the two-dimensional plane. In space, it also presents different odor distributions and spatial features.

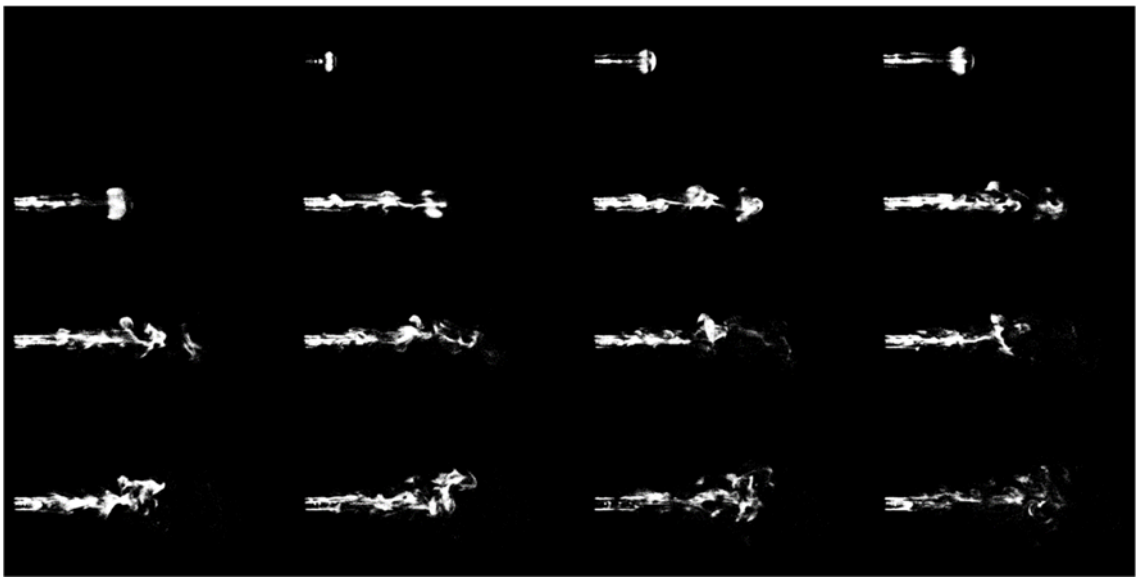


Figure 7.11 Screenshot of Blender simulated odor propagation frames (Image source: author's own drawing)

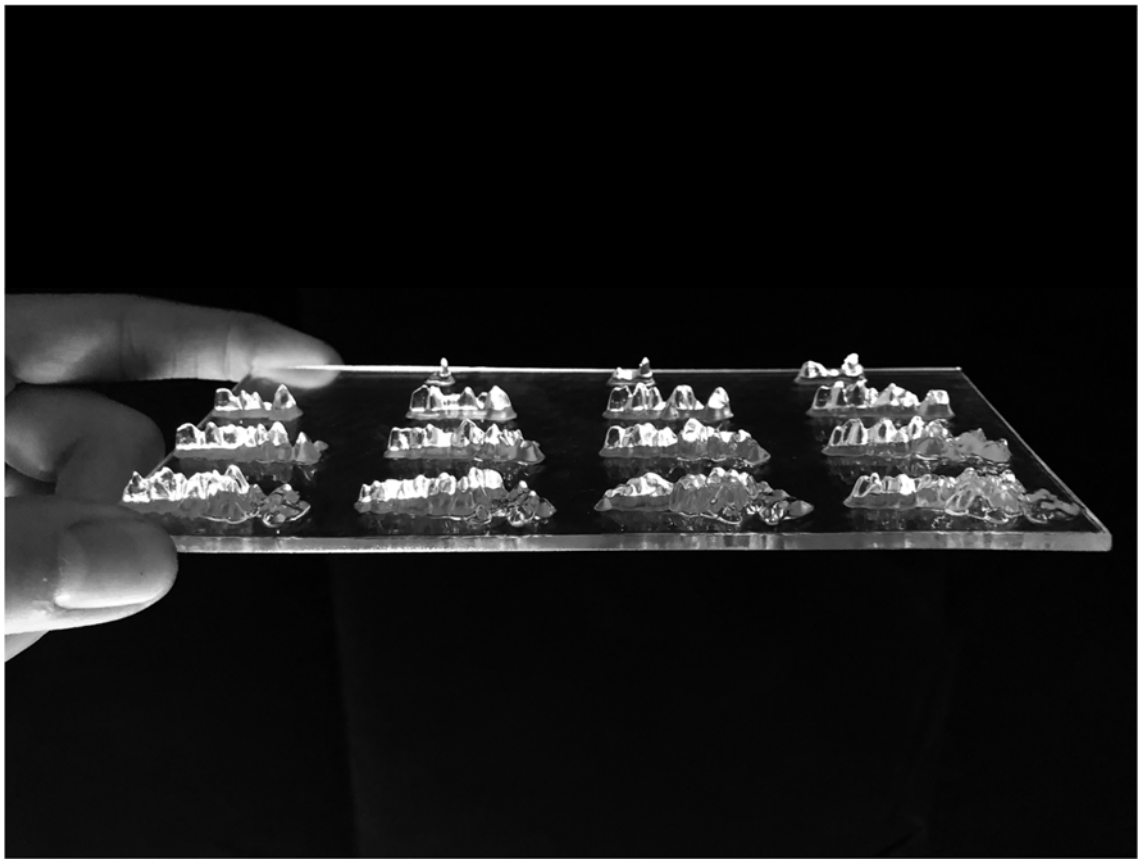


Figure 7.12 3d printed processed visualization of the odor image volume of a single jet (Image source: author's own drawing)

Based on the above research and experiments, the author believes that a proper formal representation can be found by starting from the propagation pattern of smells.Blender is a simple and easy-to-use tool for simulating smells. By setting parameters to simulate a continuous puff of smoke in the x-direction, an animation can be rendered (Figure7.11). The output of the animation is then image processed into a 3d block by grasshopper (Figure 7.12). This 3d process is also a preliminary attempt to visualize odors, revealing that odors actually follow a certain distribution of direction and intensity in a seemingly random diffusion pattern.

7.3.2 From Tesla Valves to Controlled Environments

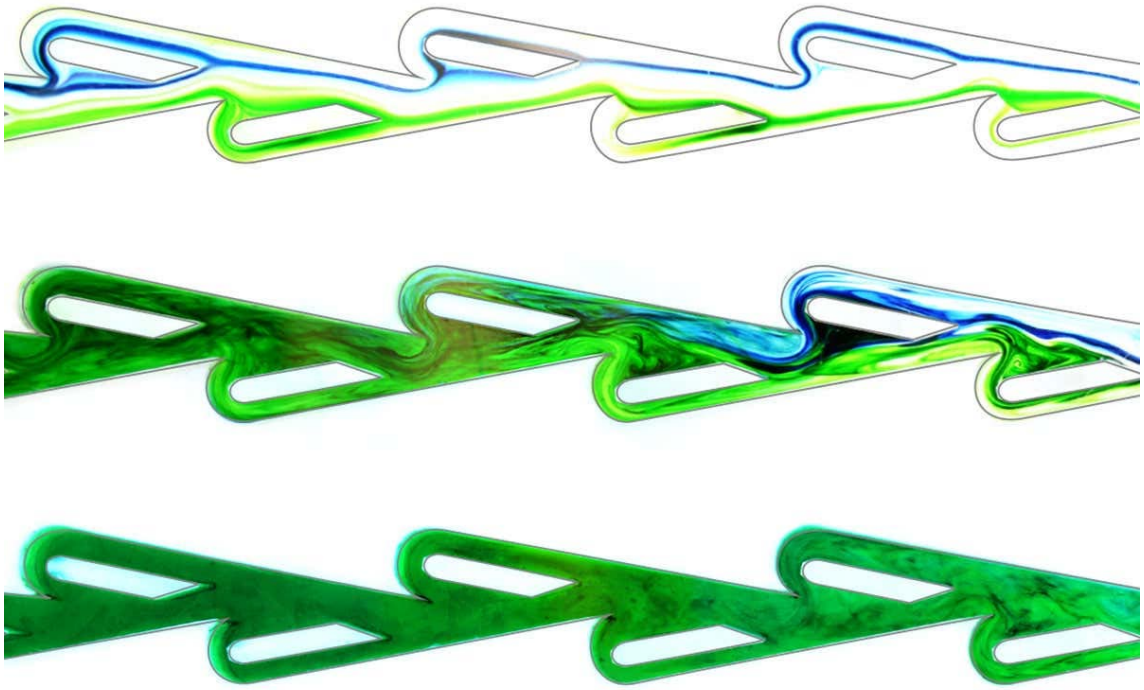


Figure 7.13 How the Tesla valve works (Image source: NYU Applied Math Lab)

In the course of an intensive study of the properties of gaseous fluids, the author's goal was to manipulate odors, i.e., to control airflow in buildings and urban spaces, which would serve the purpose of the design - to provide a different, but controlled, experience of odors.In 1920, Nikola Tesla proposed the Tesla valve to achieve precisely this purpose (Figure7.13), whose simplicity of form and the principle that no power is required to achieve reverse blockage of odours suggests that the same effect can be achieved in similar spaces. By designing the plane so that odors entering from the reverse direction are obstructed by the disturbance of the wing block on either side and thus the forward direction.

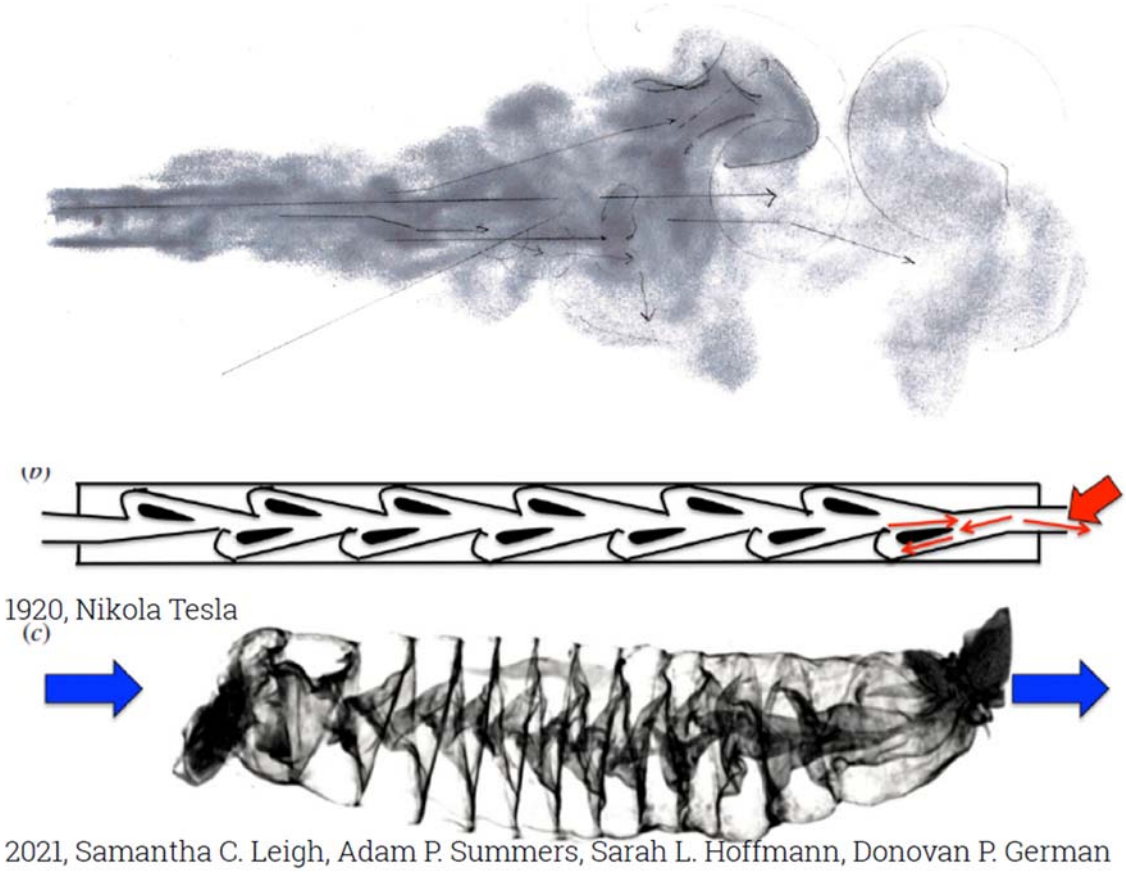


Figure 7.14 Similarity of odors in the space of natural diffusion, Tesla valves and shark gut segments (Image source: author's own drawing, Nikola Tesla, ref. [27])

The August 2021 article by Samantha C. Leigh et al. learned from scanning shark intestinal segments that the secret of their unique structure lies in the fact that they are a Tesla valve (Figure7.14), with food, like the gas in the Tesla valve, allowing more contact with the intestinal wall as it travels through the segment to absorb nutrients. This three-dimensional structure certainly enriches the space of the Tesla valve. It inspired the author to abstract and design a spatial prototype based on it.

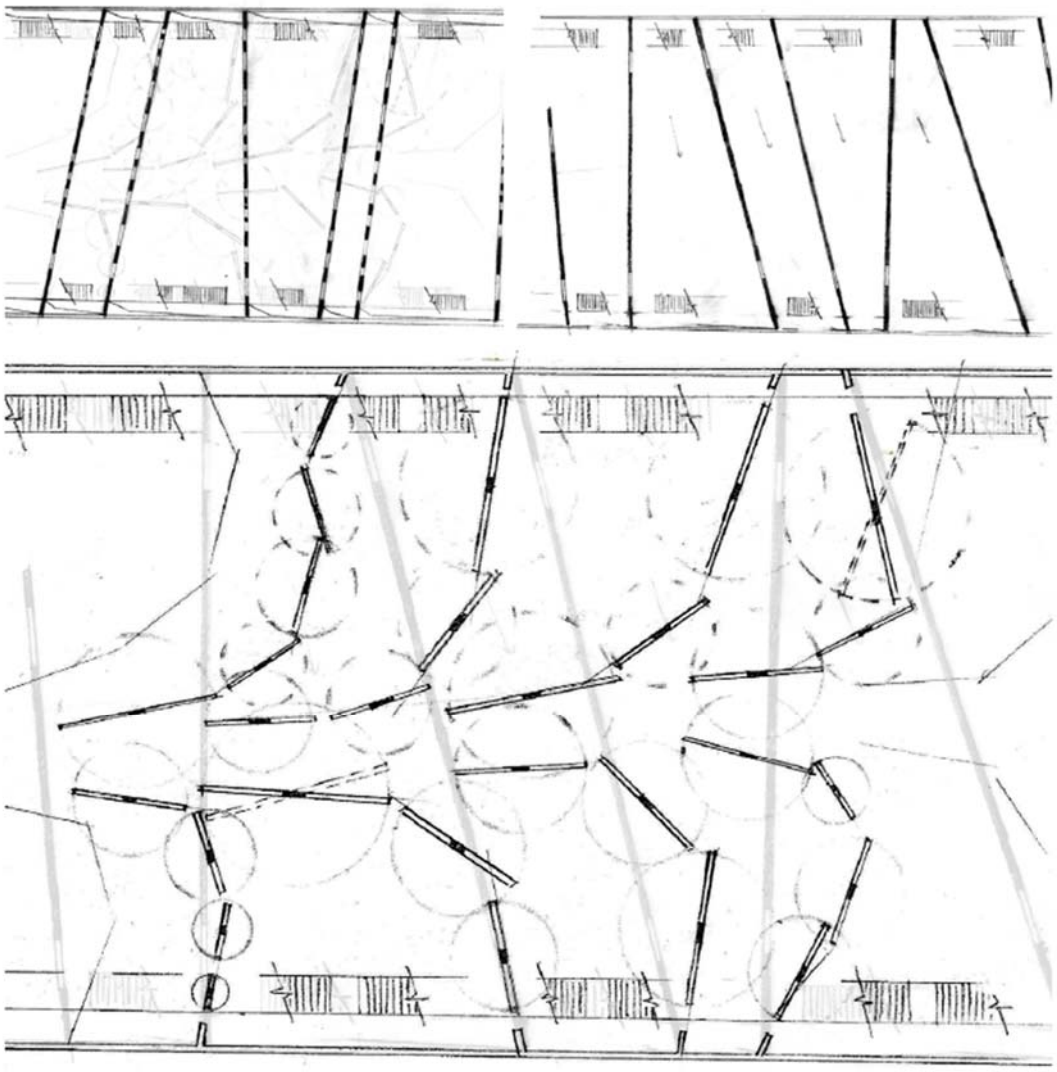


Figure 7.15 Space prototype (Image source: author's own drawing)

Based on the study of the shark gut segment, it was disassembled into three spatial layers - the upper middle and lower - and formed a segment of a spiral structure (Figure7.15). Among them, the middle layer, as the core space, has two different internal spaces - an odor channel located in the middle and odor compartments on both sides, where the odor from the odor channel spreads quickly and does not enter into the compartments, while the compartments are interconnected by the spiral structure of the upper and lower layers, so that a particular odor from one compartment can be sensed in the other This structure ensures that the odor in the building is This structure ensures that the scents in the building are controlled and interesting. We can imagine that the

scent in the central passage can come from the fresh smell of the nearby river and plants, or we can use some artificial or special natural scents - e.g. coffee, freshener, etc. And the scents in the two side compartments could come from some specially designed scent art installations. The flexible walls ensure the connection of sight lines and flexible use of space.

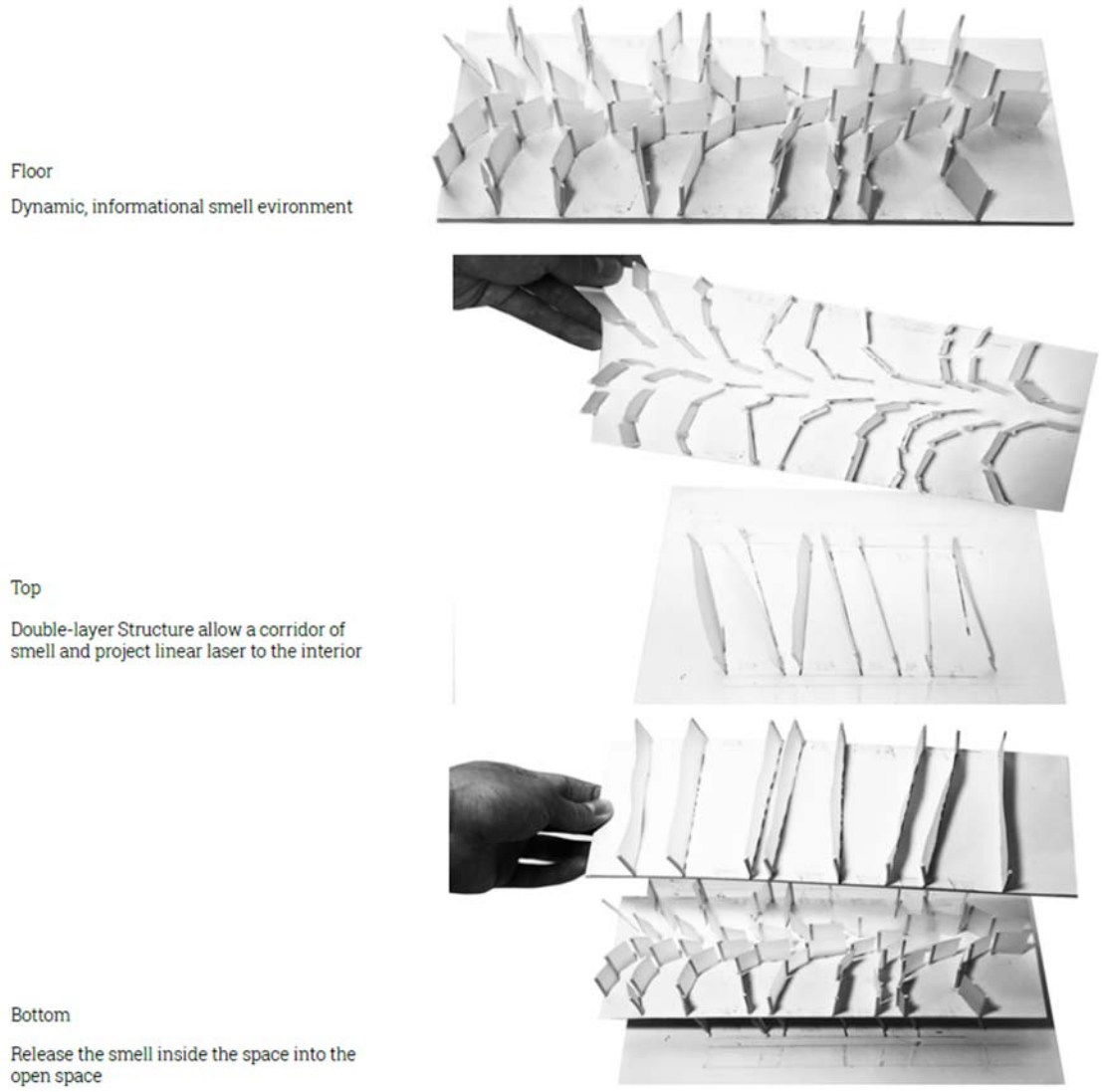


Figure 7.16 The spatial relationship between the upper, middle and lower structures (Image source: author's own drawing)

The diagram above clearly presents the up-and-down relationship of this spatial prototype (Figure7.16). The odor will enter from one compartment, through the lower picket (if this odor has less molecular weight than air, and vice versa from the upper

level), into the lower odor channel, and into the connected space on the other side.

7.3.3 From odor visualization to experimental validation

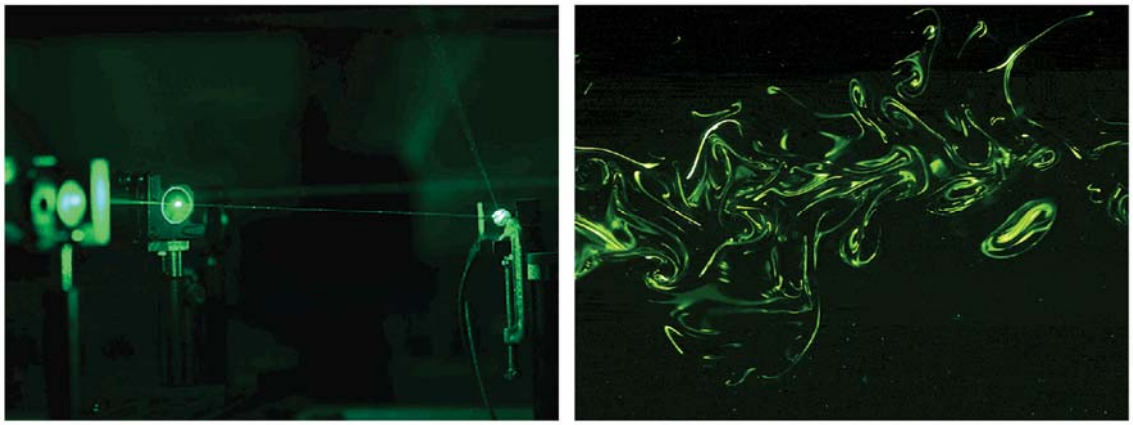


Figure 7.17 The john crimaldi team produced a laser scan of the scent (Image source: PBS)

Not to be missed in the study of the diffusion principles of odours is the visual representation of odours by a team led by Professor John Crimaldi (Figure7.17). He has produced extremely visual and beautiful images of odours by allowing them to diffuse in water and using laser scanning of the cut surface. This representation clearly presents the exact distribution of the odor over time and how it changes in response to external disturbances. Based on this, the author made a model of the spatial prototype mentioned above (Figure7.18), simulated the odor environment and visualized its presentation by means of a linear laser and a smoke maker. The results of the experiments proved that this spatial form allows for the differentiation and interoperability of the two odour spaces. From the opening on the left side odours can easily enter, while the opening on the right side has difficulty entering outside odours (in this case, car exhaust from the road).

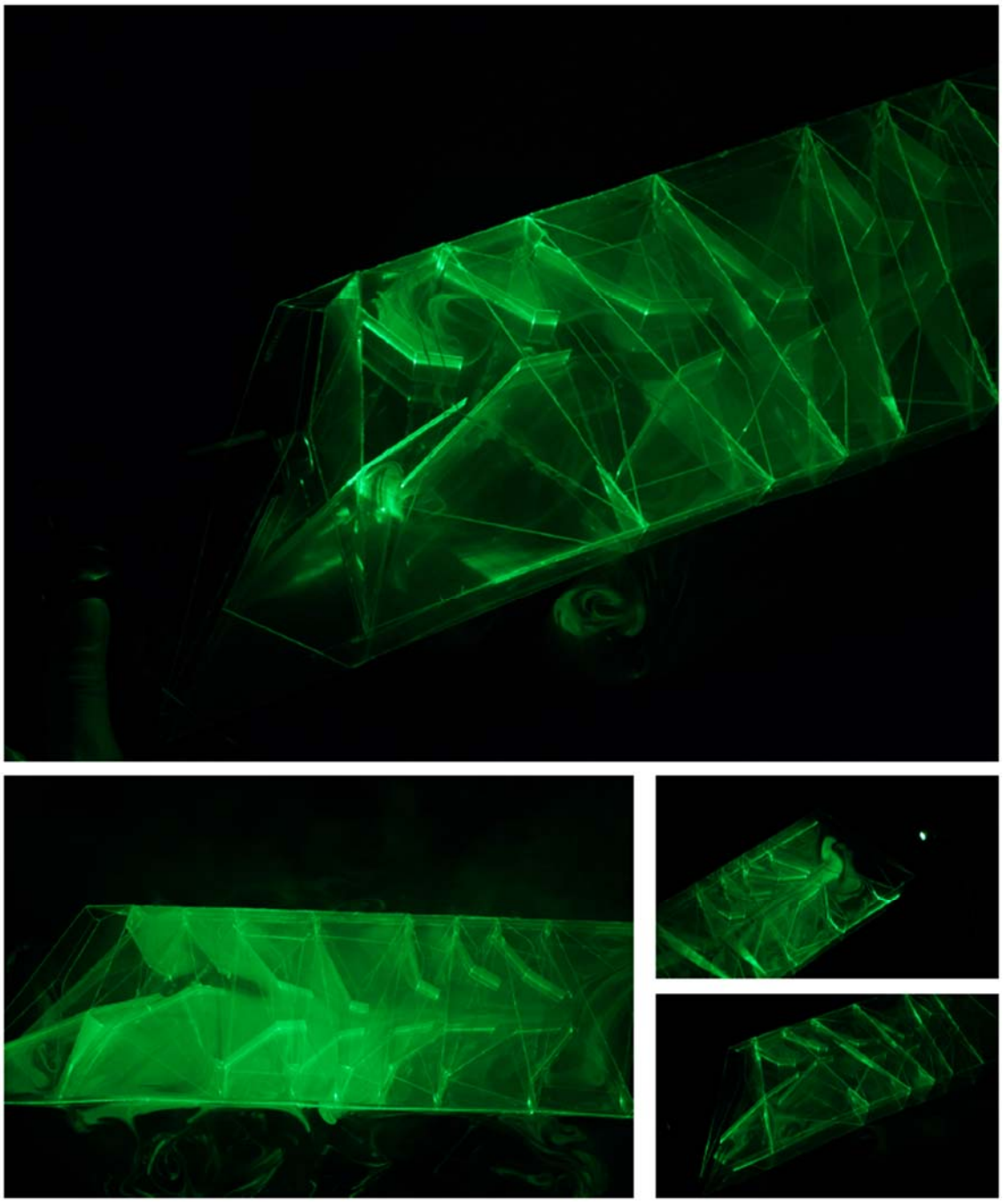


Figure 7.18 Record of experimental verification (Image source: author's own drawing)

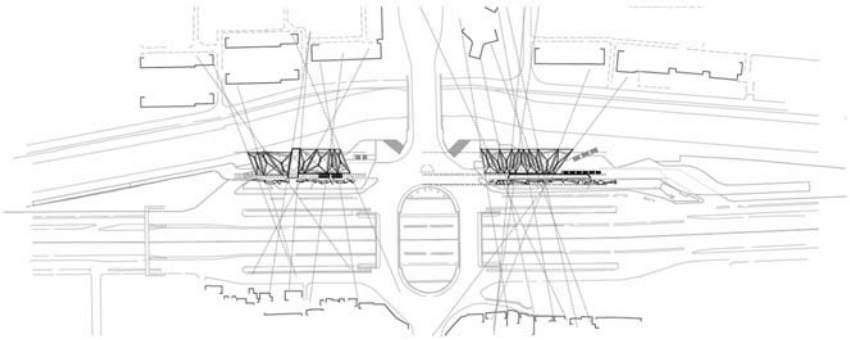


Figure 7.19 The relationship between the basic axis of the spatial prototype on the site and the seam of the surrounding buildings (Image source: author's own drawing)

The location of the control line was further determined on the site (Figure7.19). An important determinant of the airflow environment of the site is the distribution of nearby high-rise housing and, on the other hand, the line of sight from north to south is relevant. Therefore, the direction of the control line of the site is determined at the general plan scale. Afterwards, the specific form of the plan, floor slab, upper and lower part is then obtained step by step based on the control line (Figure7.20).

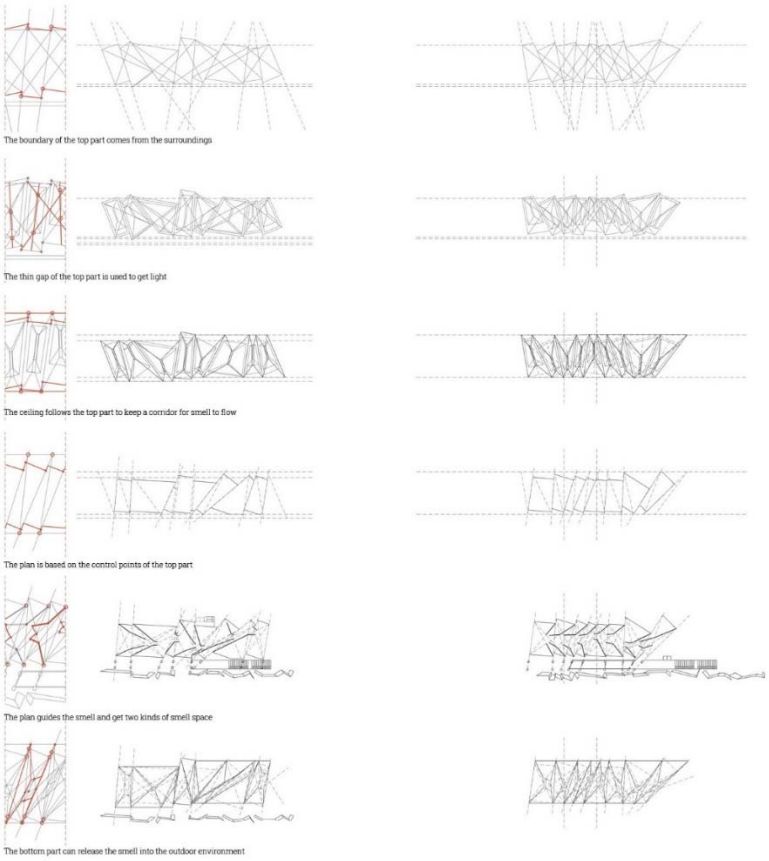


Figure 7.20 Projection analysis of various parts of the building (Image source: author's own drawing)

Once the top construction was determined from the control line, as described above, the slit at the top was used as a uniform light hole. The ceiling is of light wood construction, sharing the control line at the top, with the aim of leaving an access for odour use - that is, the upper part of the spiral structure - and some building equipment can be placed in this mezzanine. The control line of the planar floor then comes from the intersection of the upper control line with the boundary, following the logic of the lower part. The logic of the planes then comes from the spatial archetypes, with directions indicating that the interior is more likely to enter the fresh scent of the surroundings rather than the tailpipe scent of the second ring road. Finally, the bottom control line is the same as the planes, and as the lower part of the spiral structure, odors can be released to the surroundings through the openable holes in the middle. Thus, the building itself interacts with its surroundings through odor.

7.4 Urban Scent Public Landscape

7.4.1 Existing environment and odor masking

Figure 7.21 Odor walls mask negative odors and accumulate odors from rivers and plants (Image source: author's own drawing)

Although the area where the site is located has a high quality urban odor landscape, at the same time the pollution of the odor environment by waste exhaust fumes from traffic cannot be ignored. The Second Ring Road is an important urban expressway within the city of Beijing, and the exhaust fumes at the traffic nodes give people a negative impression of the surrounding environment. Taking the author's own experience as an example, during the site survey, the mixture of asphalt and exhaust fumes could be smelled when stepping out of the subway station, and this negative odor has been still lingering in the moat park, especially when there is no barrier between the site and the road. The author happened to encounter asphalt paving in Wudaoying Hutong in December 2020, and the overwhelming burnt smell left few visitors to the hutong, a side note to the impact of the strong negative odor on the space.

The barrier (Masking) in the design approach to odors in the Moncrieff study is important for the masking of negative odors. By designing large barriers, the propagation of negative odors from the second ring towards the moat can be effectively blocked. A gaseous fluid simulation of the site extent using Blender software revealed that the creation of large barriers blocked negative odors and accumulated water feature odors from the moat.

Therefore, the use of plants to design a green wall became the answer to design a response to negative odors. The light steel skeleton is planted with native Beijing plants - wall climbers, petunias and other plants - which on the one hand block car exhaust and

on the other hand evoke memories of Beijing life when they are in bloom. At the same time, the plant wall does not completely block the view. In order to ensure that visitors can still see the high-quality landscape of the old city, the layers of the green wall are interlaced to give way to the line of sight and guide people to the continuous rooftops of the old city.

The Smell Wall continues the urban landscape and defensive function of the Beijing City Wall (Figure7.21). Like the Wall Park planned by Mr. Liang, the Smell Wall once again transforms this valuable space occupied by urban roads into a high-quality urban infrastructure that can be subsequently extended and has a transformable character. The height of the Scent Wall is lower than the high-rise residences on the north side, but it can block the skyline of the high-rise residences in terms of sight lines, so that tourists visiting the Old City see a green and vague wall instead of the bland and insipid residential façade behind it. In perspective, the green city wall opens up the site's horizontally oriented composition.

7.4.2 Urban Heritage and Linear Parks

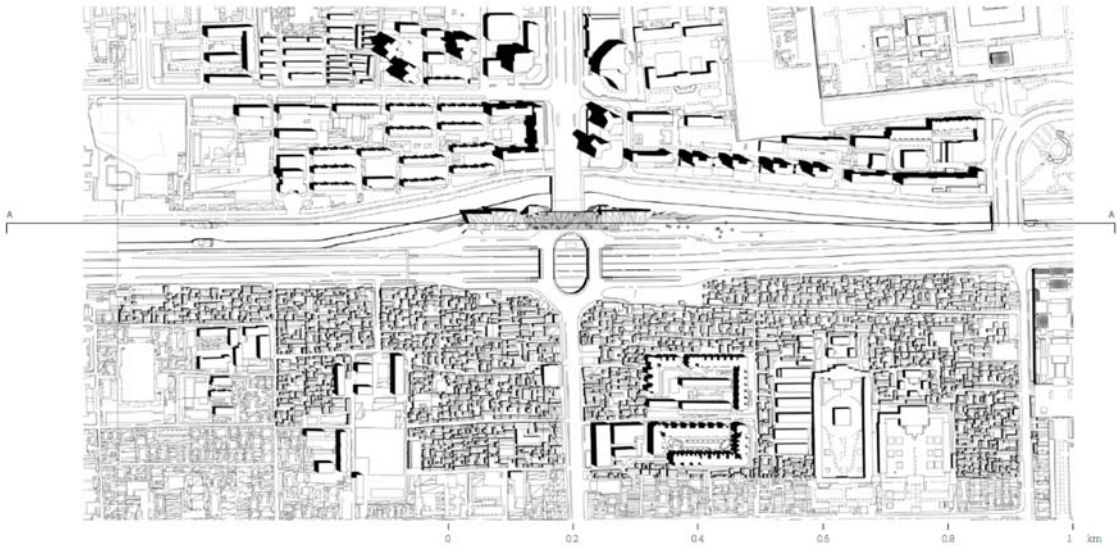


Figure 7.22 Master plan (Image source: author's own drawing)

Figure 7.23 City profile (Image source: author's own drawing)

As can be seen from the master plan (Figure 7.22), the urban fabric on both sides is connected to some extent through the urban space in which the building is located. In the urban profile (Figure 7.23), the building is designed with the surrounding landscape with different functional spaces around the theme of smell. The facilities in the lower part of the building can be used as a simple restaurant and bar and café, open to the river, while the landscape is planted with floral vegetation with healing properties and fragrance, masking negative odors while giving a certain health value to the urban public space. At the same time, the riverside walkway can be curated with a scent theme, displaying specially designed open scent installations and activities, making it an attractive new urban space with a scent theme. With the moat as an important odor resource within the site, combing the profile along the moat becomes an important part of creating the odor landscape of the site. The problem with the existing moat park is the small space and single function, even so, it is a place for nearby residents to walk after dinner. The design extends the waterfront space and sets up a large area of odor plaza at the exit of the subway station, which on the one hand can relieve the spatial pressure of the crowd squeezed by the subway station during peak hours, and on the other hand can be the first part of the outdoor public space.

In profile, the separation of functions is achieved in the horizontal direction. Starting from the river elevation, the functions in the upward direction are waterfront park, bus station, open deck, and odor exhibition in that order. In terms of use, the waterfront park serves both local residents and visitors, and the open platform is connected to the waterfront park so that visitors can move freely from the water's edge to the top of the platform, enabling the transformation from a natural to an artificial scent environment. It also enriches the options and boundaries of the scent environment. At the same time, the ground floor of the building at the connected elevation corresponds to the riverfront park, which can be used as a public bazaar, teahouse coffee or cooler, and also serves to increase the capacity of the river during abundant water. Above the second floor corresponds to the service functions of the bus yard, including a driver's lounge, offices and some charging station equipment.

Figure 7.24 Aerial view showing the building in relation to the river and the city (Image source: author's own drawing)

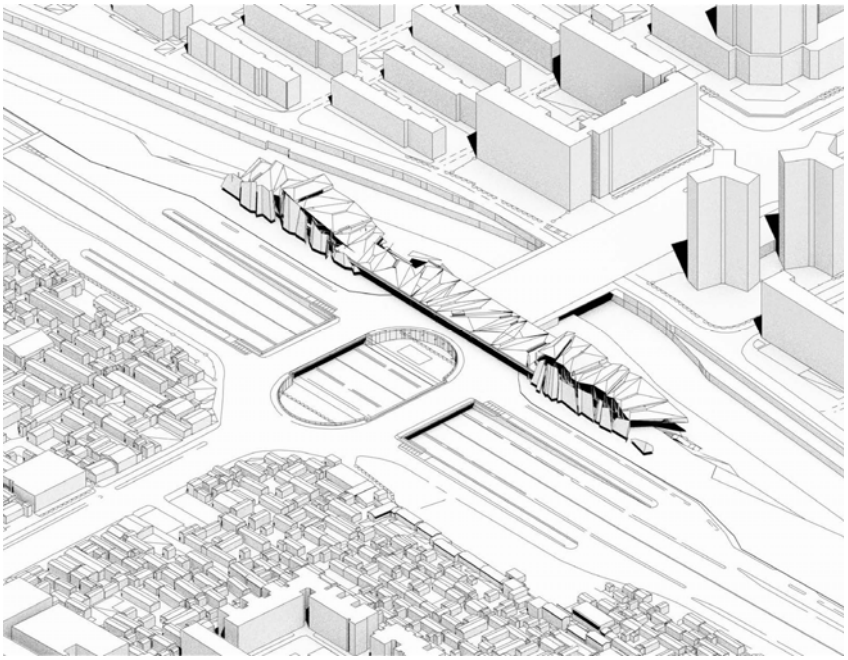


Figure 7.25 Urban axonometric relationships towards the Old Town (Image source: author's own drawing)

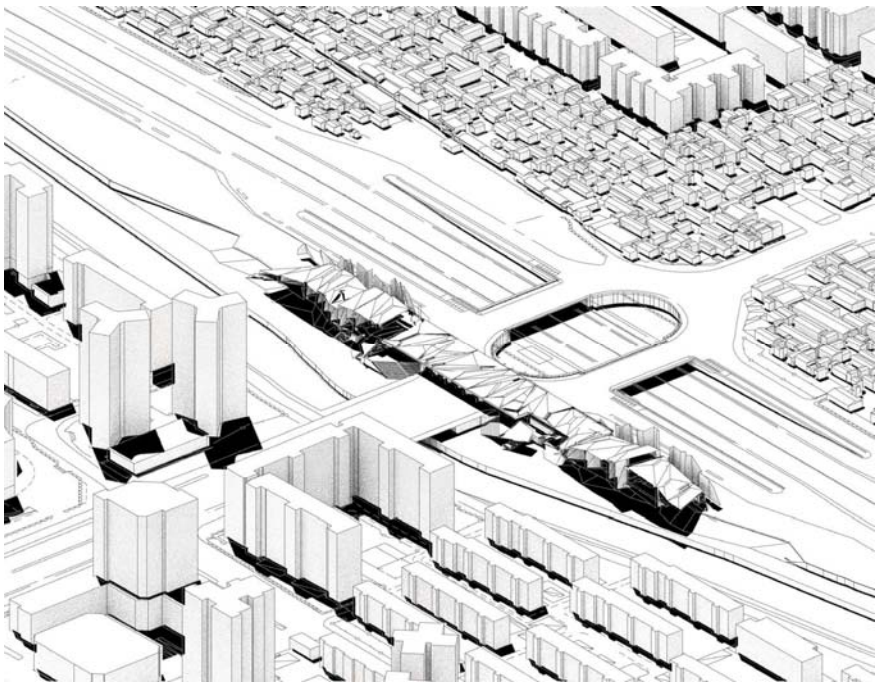


Figure 7.26 Urban axonometric relationships towards the new city (Image source: author's own drawing)

7.4.3 Spiral structure and spatial logic

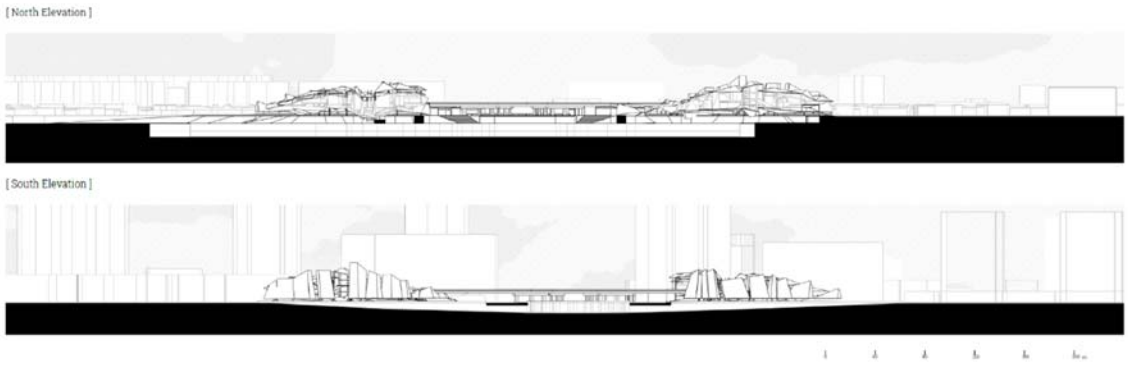


Figure 7.27 North and south elevations (Image source: author's own drawing)

The spatial logic of the spiral structure is also reflected in the façade (Figure7.27). The north façade is glazed with a boundary derived from the boundaries of the structure above and below, presenting the city with an interior rich in scent activity. On the north elevation facing the more large-scale new city, the façade takes on a dynamic and flexible form that creates a dialogue with the massive residential façade and is a

translation of the low and pleasing façade of the old city. Facing the better preserved Old Town block to the south, the façade adopts the language of the ancient city wall, a continuous and gaping vegetated wall surface that blocks the intervention of the modern city behind it into the Old Town space, while acting as a backdrop to add to the Old Town landscape.

The building simultaneously provides a new linear park in the city (Figure7.28). By adding a green belt to the existing river park, the separated spaces on either side are linked together by adding a green belt to the city road, which also further refines the river park into an attractive and spatially rich public amenity. The steel truss structure located behind the odor wall supports the odor wall on the south side and the structure on the north side, while the grounded portion of the building is also used as a support structure.

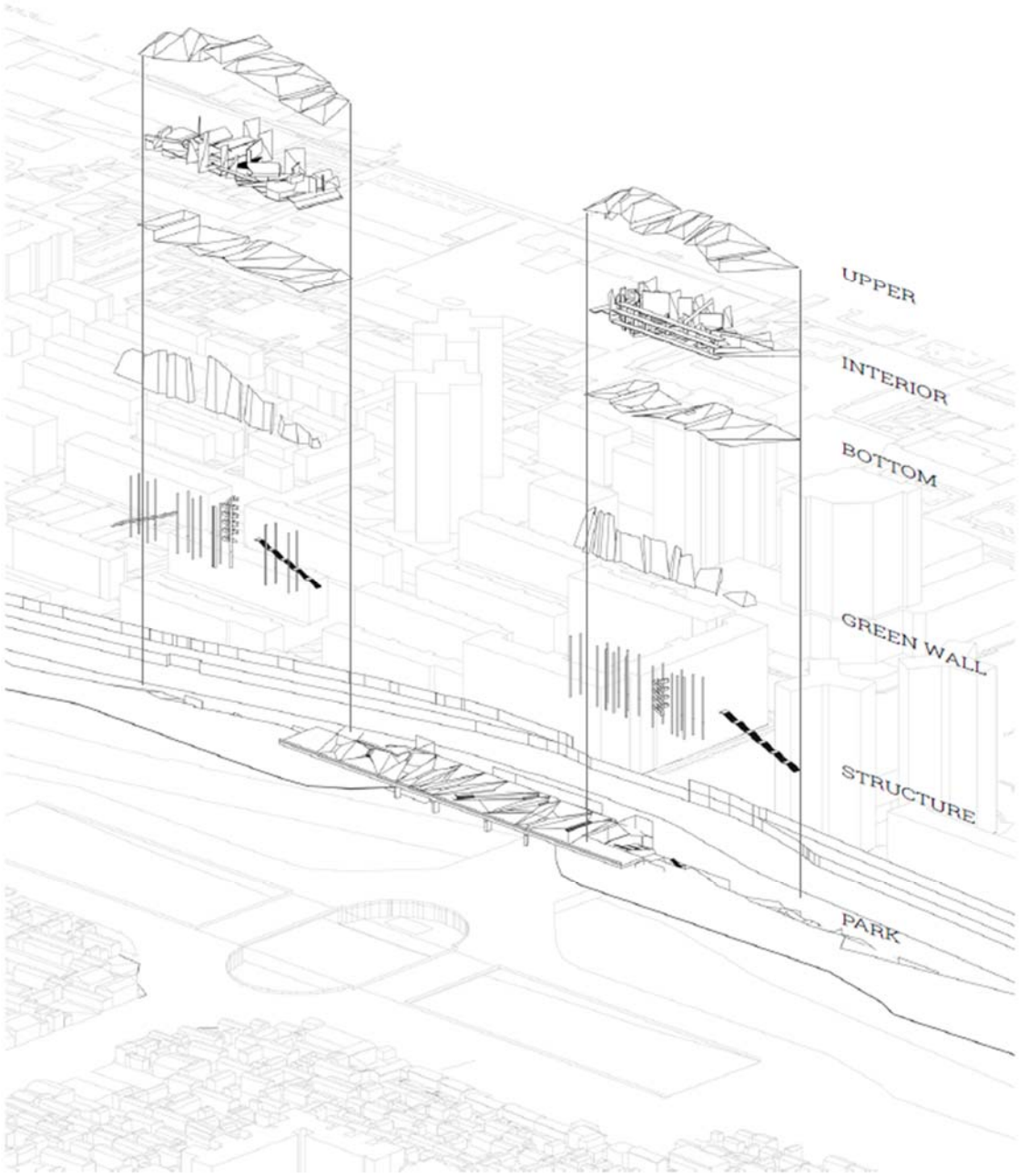


Figure 7.28 Exploded axonometric view (Image source: author's own drawing)

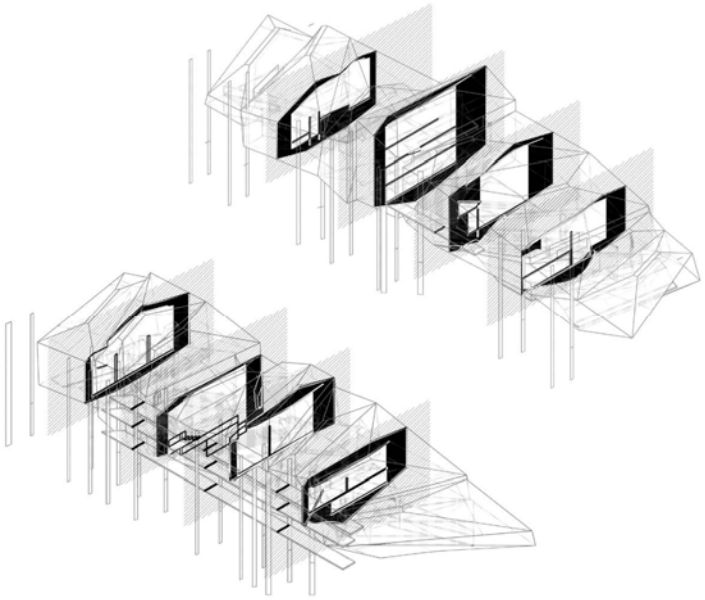


Figure 7.29 Continuous profile (Image source: author's own drawing)

The space of scent and the space of people are treated separately in the building (Figure7.29); on the one hand, the main tour paths are permeated with rich, designed scents in the spaces used by people, and on the other hand, the space around the building is used as a channel for scent, wrapping around the space of people, so that scent and people achieve a dialogue and interaction in the building. The rich spatial entanglement allows people to close their eyes in it and experience the flow, disturbance and sedimentation of scents in the space.

7.5 Scent Experience Urban Space

7.5.1 Scented urban spaces

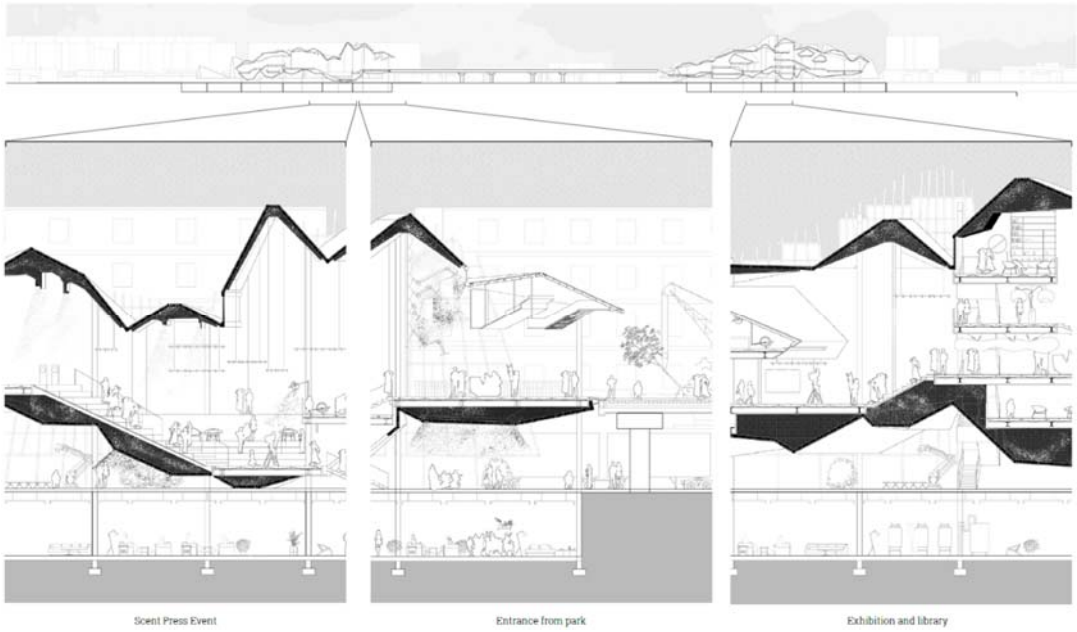


Figure 7.30 South-facing section of the building (Image source: author's own drawing)

After defining the top-middle relationship of the projected planes, a rich architectural profile was designed to provide different functional spaces for scent (Figure7.30). The eastern part functions as a scent art museum, exhibiting scent-related art installations and temporary exhibitions, with internal stair spaces for holding scent events (e.g. the launch of a perfume, or large scale scent exhibition installations), ground floor rooms for experiencing rising scents, and ceiling openings that allow scents from the scent aisles above to descend into the experiential spaces below. The west side takes on more of a public facility function, such as a scent museum and a scent conservation center. The scent system on the west side is more closely connected to the environment, and the openings at the top allow outside scents to enter the room. The interior compartments serve to provide space for research while opening up to the outside world in terms of sight lines.

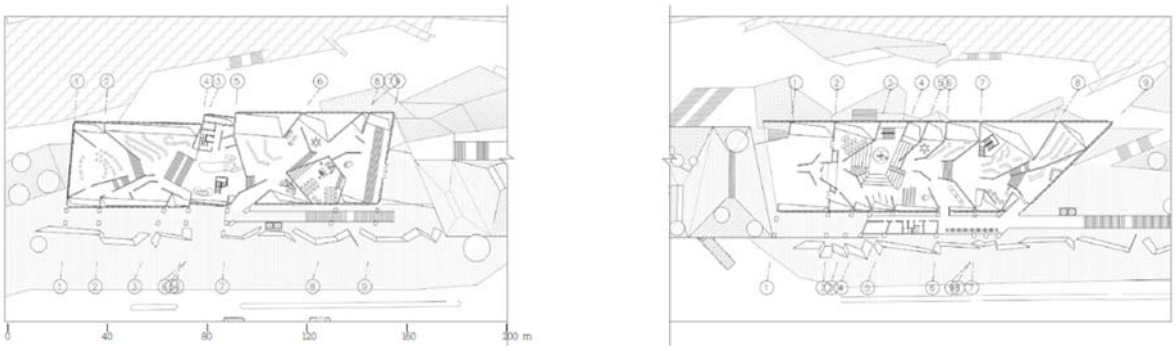


Figure 7.31 Building first floor plan (Image source: author's own drawing)

The logical basis of the floor plan follows the Tesla valve's odor space archetype (Figure7.31), and the boundaries of the space archetype become the control lines for stairs and functional space delineation. At the urban scale, the indoor spaces are connected by an elevated park to form a continuous odor landscape, from west to east, the experiencer can smell various odor profiles, experience the new urban space in the botanical park above the second ring road for the negative odor elimination, and finally visit the exhibition at the Scent Art Museum on the east side.

Figure 7.32 Perspective of the river view (Image source: author's own drawing)

The design gives the original river park a greater public attribute. The original river park is to a greater extent just a linear walkway. In the author's several experiences, on

the one hand, the dense vegetation squeezed by the bus station obscures the existence of the park (which also protects the privacy of the park to some extent), on the other hand, the linear park itself, which extends almost the whole moat, has no ancillary facilities, and with the limited depth, only a passage less than three meters wide. Therefore, the park is not an attractive public place, not to mention the high quality of the Ditan Park in the vicinity.

The scent plaza incorporated into the design provides open space at two elevations for people to relax and gather (Figure7.32). As can be seen in the perspective view, the path at the river side has been widened to accommodate a greater flow of people, including cyclists and runners. At the same time, the scent plaza on an elevation equal to the path is connected to the building, and the lower level of the building releases characteristic scents to the outside, so the plaza will be a rich scent site full of variation, and can also house outdoor scent installations. The two elevated scent plazas are connected by a ramp, under which space is set up to accommodate a cafe, bar or simple restaurant serving food and drink, while collecting rent to keep the building running. The slopes themselves can welcome people to picnic and chat and interact with the river.

Figure 7.33 Old Town view of the smelling walls (Image source: author's own drawing)

Whereas on the south side facing the Old City, the buildings screen the oppressive view of the new city behind, the view from the Old City reveals a horizontal

continuation of the green walls and a plant garden above the road (Figure7.33), with the colour of the light walls changing with the colour of the plants in different seasons.

7.5.2 Marketing Communications for Scent

Figure 7.34 East side of the scent hall (Image source: author's own drawing)

Scent marketing, an important offshoot of scent urbanism, offers a new way of thinking about the integration of scent and commerce. In the East Side Museum of Scent Art, the museum itself could take on the task of temporary scent exhibitions, inviting architects and artists to create installations related to space and scent. In addition, the museum could try to collaborate commercially with perfume brands, scentbranding companies, or other companies, and the launch of a perfume brand could be held in the Hall of Scents, for example, when a fragrance is launched that tries to evoke the memory of the space in Marrakech, Morocco, the space could be covered with sand, and the sunken platform could prevent an installation used to allow everyone to experience the scent to achieve a distinctive launch (Figure7.34).

7.5.3 An exhibition study of scent

Figure 7.35 Scent study and interaction on the west side (Image source: author's own drawing)

In our country, the identification and preservation of the odor heritage is largely unimplemented. Therefore, the establishment of an odor library to collect important odors from Beijing and the whole country becomes an inevitable part of the future development of odor urbanism. The European perfume industry has studied the process of odor refinement in detail, and by introducing the odor refinement process and storing odor molecules in alcohol containers, a standardized odor storage and experience device can be made. The library space should be homogeneous and could be appropriately expanded for future additions to the collection.

At the same time, odor-related research work, including the process of purification, archiving, and storage, can also have some scientific and display value, by showing the research process to the outside and releasing the odor, or by holding workshops to scientifically educate the community about the widespread existence and importance of urban odors. The diverse public spaces in the Odor Conservation Center and the west side of the library building can likewise be furnished with exhibitions such as odor maps and odor installations, making this a premier odor public space (Figure7.35).

7.6 concluding remarks

The future of architecture in the perspective of odorous urbanism

Scent as a substance, space influences the transmission of scent, and at the same time scent influences the form of space. The exploration of spatial forms of odor allows architects to evaluate space from a non-visual perspective and find new inspiration about the language of architecture. More importantly, architecture under the influence of scent urbanism can also have a positive impact on its users. We have become aware of the possible negative implications of buildings that ignore scent, such as public buildings near landfills and housing facing urban highways, and by considering scent in the design phase, the overall spatial quality of the building is also greatly enhanced.

Research on scent architecture has been slow to progress due to the passing of Victoria Henshaw, but the subject of scent continues to attract the exploration of architecture students and practitioners around the world. There are at least 2 future directions that scented architecture can take: narrative, and health.

Under the perspective of spatial narrative, scent is certainly a very attractive thread of narrative. The exploration of the narrativity of smell is bound to touch on the most fundamental forms of architecture, and at the same time, spatial narratives give rise to new languages.

In terms of healthiness, there is no closer relationship between the scent landscape and urban dwellers than the relationship between odor and psychology. Due to the specificity of the direct connection between the olfactory nerve and the brain, odors are more likely to have a direct impact on our psychological state than other senses. Imagine a carriage full of sweat and a dumpster in the summer, negative odors make it impossible to concentrate, while positive odors have been shown to have a positive effect in the field of healing, especially in the stages of mental illness and recovery from illness, where a positive scentscape can speed up the healing process.

The Future of Public Space in the Perspective of Odorous Urbanism

The creation of public space is closely related to place-making. And the relationship between odor and placemaking has been directly or indirectly confirmed by many scholars. A large number of interviews, questionnaires, and studies on odor reflect that people's memory of place comes largely from the memory of place odor. Therefore, the odorscape of public space has not only the meaning of spatial quality, but also the meaning of sociality.

The Future of the City in a Scented Urbanism Perspective

The impression of odor produced by a city as a whole can be directly related to the

impression the city leaves on people. When people think of a city with a particular industry, they often associate it with the signature odor produced by that industry (when it is sufficiently pronounced), and it is often the change in odor that is first recorded in historical records as people travel to a city. Victoria Henshaw, for example, has given the example of a city on a hillside and a city on a plain, where the odor landscape is markedly different, both from the odor of the city's drainage system and from the difference in the large-scale odor landscape produced by the topography.

In the process of conducting my research, friends around me often asked me about the authenticity and necessity of this topic. This brings me to a key question about odour cityscapes: where exactly does the odour landscape fit into the current urban landscape? If we are not just satisfied with eliminating negative, noxious smells, with creating smoke-free and fragrance-free zones in cities, with the homogeneous perfume emanating from the open doors of shopping malls, then where do we go from here? Can people actually appreciate the presence of smell, the beauty and ugliness of smell?

The author relies on these studies to make designers obsessed with the visual vortex stop and rethink the meaning and value of the senses. The design of scent is not only about the space itself, but also closely related to the city and its inhabitants. After more than a year of research, the author is deeply convinced that this thesis still has many shortcomings, and throws light on the hope that more researchers will devote themselves to the study of scent urbanism**.**

Bibliography

[1] Broweus, N., Hultén, B., van Dijk, M. (2009) *Sensory Marketing*, London: Palgrave Macmillan Ltd

[2] Defazio, K. (2016) *City of the Senses*, London: Palgrave Macmillan.

[3] Pallasmaa J. (2012) *The Eyes of the Skin: Architecture and the Senses* (3rd edition), Hoboken: Wiley.

[4] Reinarz, J. (2014) *Past Scents: Historical Perspectives on Smell*, Champaign, IL.: University of Illinois Press

[5] Steward, J., Cowan, A., Pinol, J-L., Rodger, R. (2016) *The City and the Senses: Urban Culture Since 1500*, London: Routledge

[6] Jieling, X. (2018) Smell, Smellscape, and Place-Making: A Review of Approaches to Study Smellscape in Francesco, A(ed.), Jieling, X(ed.), *Handbook of Research on Perception-Driven Approaches to Urban Assessment and Design*, Hershey, PA: IGI Global, 240-258

[7] Henshaw, V., McLean, K., Medway, D., Perkins, C., Warnaby, G. (2018) *Designing With Smell*, London: Routledge

[8] Henshaw, V. (2014) *Urban Smellscapes*, London: Routledge

[9] McLean, K. (2020) *Nose-First: Practices of Smellwalking And Smellscape Mapping*. London Royal Academy of Art

[10] McLean, K. (2012) *Location, Emotion And The Senses: A Virtual Derive Smellmap Of Paris*, Proceedings of 8th International Design and Emotion Conference London

[11] McLean, K. (2015) Ex-Formation As A Method For Mapping Smellscapes. *Communication Design* 3 (2): 173-186

[12] McLean, K. (2013) Smell Map Narratives Of Place – Paris. *New American Notes Online,* 6. ISSN 2160-0104

[13] McLean, K. (2017) Smellmap: Amsterdam – Olfactory Art & Smell Visualisation. *Leonardo*, 50(1): 92-93

[14] Maria, Aiello, L. (2016) The Sensorial Map of the City. *WWW '16 Companion: Proceedings of the 25th International Conference Companion on World Wide Web*, 2016: 529

[15] Porteous, J.D. (1990) *Landscapes of the Mind - Worlds of Sense and Metaphor*, Toronto: University of Toronto Press

[16] Quercia, D., Maria, Aiello, L., Schifanella, R. (2016) The Emotional and Chromatic Layers of Urban Smells. *Proceedings of the Tenth International Conference*

on Web and Social Media

[17] Southworth, M. (1969) The Sonic Environment of Cities, *Environment and Behavior*, 1(1): 49–70.

[18] Esther, W. (2007) *the Whiff of Uncertainty*, http://estherwu.com/student.html

[19] Marketou, J. (2008) *"SMELL IT" Installation*, jennymarketou.net/works_2008_6.html

[20] McLean, K. (2020) *Sensory maps*, https://sensorymaps.com/

[21] Canadian Centre for Architecture Montréal, Wolfgang S. (2005) *Sense of the City: an Alternate Approach to Urbanism*. Canadian Centre for Architecture

[22] Śliwa, M., and Kathleen R. (2012) Making scents of transition: Smellscapes and the everyday in 'old' and 'new' urban Poland. *Urban Studies* 49.1: 23-41.

[23] Emmons, P. (2014) The place of odour in modern aerial urbanism, *The Journal of Architecture* 19.2: 202-215.

[24] Spence, C. (2020) Senses of place: architectural design for the multisensory mind. *Cognitive Research: Principles and Implications* 5.1: 1-26.

[25] Boswell, R. (2008) Scents of identity: Fragrance as heritage in Zanzibar. *Journal of Contemporary African Studies* 26.3: 295-311.

[26] Bembibre, C., and Matija S. (2017) Smell of heritage: a framework for the identification, analysis and archival of historic odours. *Heritage Science* 5.1: 1-11.

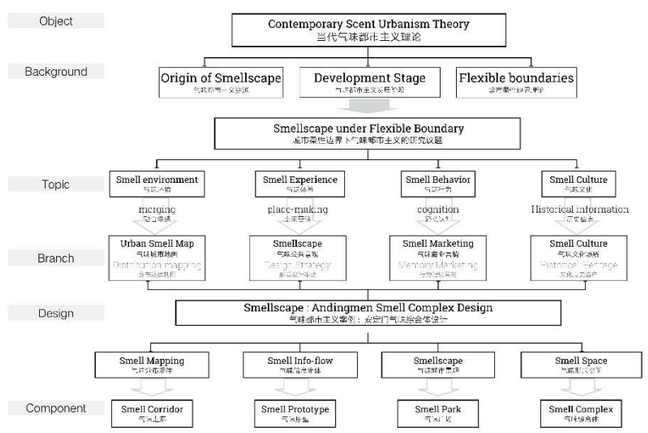
[27] Leigh, S. C., Summers, A.P., Hoffmann, S.L., German, D.P., (2021) Shark Spiral Intestines May Operate As Tesla Valves. *Proc.R.Soc.B* 288

[28] Castro, J.B., Ramanathan, A., Chennubhotla ,C.S.(2013) Categorical Dimensions of Human Odor Descriptor Space Revealed by Non-Negative Matrix Factorization. *PLOS ONE* 8(9): e73289

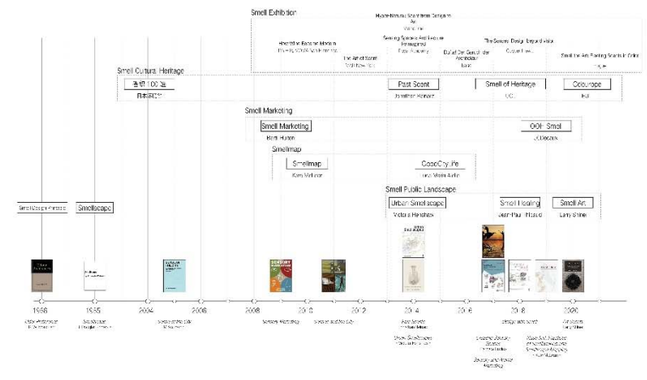
Appendix Final Drawings

气味景观研究综述及北京气六综合体设计

[Research Structure]

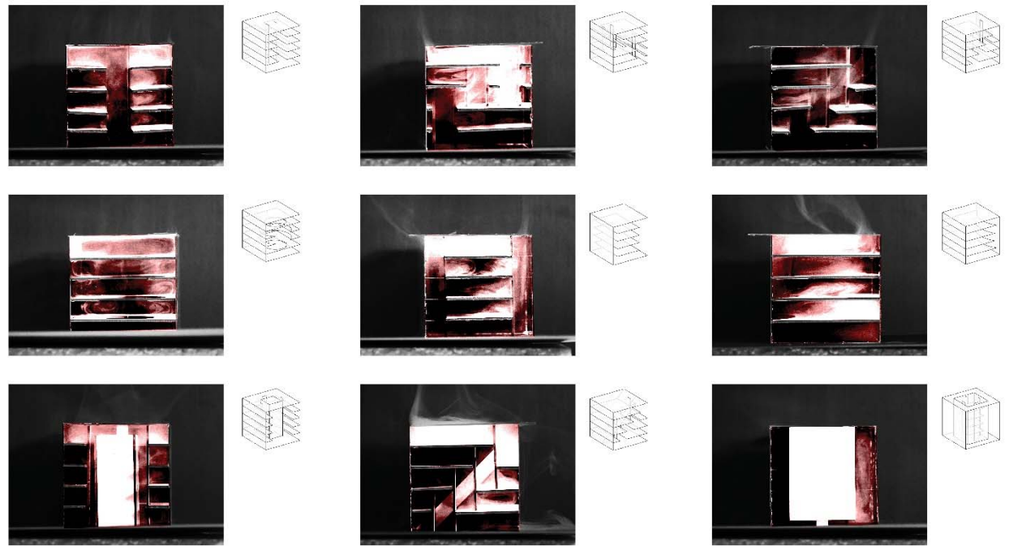


[Research Chronology]

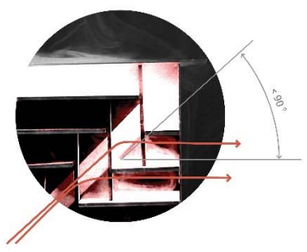


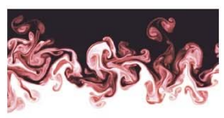
[Mapping Olfactory - Wucaoying Hutong]

[Model Test to Show Smell Flow]



[Researcher Mapping]





Abhijeet Dhillon, 2020

$$\exp(\gamma t), \quad \text{with} \quad \gamma = \sqrt{Ag\alpha} \quad \text{and} \quad A = \frac{\rho_{heavy} - \rho_{light}}{\rho_{heavy} + \rho_{light}},$$

Rayleigh–Taylor instability

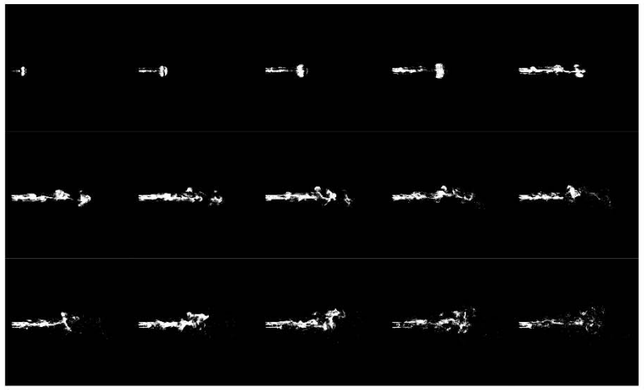
$$\eta = \Re\left\{B \exp\left(\sqrt{Ag\alpha}\, t\right) \exp(i\alpha x)\right\}$$

[Research Content]

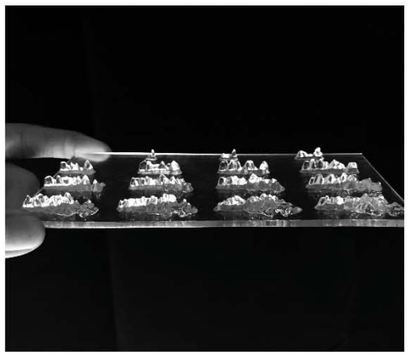
The urban scent landscape is an important aspect of improving the quality of urban space. Odor urbanism refers to the process of increasing the publicity of urban public space by designing and improving the odor landscape in the design process of public space. As a new sub-field of urban design, the practice of urban scent landscape continues to emerge, such as the experience installation of scent landscape, the healing garden of natural scent, and the creation of place for marketing scent. The urban scent landscape caters to the concept of a city with five senses and expands the perspective of urban construction and planning under visual centralism. Western scholars have carried out multi-disciplinary explorations of odor urbanism, including the perspective of discussing the recognition and protection of odors in the field of cultural heritage, the debate on the relationship between odor art and art and philosophy, and the perspective of odor city mapping and urban odor spatial mapping.

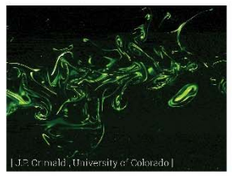
Western scholarly research on odor urbanism is still in its early stage. Most studies focus on a certain topic of odor urbanism, or a certain interdisciplinary perspective, and there is no systematic generalization of spatial research. Therefore, from the perspective of architecture and urban design, this research integrates and summarizes many existing studies, and divides the relevant practices and research of urban scent landscape into four categories: distribution law mapping, formal design strategy, behavioral memory marketing, and cultural and historical heritage. Issue a framework. Provide new ideas for the future direction of urban design.

[Air Fluid Simulation]

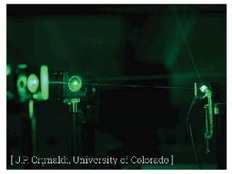


[Smell Visualization]



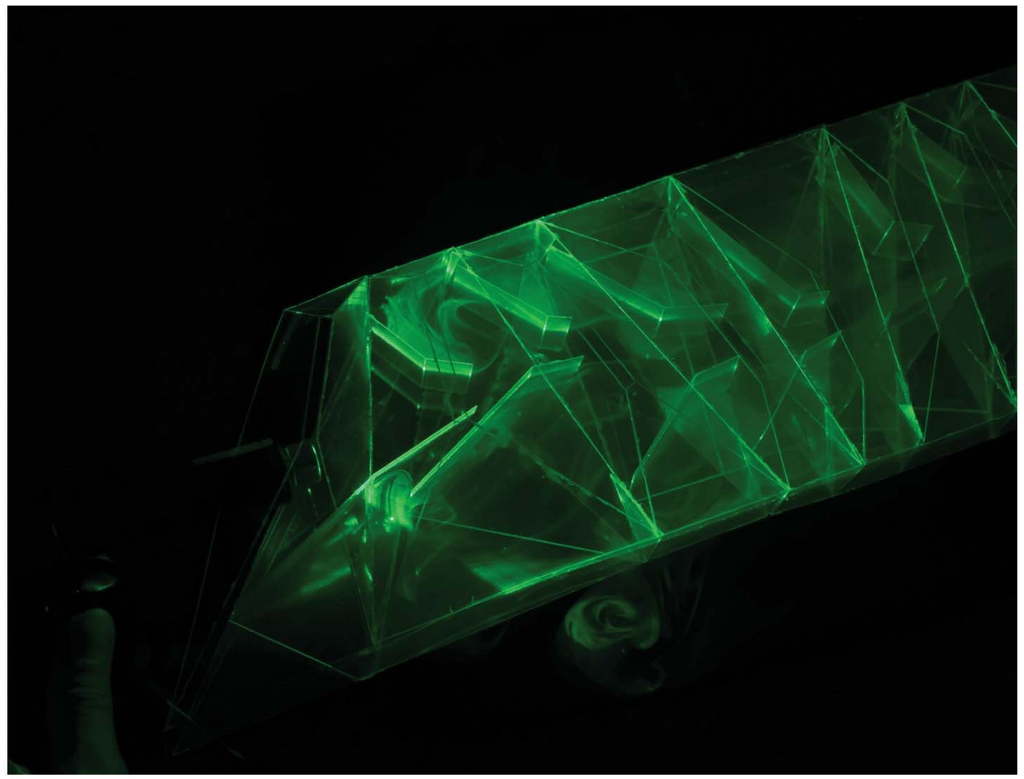


[J.P. Cornaldi , University of Colorado]



[J.P. Cornaldi., University of Colorado]

[Simulation Test with Laser and Fogmaker]

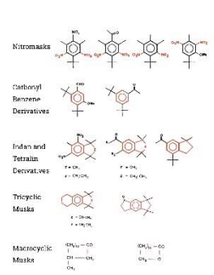


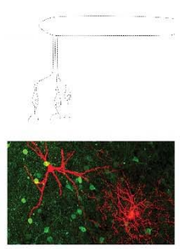
[Neural Mechanism of Odor]

To a certain extent, we can simplify the smell as a gaseous fluid. To study the relationship between smell and architecture, you can start with studying the spread of smell in the profile.

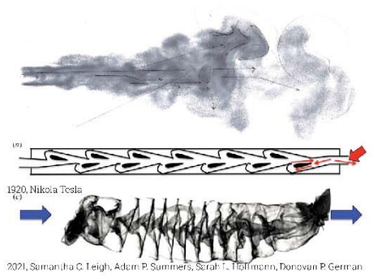
By designing 9 simple cross section modules, the scent is guided by burning incense at the bottom to observe the spreading mode of the scent. The experiment has three simple conclusions:

1) In the connected patio area, the gaseous fluid has a faster flow rate, resulting in a lower concentration;
2) In the deep flat area, the gaseous fluid is easy to accumulate;
3) The distribution of the gaseous fluid follows the characteristics. The law of the Tesla Valve, that is, the reverse blocking principle, guarantees the direction of movement of the gaseous fluid.

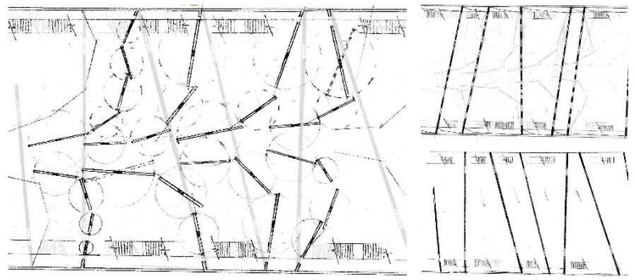


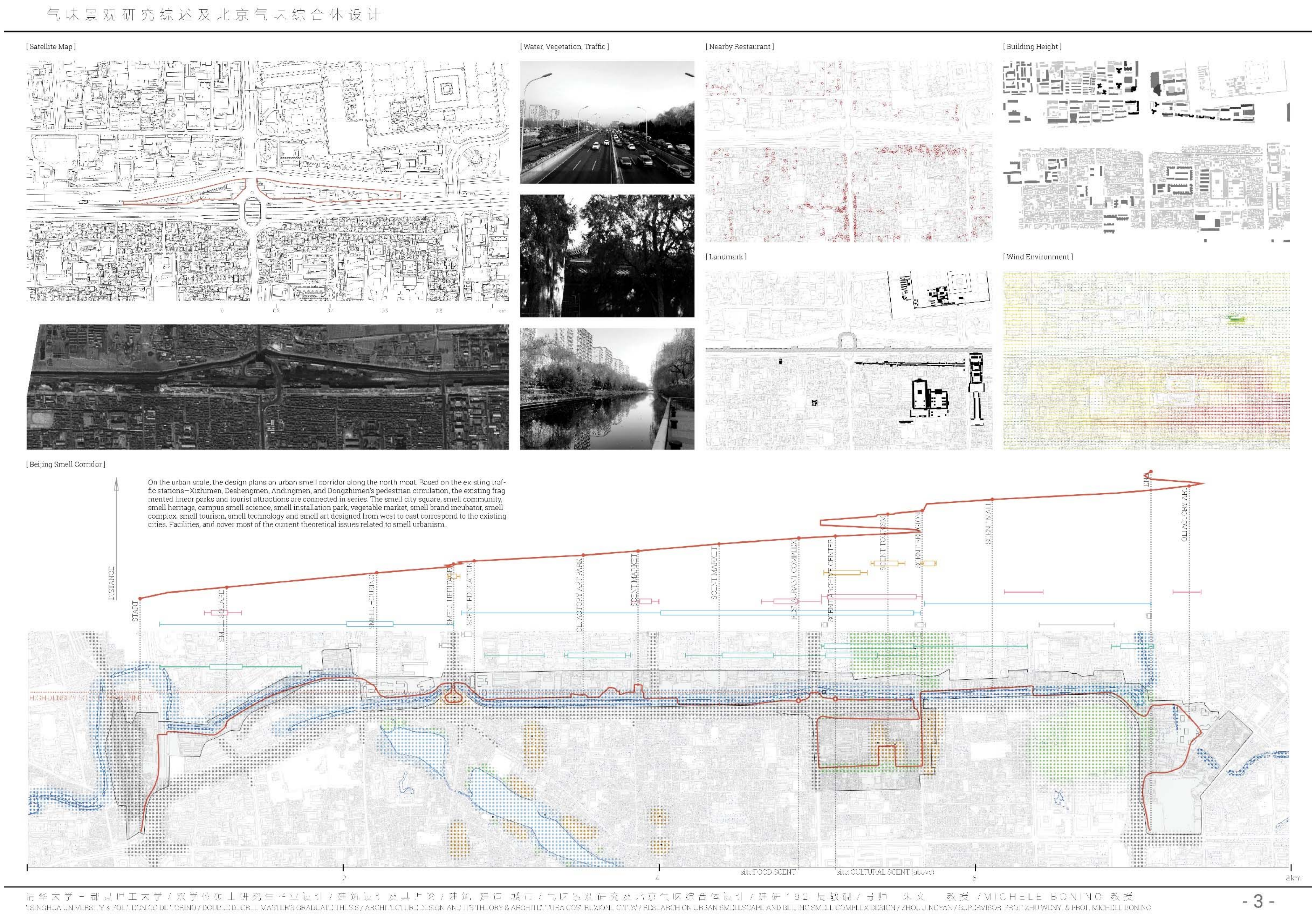


[Tesla Valve & Sharks Intestines]

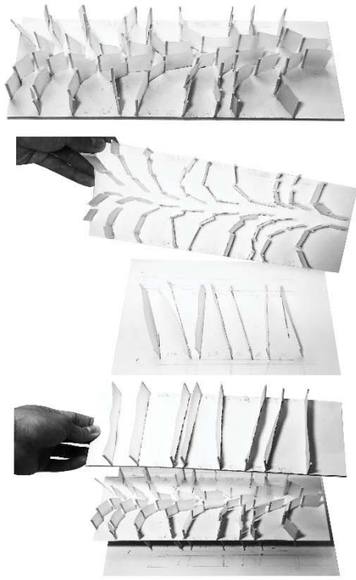


[From Tesla Valve to Form]




气味景观研究综述及北京气味综合体设计
[Satellite Map]
[Water, Vegetation, Traffic]
[Nearby Restaurant]
[Building Height]
[Landmark]
[Wind Environment]
[Beijing Smell Corridor]
On the urban scale, the design plans an urban smell corridor along the north moat. Based on the existing traffic stations—Xizhimen, Deshengmen, Andingmen, and Dongzhimen's pedestrian circulation, the existing fragmented linear parks and tourist attractions are connected in series. The smell city square, smell community, smell heritage, campus smell science, smell installation park, vegetable market, smell brand incubator, smell complex, smell tourism, smell technology and smell art designed from west to east correspond to the existing cities. Facilities, and cover most of the current theoretical issues related to smell urbanism.
DISTANCE
START
SMELL SQUARE
SMELL HERITAGE
SCENT MARKET
SCENT MARKET
SCENT TOURISM
SCENT WALL
SITE: FOOD SCENT
SITE: CULTURAL SCENT
2
4
6
8km
- 3 -

[Prototype Spiral Stucture]



Floor:

Dynamic, informational smell evironment

Top

Double-layer S.tructure allow a corridor of smell and project linear laser to the interior

Bottom

Release the smell inside the space into the oper space

[Line with Surroundings]

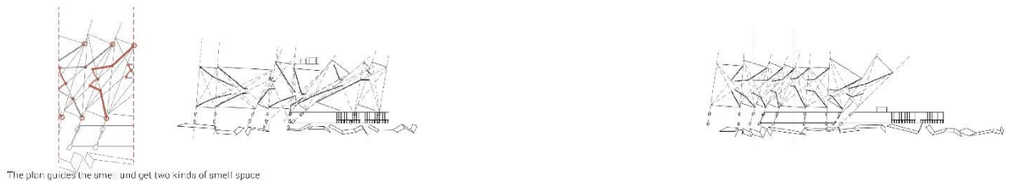
[Logic and Geometry of Plan, Top, Bottom]

The boundary of the top part comes from the surroundings

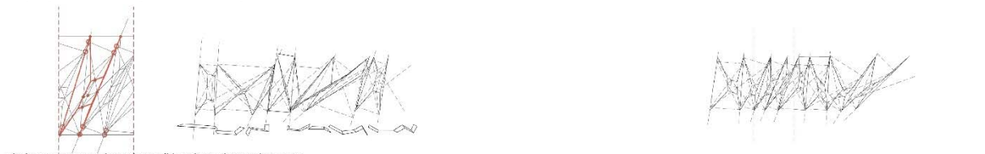
The thin gap of the top part is used to get light

The ceiling follows the top part to keep a corridor for smell to flow

The plan is based on the control points of the top part



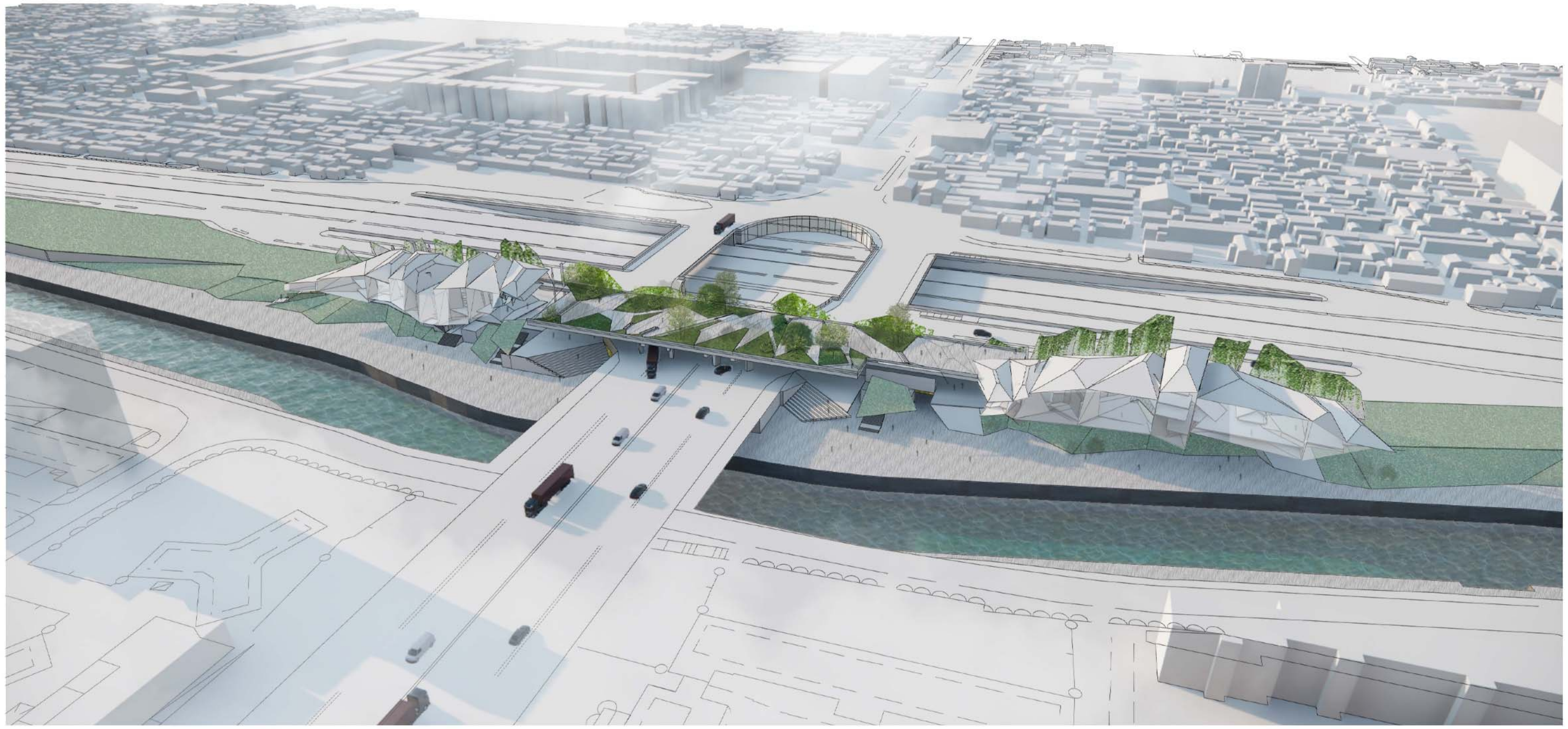
The plan guides the smell and get two kinds of smell space



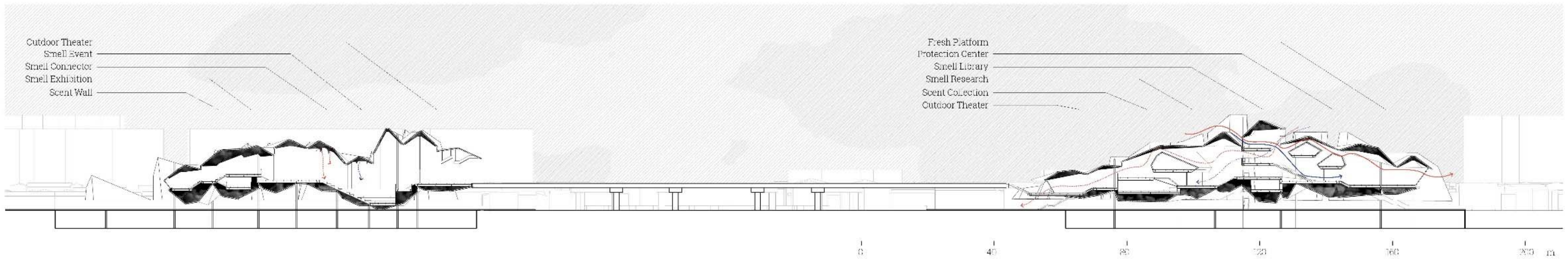
The bottom part can release the smell into the outdoor environment

气味景观研究综述及北京气味综合体设计

[Smell as Infrastructure]

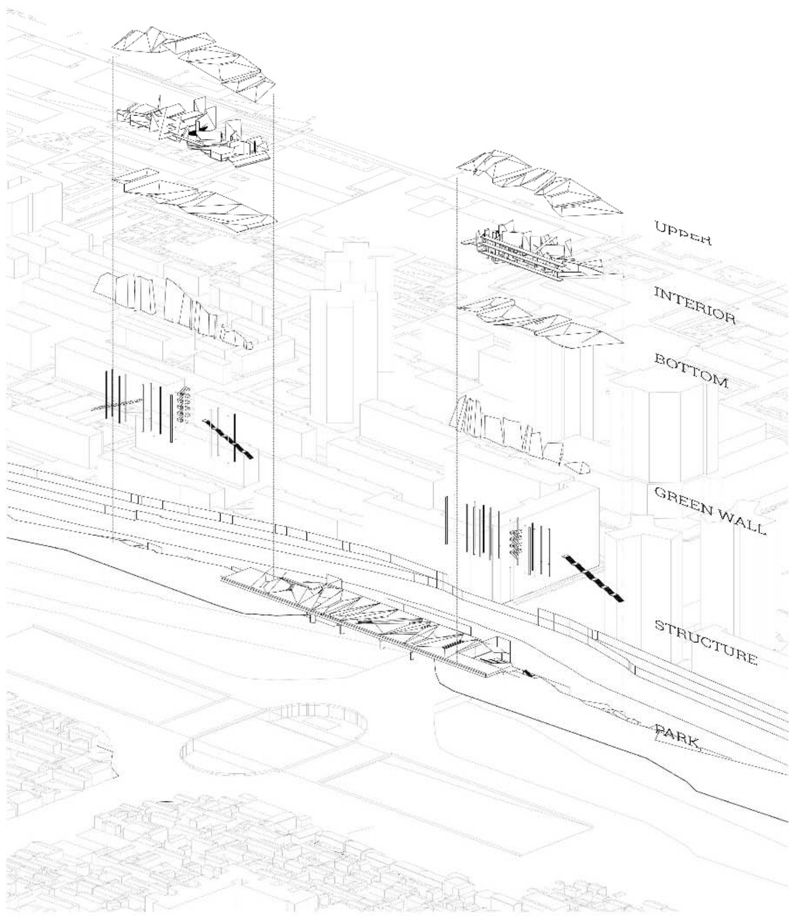


[Smell Space with Functions]

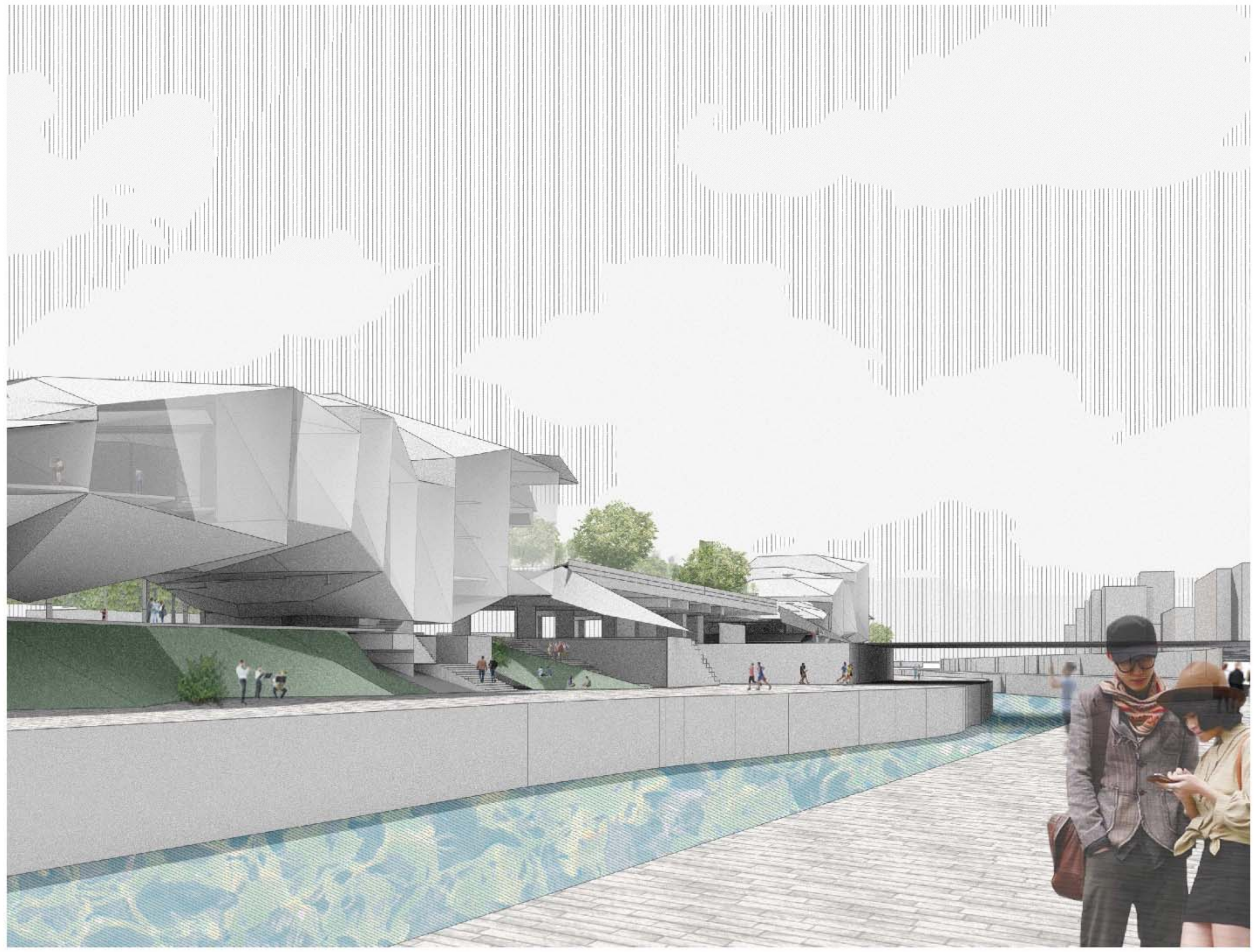


气味景观研究综述及北京气味综合体设计

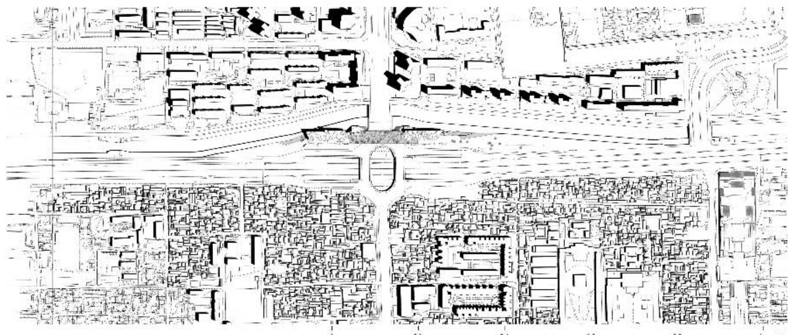
[Layers of the Skin and Inner Space]



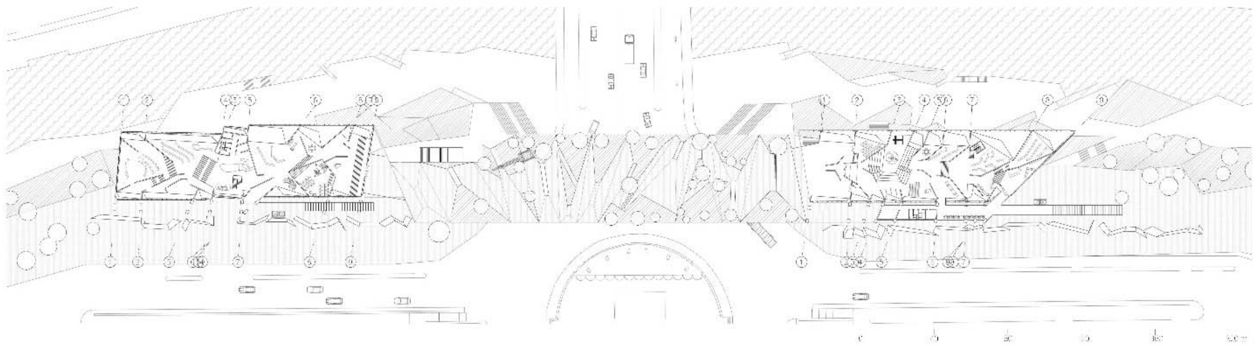
[From Riverside]



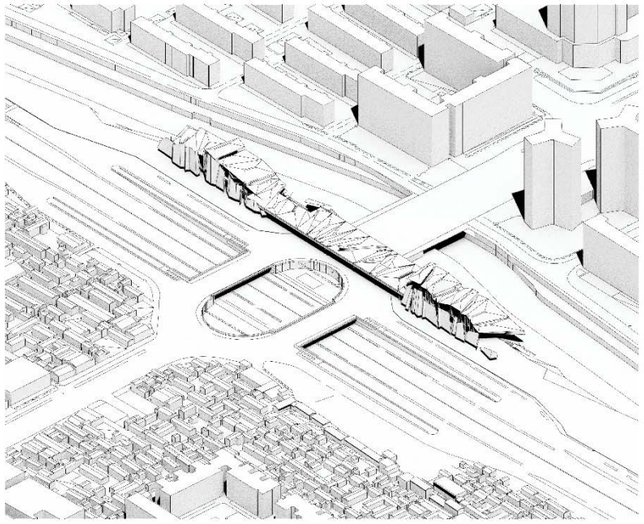
[Masterplan]



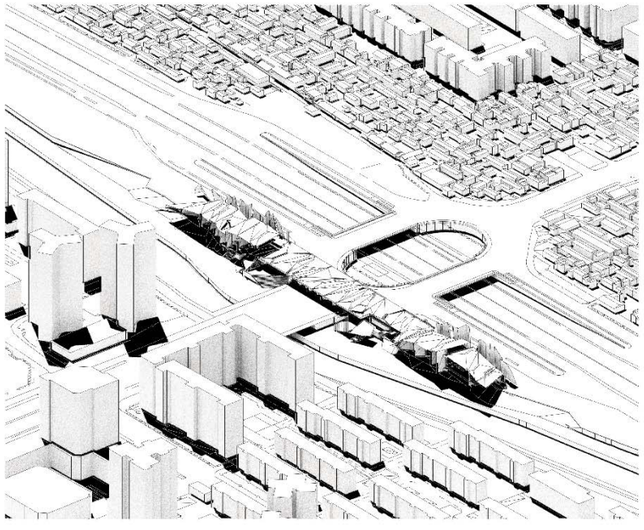
[Plan]



[Facing Old Beijing]

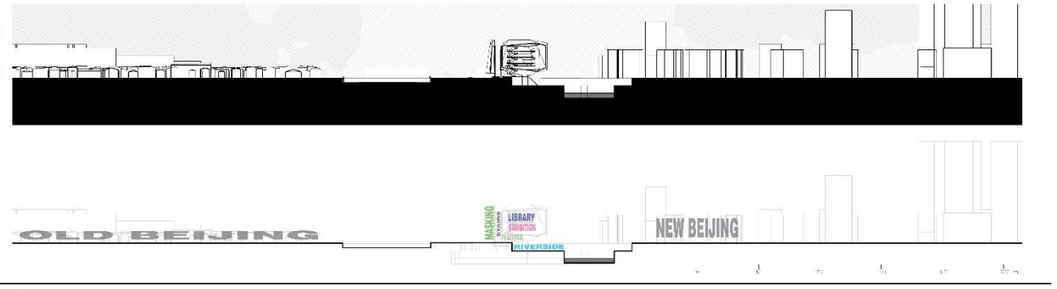


[Facing New Beijing]



[Big Space for Press Conference]

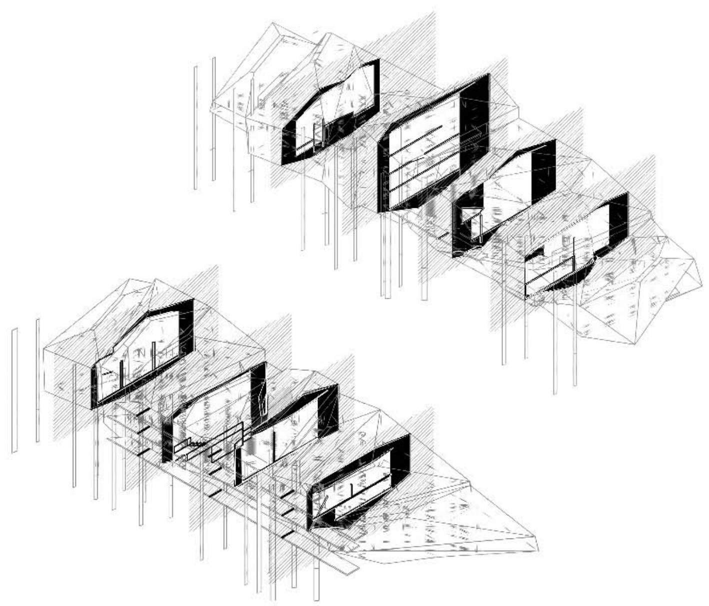
[Relation with Old and New Beijing]



气味景观研究综述及北京气味综合体设计

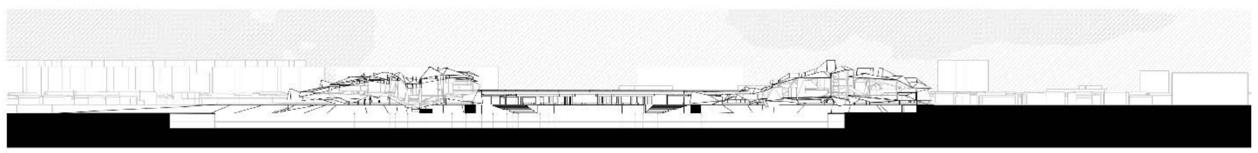
[View from Old City]

[Continuous Section]

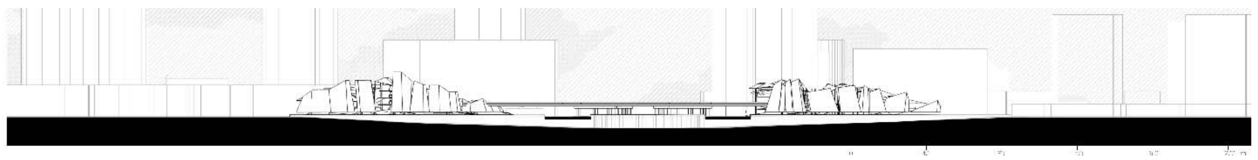


[Smell Research and Experience]

[North Elevation]



[South Elevation]



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